

PUNJAB STATE TRANSMISSION CORPORATION LIMITED
(Regd. Office: PSEB Head Office, The Mall,
Patiala)

**STATE LOAD DISPATCH CENTER,
PUNJAB**

TENDER ENQUIRY NO.: 12/SE-OA/2026

Tender Notice for: Design, Engineering, Supply, Erection, Testing, Commissioning and Integration of Remote Terminal Units (RTUs) for SCADA/ EMS system in PSTCL on Turnkey Basis.

SLDC Building, 220kV Grid Sub Station
PUNJAB STATE TRANSMISSION CORPORATION LIMITED,
ABLOWAL, PATIALA-147001

Ph. No. 0175- 2366007/ 2365901

Fax No.0175-2367490

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NOTICE INVITING TENDER

Address details of issuing authority	Chief Engineer/ SLDC, SLDC Building, 220 KV Grid Sub-Station, PSTCL, Ablawal (Patiala)	
Tender Enquiry No	12/SE-OA/2026	
Scope / Short Description	Design, supply, erection, testing, commissioning and integration of Remote Terminal Units (RTUs) for SCADA/EMS system in PSTCL as per the specification	
Quantity	55 Nos.	
Downloading of Tender documents	Start Date	Date of Publication
	Last Date	03.07.2026 upto 11:00 AM
Date & time up to which tenders shall be received		03.07.2026 upto 11:30 AM
Date & time of opening of tenders		07.07.2026 at 11:30 AM

Please note that the tenders against this tender enquiry are being invited through e-tendering mode. **Submission of Manual tenders in any case shall not be accepted. However one hard copy of upload documents shall be submitted upto the date and time of receipt of tenders.**

The details regarding e-tendering process may be seen on Punjab Govt. e-tendering website <https://eproc.punjab.gov.in> and the prospective bidders may contact 24x7 Help Desk for any technical queries at their toll free nos. 0120-4001002, 0120-4001005, 0120-4200462, 0120-6277787. Details regarding e-Tendering are available on website www.pstcl.org. All the prospective bidders are requested to get their digital signatures, register themselves on the web site <https://eproc.punjab.gov.in> and get conversant with the process of on line submission of tenders well in time so as to upload the tender by the due deadline. No request for extension in the due date of tender opening on the above grounds shall be entertained.

Contact Person


Dy. CE/SLDC (Market Operations),
PSTCL, Ablawal, Patiala
Phone No. 0175-2365901

SAVE ELECTRICITY TO REDUCE POWER CUTS

CHECK LIST OF DOCUMENTS

It is mandatory for the bidders to submit/upload/fill online the following documents else, the bid shall be considered unresponsive and hence rejected:-

Sr. No.	DETAILS	PART	REMARKS by PSTCL	Whether the documents/ requirements as specified in specification are attached/ complied by the firm
1.a 1.b	Processing Fees Earnest Money Deposit (EMD)	Part-I	Submit proof for submission of Processing Fees (if applicable)/ EMD/ valid PEMD certificate before the last date & time of bid submission/ uploading & fill up the DD/ PEMD details on- line.	Yes/No
2.a	Documents in support of fulfilling the qualifying requirement as specified in Clause 3.0 (Part- A - Annexure-XIV(a) (Technical Experience) & XIV (b) (Net worth)	Part-II	FILL ONLINE/UPLOAD SCANNED COPIES AS THE CASE MAY BE	Yes/No
2b	Sub Clause No. 3.3 under Clause 3.0- Annexure-XV (Certificate regarding past dealings with Erstwhile PSEB/PSTCL)			Yes/No
2c	Clause 3.0 (Part-B) – General Capability Requirement- Annexure-XVI(a), XVI(b), and XVI(c)			Yes/No
2d	Undertaking as per Clause No. 9.34			Yes/No
3	Annexure-XVII (Cover Letter- suitably modified in case EMD is submitted before last date)			Yes/No
4.	Annexure-X (Works Appraisal Performa)			Yes/No
5.	Annexure-XI: Schedule of Techno-commercial Deviations			Yes/No

6.	Annexure-XII: Schedule of Testing Facilities			Yes/No
7.	ANNEXURE XIII: Guaranteed Technical Particulars			Yes/No
8.	ANNEXURE XIX(A) Schedule of consolidated Bill of Quantities			Yes/No
9.	ANNEXURE XIX(B) Schedule of detailed Bill of Quantities			Yes/No
10.	Scope of Work as per Section 5.0			Yes/No
11.	Technical Specification requirement of RTUs and other equipments as specified in Section 8.0			Yes/No
12.	General instructions to be observed by the tenders as per Section 4.0			Yes/No
13.	Vendor Responsibility and obligations as per section 6.0			Yes/No
14.	Details of RTU Locations as per Section 7.0			Yes/No
15.	General Terms & Conditions as per section 9.0			Yes/No
16.	Terms & Conditions for Erection work as per Section 10.0			Yes/No
17 (a)	Schedule-1: Supply Part	Part-III		Yes/No
17 (b)	Schedule-2: Spare Qty			Yes/No
17 (c)	Schedule-3- Type Tests			Yes/No
17 (d)	Schedule-4- Service Portion			Yes/No
17 (e)	Schedule-5- Grand Total			Yes/No
18	MSME Annexure (Annexure XX)			
19	Model Clause/Certificate to be submitted by bidder (as per Rule no 144 (xi) of GFR (AnnexureXXI)			

TERMS & CONDITIONS:

1. Details regarding e-tendering process are available on the Punjab Govt. e-tendering website <https://eproc.punjab.gov.in> or prospective bidders may contact 24x7 Help Desk for any technical queries at their toll-free nos. 0120-4001002, 0120-4001005, 0120-4200462, 0120-6277787. It may be noted that no hard copy of the specification will be issued by this office and the specification can only be downloaded from the above-mentioned website.
2. Copy of proof of EMD Deposit or PEMD certificate issued by AO/CPC, PSTCL, Patiala may be furnished in separate envelopes upto the last date/time of bid submission in the office of Dy. CE/SLDC (Market Operation), PSTCL, Patiala failing which bids of the firms will not be opened.
3. Prospective bidders are requested to get issued their digital signatures well in time for participation in the tender as no request for extension on this account will be entertained.
4. Please note that the bids against this tender enquiry are being invited through e-tendering mode. Submission of Manual tenders in any case shall not be accepted.
5. Only FIRM Prices should be quoted. Offer with variable prices will not be accepted.
6. If the day fixed for opening of tenders happens to be a holiday, the same will be opened on next working day at the same time and at the same place.
7. PSTCL reserves the right to increase/ decrease the NIT quantity or to reject the NIT item/ quantity, whole or a part thereof, without assigning any reason (s) or liability to the Purchaser.
8. Telegraphic/ fax/ e-mail tenders will not be accepted.
9. Tender document can be downloaded from the website <https://eproc.punjab.gov.in>
10. Conditional tenders are liable to be rejected out rightly.
11. The offers must be valid for 180 (One hundred eighty) days from the date of opening of techno-commercial bid.
12. PSTCL reserves the right to reject any or all the tenders so received at any time without giving any reason and shall not be responsible to pay for expenses or losses that may be incurred by the Bidder in preparation of tender bids.
- 13) The tenderer shall supply a list of two authorized person with their signatures duly attested on the firm's pad so that they may represent on behalf of the firm and participate in the opening process of the bids and the same should be

with the authorized person(s), at there under he/they will not be allowed to participate in the opening of tender.

- 14) Negotiations, if necessary, shall be held with the lowest tenderer only.
- 15) Tenderer should not indicate any discount on rates mentioned in the Annexure of cost analysis. However, qty/payment discount can be mentioned in the main tender itself. Tenderers offering discount on quoted price or after the opening of tender will be out rightly rejected.
- 16) The tenderers will have to give an undertaking that they shall not pay any commission etc. or engage any commission agent or liaison agent for dealing with PSTCL in any matter including purchase of specification etc. This undertaking is required to be supplied / uploaded alongwith the offer.
- 17) Any deviation in Technical & General conditions must be indicated, otherwise it would be assumed that the material offered is entirely as per enclosed Technical specification & General conditions which are acceptable to the Tenderer in to-to.
- 18) The tenderer revising their offer or withdrawing the same within validity period after opening of tender are liable to be rejected / black listed.
- 19) Documents to be furnished must bear signatures of a person authorized as per constitution and composition of the firm. Authenticating documents to prove authority of signatory (Legal power of attorney in favour of signatory) must be attached/uploaded with the bid.
- 20) Tenderers should submit their offer in unambiguous wording failing which PSTCL's interpretation will be final.
- 21) The prospective bidder shall have to pay applicable tender processing fees on online e-tendering portal, the current rate of which is Rs. 5,900/-.
- 21) Compliance to notifications issued by Government of India:
 - The bidder shall furnish undertaking in compliance to notification order no. F.No.6/18/2019-PPD (Order Public Procurement no.1) dated 23/07/2020 amended from time to time regarding "Restriction under Rule 144(xi) of General Financial Rules as per Annex.-19.
 - The bidder shall comply to the instructions of Public Procurement (Preference to Make in India) order dated 16.11.2021 of GoI, MoP and all other related orders issued in its furtherance. The bidder needs to provide self-certification that the item offered meets the local content requirement for Class-I local supplier/a Class-II local supplier as the case may be. They shall also give the details of the locations where local value addition is made.
 - The bidder has to furnish undertaking in compliance to order no. 12/34/20202-T&R dated 08.06.2021 and all other related orders issued in its furtherance and cyber security conformance testing for the offered items as per the

guidelines issued by Ministry of Power.

- The bidder shall have to be an entity registered in India in accordance with law.
- The bidder shall follow Indian laws, regulations and standards.
- Country of origin of the equipment/material shall be provided in the bid.
- For supply of equipment/material from the country of origin other than India, the bidder shall submit performance certificate in support of satisfactory operation in India or a country other than the country of origin having climatic and operational conditions including ambient temperature similar to that of India for more than 5 years (to be specified by the procurer)
- The technologies/ products offered shall be environment friendly, consuming less energy, safe, energy efficient, durable and long lasting under the prescribed operational conditions.
- The supplier shall ensure supply of spares, materials and technological support for the entire life of the project.
- The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.

NOTE:- Bidders are requested to read the specification carefully so that their offer may not be rejected on account of amendments/ revisions (if any) with respect to the earlier specification.


Dy. CE/ SLDC (Market Operation),
PSTCL, Ablawal, Patiala.

1.0 Introduction:

Punjab State Transmission Corporation Limited (PSTCL) has Supervisory Control and Data Acquisition (SCADA) system-based Energy Management System (EMS) for computerized load dispatch & management under the Unified Load Dispatch & Communication (ULDC) scheme for Northern Region executed by Power Grid Corporation of India Ltd. (PGCIL). Power flow data from RTUs/ SAS/ Substation SCADA installed at generating stations and important 400kV, 220KV and 132 KV Stations in PSTCL is presently being acquired under this scheme at State Load Dispatch Centres (SLDC), Ablowal (Patiala) and 2 no. Area Load Dispatch Centres (ALDCs) at Laltonkalan (near Ludhiana) & Jamsher (near Jalandhar). It is now proposed to augment the SCADA/ EMS scheme by providing more RTUs at the left out 132kV substations as well as against replacement of defective/outlived RTUs, online data of which are to be integrated with EMS/ SCADA system of M/s Siemens under ULDC Phase-II or upcoming SCADA under ULDC Phase-III.

2.0 General Requirements:

The tentative list of 132kV & 220kV Sub Stations where these RTUs are required to be provided for replacing the existing RTUs for Cannibalizing purpose and/ or Retrofitting purpose is as per Annexure-XVIII. Cannibalizing work of RTU, retrofitting work of RTU have been defined in section on Scope of Work of this TE. Further, these RTUs can also be installed/ shifted to new/ upcoming sub-station as per the requirement. However, the list & quantity of sub stations are purely tentative and the number of RTUs can be increased or decreased depending upon the actual status of commissioning/ availability of data connectivity of the 132kV & 220kV Sub Stations or as per the policy or otherwise at the option of PSTCL, without any liability to the Purchaser. At the time of placing the Order on successful Bidder exact number of RTUs which the Bidder have to Supply/ Commission as per the Clause on Delivery/ Commissioning Schedule will be given and for the rest of the RTUs the delivery/ commissioning can be deferred/ staggered as may be required for upto two years from the date of Order or which can be further be increased or decreased in mutually agreement.

Tentative list of I/O Count/ BOQ for the purpose of evaluating the submitted bids is given in Annexure-XIX (A) & (B). The exact number of I/O will be ascertained by the successful vendor during the survey under the guidance of Implementation agency i.e. concerned CO&C division of Purchaser and get it approved from the Purchaser before execution of the order. After receiving the actual I/O Count as per the field survey report from the Contractor, necessary amendment to the order will be issued.

Payments will be made as per actual I/O count.

This tender document spells out the specification requirements for design, engineering, supply, erection, testing, commissioning and integration of the RTUs with the EMS/ SCADA scheme/s.

3.0 Qualifying Requirements

Qualification of bidder will be based on meeting minimum pass/ fail criteria specified below regarding the bidder's technical experience and financial position as demonstrated by bidder's responses in corresponding bid schedules.

Part- A:

3.1 Technical Experience:

The bidder must be a manufacturer of RTUs who has supplied, installed, tested & commissioned RTUs in EHV substation including integration with SCADA system for a power utility (Generation/Transmission/ Distribution) during last 5 years and further meeting the following requirements:-

- 3.1.1 The above jobs should consist of at least 5 no. RTUs.
- 3.1.2 RTUs of the above executed job should be in successful operation for at least 2 years as on date of publication of notice of inviting tender (NIT).
- 3.1.3 The new bidders, who are offering the RTUs to the PSTCL/ SLDC for the first time and those bidders who had earlier participated during the Tender Enquiry No. 04/SLDC-D/2022 but are offering different RTUs from previous ones shall have to come for detailed testing of their RTU at PSTCL/SLDC during the Technical Evaluation process of the Tender to show compliance of their offered RTU with respect of the present TE specifications. For which, the bidder will be called for detailed testing by PSTCL/ SLDC after opening of the tender as soon as possible.
- 3.1.4 The bidder is also required to submit details in respect of above:-
 - a) Copy of LOA/Work order/Purchase order/Contract Agreement.
 - b) Work Completion certificate
 - c) Certificate/ Confirmation in respect of satisfactory operation of RTUs as mentioned above.

3.2 Financial Position:

Bidder shall meet the following financial criteria:-

- a) Net worth* for last 3 (three) financial years should be positive which must be evaluated as per duly filled annexure (Annexure-XIV(B)). The firm should also have earned profit in at least three out of last five financial years.

- b) Minimum Average* Annual Turnover # (MAAT) for best three financial years out of last five financial years of the bidder should not be less than Rs. 15 Cr.
- c) Bidder shall have liquid assets (L.A.) and/or evidence of access to or availability of credit facilities of not less than Rs 2.5 Crores.

Note:

* In case bidder has established manufacturing facility in India and is yet to complete three financial years, the net worth and average of the turnover as per financial statement for completed financial year shall be considered for the purpose of compliance to the specified net worth and MAAT requirements.

- i. # Annual Turnover as incorporated in the profit and loss account excluding non-recurring income i.e. sale of fixed assets, etc.
- ii In case bidder is a holding company; MAAT referred above shall be of that holding company only (i.e. excluding its subsidiary/group companies). In case bidder is a subsidiary of a holding company, MAAT referred above shall be that of subsidiary company only (i.e. excluding its holding company).

3.3 Past dealings with erstwhile PSEB/ PSTCL:

- 3.3.1 Those firms will not be considered with whom business dealings have been suspended blacklisted firms & debarred.
- 3.3.2 Any firm which is defaulter for the supply of 25% or more quantity of the ordered quantity for more than 9 months from the date of expiry of the Contractual Delivery Period at the time of opening of the Tender enquiry, shall be regarded as defaulter and shall not be eligible for participation in any new Tender enquiry for a period of three years from the date of issue of Purchase Order in which it has defaulted.

The bidder shall attach certificates/ undertakings in compliance to the above requirements as per Annexure-XV.

Part B:

3.4 General Capabilities Requirements:

The bidder shall attach certificates/ undertakings in compliance to the following requirements as per Annexure-XVI.

3.4.1 Litigation History:

The bidder shall provide the detailed information on any litigation or arbitration arising out of contracts completed or under execution by it over the last 5 years. A consistent history of awards involving litigation against the bidder may result in rejection in bid at any stage.

3.4.2 Personnel capabilities:

The bidder shall have suitably qualified personnel to execute the job. The

- bidder shall supply detailed information of its key personnel handling RTU job position wise providing their qualifications, past experience data, etc.
- 3.4.3 Details of orders in hand or pipe line for similar jobs, commitments to others, etc.
- 3.4.4 Notwithstanding anything stated above, the Purchaser reserves the right to assess the capacity and capability of the bidder should the circumstances warrant such assessment in an overall interest of the PSTCL, to successfully execute the scope of work covered under the package within stipulated completion period. This assessment shall inter-alia include (a) document verification; (b) bidders work/manufacturing facilities visit; (c) manufacturing capacity, details of works executed, works in hand, anticipated in future & the balance capacity available for the present scope of work; (d) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources; (e) details of quality control systems in place; past experience and performance; (f) customer feedback; (g) Banker's feedback etc.
- 3.4.5 It is also requested to please fill in the Schedule-C at Annexure-X, Schedule-E at Annexure XII.
- 3.4.6 **The bidder should have their own works where RTUs shall be assembled/ manufactured and offered for the inspection before dispatch to PSTCL, with all the test facilities with valid certificates from Central Power Research Institute (CPRI), Bengaluru, Karnataka in compliance to MoP, GoI Order No. 12/34/2020-T&R dated 24th December 2021 and 25-10/72/2024-PG dated 6th August 2025 and valid certificates from NABL approved lab for other tests as per specification.**

4.0 General Instructions to be observed by the Tenderer:

4.1 Submission of Tenders

- The bidders must carefully observe the following instructions. The offer/ bid not strictly in accordance with these instructions are liable to be rejected
- 4.1.1 Tenders not fulfilling the minimum pass/ fail qualifying requirements shall be outrightly rejected and decision of purchaser shall be final.
- 4.1.2 The tender must be complete in all respects. Every clause should be carefully studied before submission of a complete and comprehensive tender. All the necessary certificates/ undertakings/ Deviations (Non-Compliance), Price Schedules etc. should be as per the specified performance given in the Annexure. Any deviation (non-compliance) and/ or any difference necessitated from the specified performance must be mentioned in the Deviations sheet, even any deviation from the language of the certificates/ undertakings should be mentioned along with explanation. Failure to comply with any of these instructions or to offer unsatisfactory explanation for non-compliance is likely to render effective comparison of the tender as a whole impossible and may lead to rejection of an otherwise competitively lowest offer.

- 4.1.3 Offers/Tenders should positively be uploaded before the stipulated time and the last date prescribed for their receipt. Those uploaded late will not be considered /opened at all.
- 4.1.4 As such, uploaded tenders must have a cross reference i.e. Page No & Highlighted (e.g. Page No 5 Mark/ Sidelined A, Page No 5 Mark/ Sidelined B, Page No 25 Mark/ Sidelined E) Marking corresponding to the submitted/ claimed facts by the bidder, where proof of the same could be checked/ referred to. In case of noncompliance to these instructions, the Bid may be rejected without liability to the Purchaser. As such bids should be complete in all respect.
- 4.1.5 The scanned documents submitted/uploaded should be wholly typed or printed. As a first principle there should be no cutting/over writings or erasion. However, any unavoidable cutting/over writings should be duly signed and authenticated.
- 4.1.6 Telegraphic/fax/e-mail tender bids will not be accepted.
- 4.1.7 The tenders shall be uploaded in three parts i.e. Part-I, Part-II & Part-III. The following procedure shall be adopted for opening of the tenders:-
- Part-I Tender Processing Fees/Earnest Money Deposits: The first part will, consist of Tender Processing Fees (if applicable at the time of tendering), Earnest Money Deposit (EMD) which shall be deposited by the bidder through online portal..
- Part-II Qualification/Technical/Commercial bids: The second part will consist of qualifying requirements, technical specifications of equipment offered, schedule of deliveries/ BOQ, schedule of deviations, etc and all other terms and conditions except the rates/ prices.
- Part-III Price Bids: The third part will consist of the rates quoted as well as other related terms like Freight, Insurance, GST etc. and other incidental charges relevant to the price as per the specified price schedules (Schedule-1 to Schedule-5). The quoted unit price of each item shall be used to cater for increase/ decrease of the I/O Count as per actual field survey and/ or for any other reasons.
- 4.1.8 The tender should be submitted/uploaded strictly as per NIT/ tender specification complete in all respects. Mere writing that deviations/ variations/ comments are "As per previous supply & as per catalogue attached" will not be entertained. Deviations/ Variations/Comments, if any should be clearly detailed out clause-wise in the same chronological order as given in this specification in the Annexure-XI, otherwise it will be presumed that all clauses stipulated therein are acceptable to the tenderer. No post tender development will be allowed regarding any change in terms of prices or technical specification.
- 4.1.9 Uploaded tender documents must bear signatures of a person authorized

as per constitution of the firm. Authenticating documents to prove authority of signatory (Legal power of attorney in favor of signatory) must be attached with the tender.

- 4.1.10 The firms having permanent security deposit of Rs.25.0 (twenty five) lacs. with AO/CPC, a certificate to this effect issued by the Accounts Officer/CPC, PSTCL, Patiala during six months immediately preceding the due date for tender opening and showing the Serial Number/ Account Number allotted in the permanent Earnest Money Deposit Register shall be submitted by the Tenderers in the envelope for Earnest Money, for seeking exemption thereof. Similarly Public Sector Undertakings owned by the Punjab Govt/ Central Government/ Other state Governments supplying material directly through units owned by them shall submit a certificate of Govt. ownership issued by the concerned Govt. Department in the envelope for Earnest Money for exemption from Earnest Money. Exemption shall not be applicable if the tender is submitted for supply of material through private unit/ manufacturer.
- 4.1.11 Tenderers should submit their offer in unambiguous non conditional wording failing which PSTCL's interpretation will be final.

4.2 Opening of Tenders

- 4.2.1 Offers/ tenders will be opened on the date and time prescribed in the N.I.T. in the presence of tenderers or their authorized representatives, who may like to be present. In case the date of opening of tender falls on a holiday or holiday is subsequently declared on that date, the tenders will be opened on the next working day following the holiday at the same time and venue as notified in the NIT. The following procedure will be adopted for the opening of tenders:
- 4.2.2 Firstly, the main envelope containing the EMD will be opened in the presence of bidders representatives who choose to be present at the time, date and at the address named above. If the earnest money and cost of the specification is found to be as per the requirements of the specification, only then the Part-II shall be opened from website. The bids without earnest money shall be out rightly rejected.
- 4.2.3 After opening Part-II of the bids (Qualification/technical/commercial), the bids will be taken up for qualification, technical & commercial evaluation.
- 4.2.4 Presentation/ Demonstration cum Testing: Before opening of the Price Bids (Part- III) of the submitted tenders, all the new participating bidders excluding those bidders which have already participated in the Tender Enquiry No. 04/SLDC-D/2022 and has already given the presentation/ demonstration cum testing, shall be called upon to give a presentation on their offered RTUs capabilities along with a detailed demonstration to show the capabilities of their RTUs. Further, during presentation/

demonstration, requisite testing shall be done at the SLDC itself, to check these capabilities as well as compliance to the TE specifications as well as compatibility/ integration with the Purchaser's SCADA systems. The result of the presentation/ demonstration/ testing shall be treated as a part of techno commercial evaluation criteria.

In case, those bidders which participated in the Tender Enquiry No. 04/SLDC-D/2022 offering the different model of RTU from the previous model, they shall also be called for presentation/ demonstration cum testing at PSTCL/SLDC as and when required by the PSTCL/SLDC.

For demonstration purpose any equipment, test tools, RTUs (may be rack only) (at least two), various types of cards, field simulators, power supplies, protocol analyzers tools, cables, connectors, etc. shall be brought by the bidder.

4.2.5 The third part of the bids (Price bid) shall be opened in case of only those firms whose Part-II of the bids after evaluation is found to be conforming to the specifications. The date and time for opening Part-III of the bids will be intimated to the qualifying bidders.

4.2.6 The price bids (Part-III) will be opened in the presence of the representative of the qualifying bidders who choose to attend.

4.3 The officer inviting tenders, contracting/purchasing agency/PSTCL (referred to as Purchaser reserves the right to modify the schedule of requirement, technical particulars and the specifications at any time and to place the order as a whole or in parts and to reject any or all the tenders received without assigning reasons or liability. The purchaser will not be responsible for and will not pay for expenses or losses that may be incurred by the tenderer in the preparation/ submission of the tenders.

4.4 The material offered should be strictly according to the specifications laid down in the tender documents. The quotation should also indicate the make /name of the manufacturer, brand of the equipment offered accompanied with other descriptions, literature, specified/ relevant type tests and samples, if any, at Tenderer's own cost. Fully dimensioned drawing of the equipment, technical particulars and detailed literature shall also be attached with the tender. For bought out assembly/ units, detailed drawings, part number and name of the vendors will be provided in the bid.

4.5 **Implementation Schedule**

Within one week of contract award (i.e. issue of letter of intent / LOI), the Vendor shall submit a detailed PERT/ project schedule for Purchaser's review and approval. The project schedule shall include all tasks to monitor overall duration, direction and integration of the project from inception to completion. The actual progress made to date and the

schedule delivery date for the completed systems shall be closely monitored by Purchaser.

The implementation schedule shall summarize all activities, and shall include but not limited to the following:

- Collection of basic field data of RTU substations.
- Submission of final I/O list, design drawings for Purchaser approval
- Hardware purchases, development and integration.
- Hardware production schedules
- Documentation preparation and release
- Documentation revision and release following Purchaser comments.
- Factory testing, Training schedule
- Shipment, Receipt, forwarding and staging
- Site preparations, field adaptation jobs
- Installation, Field testing, commissioning and system integration
- Site availability tests
- Completion of project
- Submission of manuals and final /as-built drawings

Each scheduled task shall have an estimated duration for completion and predefined relationships with other tasks. Relationships shall be used to enforce the logical progression of work such that certain tasks cannot start until others have finished.

4.6 Validity of Tender:

Tenders must be valid for 180 (One hundred eighty) days from the date of opening of Techno- Commercial bid. Any tenderer revising offer/bid within the validity period is likely to be ignored, rejected and/ or blacklisted.

4.7 Order Preference will be given to Punjab based manufacturers as per erstwhile Board's and PSTCL's prevailing Purchase Regulations.

4.8 Other Special Instructions:

- 4.8.1 No conditional offers shall be acceptable.
- 4.8.2 Request for extending the due date of tenders may not be considered.
- 4.8.3 Manual tender shall not be accepted.
- 4.8.4 The bidders are required to fill and submit all the Bidding Schedules as contained herein.
- 4.8.5 The evaluation of the bids will be done on the basis of information provided by the bidder in the bid/ bidding schedules. The information should be specific and self-contained without giving any references to the technical literature or otherwise.
- 4.8.6 During design/ execution of this work, in case there is any change in the specified Input/ Output digital or analog points, modems, etc, then the contract value will be adjusted in accordance with the unit prices for the corresponding items to be added/ deleted.

- 4.8.7 Purchaser reserves the right to interpret the clauses of TE specifications and its decision in the matter shall be final and without any liability to the Purchaser.
- 4.8.8 All the Optional items/ features as mentioned anywhere in the Specifications, detailed BOQ, Consolidated BOQ or Price Bid are to be quoted by the Bidder compulsorily. However, final decision to procure the same or variation in quantity to be procured is reserved by the Purchaser at its discretion without any liability/ claim. The bid price evaluation shall include all optional items (if any) mentioned in the BOQ/ Price bid by the Purchaser.
- 4.8.9 The Bidder has to quote **for 5 years** of extended warranty cum maintenance support as specified, but the charges shall be payable on equal quarterly basis for this service only after completion of the relevant quarter. Extended warranty shall be further extendable by 5 years as per mutual agreement.
- 4.8.10 Suitable standalone modem rack with pre-wired cables for mounting and powering the far end modems at the respective control-centres shall be provided by the Bidder matching with existing panels provided already at Control Centre Ends for existing Modems if no requisite space is available therein. In case form factor of the supplied Modem is different or there is no space for the extra Modems, then either Bidder will provide necessary harnesses to put its modem into the existing panel or shall supply suitable panel/s for its Modems. Further, all the wiring/ connectors from Purchaser's Communication Front Ends to Contractor's modem, from Contractor's modem to communication equipment located wherever in EMS/ SCADA control-centre building or from respective RTUs to communication equipment located wherever in substation, shall be in the scope of the bidder.
- 4.8.11 RTUs should be suitable to interface with either of mode of communication viz PLCC, microwave, V-SAT, GPRS/ CDMA/ 3G/ 4G/ 5G or fiber optic or combination of these which will be provided by Purchaser but the RTU should be capable to interface with all of different types of communication media by providing suitable Modems in- between. The initial scope of the bidder is to provide suitable Modems and Routers/ Switches for IEC101 and/ or IEC 104, for connecting only to PLCC/ OPGW equipment.
- 4.8.12 Equipment Testing
Type Testing:
 RTU and other equipment/ sub-assemblies shall conform to the relevant type tests. Type test reports for all these items needs to be submitted/uploaded with the bid for approval/ acceptance. Purchaser

reserves right to witness/ conduct type tests as specified at vendor's cost and the charges against type testing (which has to be indicated in Price schedule) shall be payable only against successful type testing. A complete integrated unit shall be tested to assure full compliance with the functional and technical requirements of the Specification. The testing sample may include one of each type of cards/ modules, devices, sub-assemblies, cables etc. The list of Type tests to be performed on the RTU and other items is mentioned in specifications.

4.8.13 If any document/ literature/ manual, Certificate, is in a language other than Punjabi or English, the same alongwith translated copy in English/ Punjabi shall also be supplied/uploaded, duly attested by the authorized signatory of the Bidders.

4.8.14 Guaranteed Technical Parameters

Bidders are required to fill in and submit the Annexure-XIII of Guaranteed Technical Parameter.

4.8.15 Schedule of Deviation:

Performa for Schedule of Deviation (Annexure-XI) is most important performa to cross check the compliance of the offered material and Terms & Conditions against TE Specifications and must be filled meticulously and signed & stamped by the authorized signatory of the bidder. Any deviation to the tender spec. must be brought out in the specified Schedule of Deviation performa to be submitted alongwith Technical / Commercial offer. Otherwise, it will be presumed that the offer is strictly conforming to the TE specification. All the deviations should whether technical, commercial, in the language of the certificates, performa etc. should be listed in the above performa in the same order as given in the TE, along with the explanation/ remarks against that deviation and how it will affect the present order as far as bidder & purchaser are concerned.

5.0 Scope of Work:

The scope of supply/ work shall be on turnkey basis and shall cover survey, design, engineering, manufacture, inspection before dispatch to the respective stations, installation, testing and complete online data integration from/ to RTUs with the SCADA/ EMS systems of M/s Siemens and also with new vendor in upcoming ULDC Phase III Even after declaration of final commissioning of the RTU, the Contractor shall give full support/ services in integrating the RTUs with any other system as may be required during the warranty & extended warranty period.

5.1 Besides RTUs, all the associate equipment:

- (i) to interface filed inputs with RTUs
- (ii) to interface RTU with Communication System of the Purchaser at

substation &

(iii) to interface the reciprocal Communication System at control centre end with the M/s. Siemens supplied SCADA/ EMS Control Room System consisting mainly of Transducers (Active Power, Reactive Power, Bus Frequency, Bus Voltage, Transformer Tap Position, MFTs, MFMs etc.), CMRs (Single Status, Double Status points, SOE, NO/ NC Contacts of df/dt, UFR Relays, etc.), Modems, Bi-Directional Serial Data Splitters/ Duplicators/ Replicators, Interfacing accessories, harnesses, nut & bolts, wiring, cables, connectors, TBs, Panels, Interposing Relays for Breaker Control etc. for successful interfacing of RTUs at control-centres as well as at Sub Stations for acquiring complete on-line data & control from/ to the respective RTU station to the respective Control Centres.

Bidder shall be responsible for all activities/ supply of tools, tackles, equipment, Hardware, Software, preliminary as well final as built drawings, documents, circuits diagrams, field survey, training, spares etc. relating/ required to the complete commissioning & smooth working during the life of the RTUs including its hardware/ software modification, if any, so as to match with the specified interoperability profile/ IEC protocol for successful integration with SCADA/ EMS Control Centre System/s of the Purchaser whether mentioned here or not, required explicitly or implicitly for the purpose of this tender shall be part of RTU Bidder's scope.

- 5.2 The scope includes supply, laying and termination of all cables, site adaptation works as required to connect/ interface the RTU and Transducer Panel with Customer's Control and relay panels, AC/ DC Distribution Boards, communication equipment installed in the substation. At some stations, existing RTUs may have to be dismantled for cannibalizing purpose and new RTUs are to be commissioned. All work related to such dismantling of the old existing RTU and interfacing the existing working equipment (i.e. transducers, MFTs, MFMs, CMRs, cables, Modems etc.) of the existing RTU, if any, which can be reused. Due care will have to be made in dismantling the RTUs as these have to be cannibalized for spares for maintaining other similar RTUs and such dismantled material shall be the property of the Purchaser. Wiring of the new bays which might have come up, if any, with the new RTU shall also be in scope of work in concurrence with the Purchaser.
- 5.3 The proposed PSTCL substations also have 66kV, 33kV & 11kV outgoing lines in its 220kV and 132kV substations. PSTCL may ask successful bidders for monitoring & controlling of these lines at its option. Accordingly, the contract price shall be revised based upon the quoted unit price of MFTs, CMRs, HDRs, cables etc. This will be finalized while placing the order and may be during detailed design engineering

phase.

- 5.4 Further, this office has installed sealable Energy Meters (very similar to MFMs) at many I/O locations. If these meters are found suitable at the time of survey/ detailed design & engineering then instead of Transducers/ MFTs for these I/O locations, these Energy Meters shall be interfaced at the option of Purchaser.

Future addition of such Energy meters by Purchaser, if any, shall also be integrated with the RTU as per the Purchaser's requirements.

- 5.5 The Bidder's proposal shall address all functional and performance requirements within this specification and shall include sufficient information and supporting documentation required to determine compliance with this specification. All hardware, software, accessories and services required for successful commissioning/ integration and operation of the supplied equipment in conjunction with the existing SCADA/EMS System at Master/ SLDC station but are not specifically mentioned in the specification shall be included in the scope of contract.
- 5.6 The equipment procured with this specification will be installed at the respective RTU station at a suitable location inside the control room building of the substation in consultation with Engineer in charge of the work.
- 5.7 The vendor shall use as much standard hardware and software as possible.

However, all of the functional requirements of this specification must be fulfilled. The use of standard hardware and software may cause the bidder and/ or purchaser to conclude that there is a need for additional items not specifically mentioned under this specification. The bidder shall supply all such items and provide a complete RTU design that meets all the functional requirements defined under this specification.

- 5.8 Cannibalizing work of RTU shall tentatively involve complete replacement of existing RTU with no usage of existing material in the new RTU except may be existing cables already laid from respective C&R Panels to RTU/ SIC Panels, plus additional cabling/ wiring/ fitting of extra devices as may be required at that location. The dismantled material which is not reusable should be handed over to concerned CO&C division after duly identifying and utilizing the good condition/ reusable/ serviceable devices & equipment in coordination with SLDC-concerned CO&C division. Further the damaged/ faulty/ non reusable/ non serviceable material if any shall be transported to Purchaser's specified location.

- 5.9 Retrofitting work of RTU shall tentatively involve replacement of existing RTU rack only with maximum usage of existing material/ cabinets/ transducers/ Relays if found suitable plus additional cabling/ wiring/ fitting of extra devices as may be required at that location and dismantled material alongwith the new RTU should be handed over to concerned CO&C division duly identifying the devices & equipment (good condition/ reusable/ serviceable) in coordination with SLDC-concerned CO&C division and rest of the damaged/ faulty/ non reusable/ non serviceable material if any shall be transported to Purchaser's specified location.
- 5.10 It is again amply stressed here that any item, device, service, etc. whether mentioned here in the BOQ of the TE, in the submitted Bid, or not, but found to be required for successful completion of the turnkey job to achieve the specified results, shall be deemed to be included in scope of supply/work of the contractor. As such, it is prudent for the intended bidder to study the scope by visiting the PSTCL substations in coordination/ permission from the Purchaser before actually submitting the bid.
- 5.11 Training:
Bidder shall arrange to provide training to Purchaser's personals and/ or nominees and associate them from the very beginning with the Project execution till the end so as to build the capacity of the Purchaser to take over & handle the project independently. Training & Capacity Building of PSTCL's employee during the entire project period shall be the responsibility of bidder. The contractor shall provide an RTU course that covers the following subjects as a minimum:-
- Interface, interaction and operation of all RTU functions as well as physical block e.g. CPU/AI/DI/Power Supply/Communication Interface etc.
 - Operation Procedures for various modes of operation, including diagnostic tests and interpretation of the associated test results.
 - Enabling, Disabling & Configuring multiple communication ports.
 - Configuring the RTU for different available protocols.
 - Demonstration of complete RTU test set use, including test set connection and set up for all possible modes of operation all operational procedures, the exercise of each command or feature associated with each mode of operation, the interpretation of results and how to use the test set to diagnose and isolate RTU problems.
 - Diagnostic for isolation of failure/ fault in RTU, earthing, System Interface Cabinet (SIC), cabling, meters.
 - Configuring all options in RTU protocol interface with master stations and configuring all parameters of MFTs.
- Duration of the course shall be minimum two or more weeks and

each day shall have 8 teaching/ practical work hours. The bidder in this regard should submit details of training methodology. The details regarding training may be finalized during detailed engineering. The requisite training must be conducted preferably during the Survey, Design & Engineering phase itself. Any specialized training which may be required from any third party shall also be in the scope of the Contractor. Contractor must give a brief on the training methodology it shall adopt as a full-fledged chapter in the bid and quote accordingly in its bid.

5.12 Assembly and Components Identification:

Each assembly (to the level of printed circuit cards) shall be clearly marked with the manufacturer's part number, serial number, and the revision level of the component. Changes to assemblies shall be indicated by an unambiguous change to the marked revision level.

All electronic parts (such as capacitors, resistors, and integrated circuits) shall be marked either with the characteristics of the part or with an industry standard part number. Where custom parts are provided (such as read-only memories), the part shall be marked such as to specifically identify the part when similar parts may exist. All printed circuit card cages and all slots within the cages shall be clearly labelled. Printed-circuit cards shall be keyed for proper insertion. It is desirable that printed-circuit cards be keyed to prevent insertion into incorrect locations.

All circuit protection breakers shall be of the manually operated, moulded-case type, and shall provide thermal over-current and instantaneous short-circuit protection in each pole.

5.13 Documentation:

The Successful Bidder shall submit hardware and software documentation in three sets for RTU/SIC to Purchaser for review and approval. After approval four sets of all the documents shall be submitted as final documentation. Any changes observed during field implementation shall be incorporated in the as-build drawing and four sets of same shall be submitted to Purchaser. All manuals, configuration utilities and software tools shall be in English language.

The following minimum documents are envisaged for submission:

- Detailed engineering drawing of RTU/SIC panels
- Details of RTU database for all point counts
- Details of hardware to be supplied
- Details of software to be supplied
- RTU Functional Design & Specification
- I/O list for all points
- RTU Hardware, maintenance and operation manuals.
- RTU FAT/SAT documents

Further, the Successful Bidder shall provide complete set of documents in soft copy as well CD media in two sets. 2 sets of CD/Floppy for system back up shall also be provided to restore the complete system including RTU database in case of system crash due to unforeseen reasons.

6.0 Vendor Responsibilities and Obligations

The vendor is responsible for providing a working and trouble-free system that meets the requirements of this specification. The vendor responsibilities include all necessary activities/ equipment to meet the specified functional requirements, including but not limited to the followings:

- 6.1 To organize site survey/ visits of each RTU site and control centres immediately after award of contract, to assess actual requirements of I/O, BOQ / hardware, field interfaces, cable routes, location of RTU/ MFT panel and Panel, etc. jointly with the representative of purchaser.
- 6.2 Provide necessary hardware/ software, services and field devices for interfacing with existing equipment wherever required.
- 6.3 Provide all racks, cabinets, mounting brackets, cables and interface units needed to satisfy the requirement of this specification.
- 6.4 Provide cabling between & within C&R panels for wiring of transducer/ MFTs, relays, etc. and from C&R panels to Transducer/ RTU panels including terminations, terminal blocks at both ends for data input signals. The CT terminals to be provided in C&R panel/ Transducer Panel shall have a provision for shorting link and the PT terminal shall have a provision for fuse protection.
- 6.5 Provide suitable Contact multiplication Relays (CMRs)/ Aux./ Interposing Relays for multiplying the contacts for digital inputs, SOE and Output Control signals in concurrence with the Purchaser.
- 6.6 Provide cabling and MCBs of suitable rating for deriving 230V AC and 48V DC supply source(s) to RTU panels and 220 V DC/ 48V DC as a supply source to transducers/MFT/ MFMs from RTU supply or substation supply at a single point to be extended/ wired out by the Bidder as may be required.
- 6.7 Provide data sheets, type test reports for RTUs, transducers/ MFT, Modems, etc.
- 6.8 Factory and field testing of all work and equipment provided including software and firmware provided, if any.
- 6.9 Provide a Quality Assurance Plan to the owner to ensure the quality of the product
- 6.10 Provide a Training plan for training of the Purchaser's personnel.
- 6.11 Shipment of all equipment and documentation to the designated locations including all required spare parts, maintenance kit/ aids and testing equipment in concurrence with the Purchaser.

- 6.12 Grounding of all equipment supplied by the vendor (double earthing) to the nearest existing earthing mat. If proper earthing to the satisfaction of Bidder and/ or Purchaser is not available nearby then necessary activity for providing such earthing shall also be in the scope of Bidder even after commissioning of the RTU if such requirement arise latter during the O&M period.
- 6.13 Availability of services, spare and expansion parts for all equipment shall be for a period as specified from the date of final acceptance after successful demonstration of Guaranteed site Availability Tests (G-SAT).
- 6.14 Project management, documentation, manuals and drawings as specified.
- 6.15 All hardware, software, and firmware required satisfying the requirements of this Specification.
- 6.16 Warranty & Extended Warranty cum maintenance support services as specified.
- 6.17 Bidders are responsible to get necessary permission (if any) from Govt. of India in respect of telecom and other equipment (if required) sourced from outside India. The Bidder has to give certificate of compliance in this respect and that the supplied equipment is not under restriction/ in banned list for installation in India.
- 6.18 Integration of RTU with multiple Master if required in future during warranty/extended warranty period.

7.0 Detail of RTU Locations:

Detail of RTU locations covered under the scope of bidder is as mentioned in Annexure-XVIII along with the whether the communication has to be dual redundant (Critical) or single (Non-Critical). Tentatively Baud rate shall be 300 for all the RTUs with IEC60870-5-101 protocol. Details of IEC-60870-5-101 protocol are also given in the specifications at Annexure-II. Details of RTUs requiring IEC60870-5-104 protocol or exclusive Data Concentrator Unit functionality as specified in the specification alongwith details shall be given during Design & Engineering Phase alongwith list of such RTUs/ DCUs.

The purchaser reserves rights to change the location, criticality/ non-criticality of an RTU or to modify quantity of the RTUs, as per its actual requirement at any stage during the currency/ pendency of the contract, before approving Design & Engineering and thereafter with the consent of the Contractor.

Prior to submission of the bid, the prospective bidders may visit respective sites (at their own expenses), and make surveys and assessment as deemed necessary for proposal submission, after taking permission from the Purchaser i.e. PSTCL.

8.0 Technical Specification Requirements of RTUs, Other Equipment etc.:

Detailed specifications of RTUs and other equipment, sub- assemblies etc. is as follows:

- 8.1 RTU, Modem, Interposing Relays, Optional Items, etc. Detailed specification of the RTU is as per Annexure-I
- 8.2 Transducers: Detailed specification of the various types of transducers i.e. Watt, VAR, Voltage, Frequency, OLTC etc. is as per Annexure-III
- 8.3 CMRs: Detailed specification of the Contact Multiplying Relays for multiplying the contacts for status inputs is as per Annexure-IV.
- 8.4 Cables: Detailed specification of the Power & Control cables is as per Annexure-V.
- 8.5 Wiring Techniques/ TBs/ Material/ Practices: Detailed specifications in this regard are at Annexure-VI.
- 8.6 Enclosures/ Panels: Detailed specifications in this regard are at Annexure-VII.

9.0 General Terms & Conditions

9.1 Earnest Money:

- 9.1.1 For the purpose of instant tender enquiry the requisite EMD details are as follows:-

Sr. No.	Description	Amount (Rs.)
1	EMD for Design, Engineering, Supply, Erection, Testing, Commissioning and Integration of Remote Terminal Units (RTUs) for SCADA/ EMS system in PSTCL on Turnkey Basis.	20,00,000/-

Earnest money may be deposited through online e tendering portal.

- 9.1.2 The following shall be exempted from depositing Earnest Money:-
 - 9.1.2(i) Public Sector undertakings owned by Punjab. Govt./Central Govt./Other State Govts. supplying material directly through units owned by them provided that a certificate of Govt. ownership issued by the concerned Govt. Department shall be submitted in the envelope for Earnest Money. Exemption shall not be applicable if the tender is submitted for supply of material through private unit/manufacturer.
 - 9.1.2(ii) Suppliers having permanent earnest money deposit of Rs. 25 lacs with the Corporation provided that a certificate to this effect issued by the Accounts Officer/CPC, during six months immediately preceding the due date for tender opening and showing the Serial No./Account No. allotted in the Permanent Earnest Money Deposit Register shall be submitted online. Accounts of Permanent Earnest Money deposit shall be maintained by AO/CPC.
 - 9.1.2(iii) Sole Manufactures/Suppliers of Proprietary items, Standardized firms.
 - 9.1.2(iv) Micro & Small Enterprises exempted under MSMED Act, 2006 read with relevant notifications issued by Government of India from time to time.

- 9.1.2(v) In case of tenders not accompanied by full amount of Earnest Money for the items tendered but not less than 25% of the amount due, the order/contract shall be awarded only for part of material/equipment/service limited to a value corresponding to the actual amount of Earnest Money submitted with the tender provided the placing of such part order is otherwise feasible and is in the interest of the Corporation, otherwise such tenders shall be ignored.
- 9.1.2(vi) The amount due, as referred above shall be calculated @2% of the tender value and subject to maximum amount of Rs. 20,00,000/-. Therefore, 25% of the earnest money shall thus be worked out on the basis of the entire amount so calculated, which shall, of course, be subject to maximum of Rs. 20,00,000/-and minimum of Rs. 10,000/-.
- 9.1.2(vii) Earnest Money shall be forfeited in case of withdrawal/modification of an offer within the validity period, as required in the NIT/Tender Specification after opening of tender.
- 9.1.2(viii) In case of successful tenders, Earnest Money shall be converted into Security Deposit and shortfall, if any, shall be got deposited for faithful execution of Purchase Order/Contract.
- 9.1.2(ix) In case of firms not falling within the zone of consideration, earnest money may be refunded immediately wherever possible. For the firms falling within zone of consideration, EMD shall be refunded within 30 days of the award of order/contract to the successful Tenderers or the closing of the Tender Enquiry.
- 9.1.2(x) In case of tender not accepted, the Earnest Money shall be refunded within 30 days thereafter.
- 9.1.2(xi) If a firm withdraws its bid before the due date of opening of tender, the EMD of the firm shall be refunded within one month from the date of issuance of release order by the tender inviting authority.
- 9.1.2(xii) No interest shall be paid by PSTCL on EMD/ PEMD deposited by the tenderer /bidder.

9.2 PRICES

The unit rates should be quoted FOR destination at any Railway Station in Punjab/ PSTCL Railway siding wherever existing or delivery at PSTCL's Stores, through road transportation which will be treated at par with FOR destination. The bidder quoting FOR destination rates must give the split up as ex-works prices, freight & insurance charges.

The breakup of the FOR-destination price should be given as under: -

- a) The Ex-works rates inclusive of packing & forwarding part of production cost should be on per unit basis. The cost should indicate the complete cost of raw material, labour, packing & forwarding charges forming part of production cost. The ex-works cost should also include taxes and duties

payable on raw material but should not include taxes and duties leviable on finished material (if leviable).

All taxes and duties leviable on the price of finished goods as per sub clause 9.2 (a) shall be paid extra and the same should be shown separately as prevalent on the date of opening of tenders, to be paid at the rate as may be actually prevalent at the time of supply otherwise these elements shall be deemed to be included in the quoted prices and will not be extra.

In addition to the breakup of total price i.e., ex-works cost, GST, F&I and packing the bidder should also give split up of Ex-works price. The break up to prices shall be indicated in respective Performa attached with the specification. The split up of Ex-works prices shall indicate cost of raw material, labour component and overhead expenses. Raw material can further be divided into 3-4 parts depending on part of material.

The bidder will not be allowed to indicate overall discount on quoted price for which split up has been given. However, quantity/payment discount can be given by bidder in the main tender (i.e. part-II relating to general terms & conditions). Any firm offering discount on the quoted price or after the opening of tender will be out rightly rejected.

In case of rates ex-works/ex-godown and for imported material, freight charge transit risk insurance, handling and clearance charges, FOB and C.I.F Commission of clearing agents at ports should also be indicated separately.

Only firm prices shall be quoted.

The Bidder should quote their prices after taking into account benefit of Input Tax Credit scheme available to them. However, the extent of Input Tax Credit benefit which has been taken into account while quoting the prices must be indicated. Any increase or decrease in this benefit due to change in policy of Govt. shall be passed on to purchaser or borne by it.

The rates quoted F.O.R. destination or ex-works should be given in both figures and words.

GST: The implication and %age (Prevalent rate) of GST levied on the prices may be clearly brought out.

IMPORTANT:

Those firms who do not give breakup of their rates as per requirement of specification shall not be considered. Rates of GST applicable must be indicated separately. All bidders should note that the price bids not indicating Ex-works including packing and

forwarding charges forming cost of production, freight and insurance charges applicable, GST may be liable for summary rejection.

The prices tendered shall cover all the material destroyed under tests and no extra payment will be made for the material so destroyed/consumed during testing.

Price Schedule:

The price (s) shall be indicated in the bidding price schedule as per the format attached (Annexure XIX(A) & (B)) which shall form the part of the price offer. The quoted prices shall be further governed by the following terms & conditions.

Any price/payment discount figure offered by the bidder, shall be indicated in the price bid itself i.e. Part III of tender. Offering of discount on quoted prices subsequent to the opening of tenders, will be out rightly rejected.

- 9.2.2.2 The quoted Unit prices shall be applicable for addition/deletion of quantities during contractual period i.e. including extended warranty period.
- 9.2.2.3 In case of addition/ deletion of RTUs, I/Os etc, Design/ Engineering & Documentation charges, spares, erection hardware or any other charges quoted in lumpsum, shall be revised on pro rata basis.
- 9.2.2.4 The bidders are required to quote unit prices for all the items for which the bidder wants PSTCL to pay for in case of increase/ decrease in quantity at the time of execution of the job. Items against which no unit prices is entered by the bidder will not be paid for by PSTCL and shall be deemed to be covered in the quoted prices in the schedule of the prices. The bidder shall fill in the unit prices for all the items of goods to be supplied and services to be rendered described in the schedule of prices, whether quantities are stated or not.
- 9.2.2.5 Tenders without break up of prices are liable to be rejected.
- 9.2.2.6 In respect of supply of goods to the Employer by the Contractor, the EXW price is inclusive of all cost as well as duties and tax (viz., custom duties & levies, duties, GST etc.) paid or payable on components, raw materials and any other items used for their consumption incorporated or to be incorporated in the Plant & Equipment.

Further, the EXW price of (i) imported Equipments/items offered as 'Off the Shelf' or dispatched directly from the Indian Port of disembarkation are inclusive of all cost as well as any duties paid/payable in relation to import of such goods (viz., Customs duties, GST & levies etc.) and no separate claim on this behalf will be entertained by the Employer. If any tax exemptions, reductions, allowances or privileges may be available to the

Contractor in the Country where the site is located and the Contractor has declared the same in its bid, the Employer shall use its best endeavors to enable the Contractor to benefit from such tax savings to the maximum allowable extent.

The Input Tax Credit (ITC) available, if any, under GST as per the relevant Government laws wherever applicable has been taken into account by the Contractor.

9.2.7 Employer would not bear any liability on account of any other taxes, duties, levies applicable locally.

9.2.8 Employer shall, deduct taxes at source as per the applicable laws/rules, if any, and issue Tax Deduction at Source (TDS) Certificate to the Contractor.

9.3 **GOODS AND SERVICES TAX**

PSTCL is registered centrally in the state under GSTIN 03AAFCP4714J1ZK.

i) GST, as applicable, will be paid as per prevailing provisions of GST Act & Laws against submission of documentary proof at rate(s) prevailing during the contracted delivery period on the basis of actual. The following certificates shall have to be furnished alongwith invoice-cum-gate pass duly signed by the authorized agent/signatory. The first invoice should accompany the specimen signatures of the authorized signatory duly attested by the Managing Director of the factory with a copy of orders regarding his appointment as authorized signatory.

- Certified that the transaction on which the GST is claimed has been/shall be included in the return submitted/to be submitted to the GST Authorities and the amount claimed from the Punjab State Transmission Corporation Ltd. Has been/shall be paid to the GST Authorities.
- Certified that the goods on which GST has been charged have not been exempted under GST Act or rule made there under and that the GST charged on these goods is not more than what is payable under the provisions of relevant act.
- Certified that we shall indemnify the Punjab State Transmission Corporation Ltd. In case, it is found, at a later stage that wrong or incorrect payment had been received on account of GST; the same will be refunded.
- Certified that we are registered dealer under the GST Act and our Registration No. is _____.

ii) In case the GST is applicable and is required to be paid extra as referred to Para-(i) above, the tenderer should clearly indicate HSN code of item alongwith present rate (in percentage) applicable to their company.

- iii) The maximum rate (in percentage) upto which the GST may become leviable/payable under the prevailing Rules & Regulations applicable to their company, should also be clearly indicated in their tender.
- iv) In case the GST is applicable/payable, necessary certificate of GST claimed/ Gate Pass duly authenticated by the authorized representative of GST Authorities, shall however, be furnished by the supplier alongwith each consignment. The supplier should, therefore clearly indicate in their tender that whether such GST Gate Passes/Certificates shall be furnished by them or not.

NOTE: The firms indicating nil or concessional rate of GST in their tenders (if any) will have to absorb GST upto the full rate applicable at the time of tendering.

- v) Further any loss due to non-availability of ITC or levy of penalty/interest payable by PSTCL on account of non-filing of return or non-compliance or any miss-statement given under the provisions of GST Act by the firms shall be recoverable from them.

The firms indicating 'Nil or concessional rate of GST will have to absorb the GST upto full rate applicable at the time of tendering. The firm who do not agree to this stipulation or indicate GST as extra without indicating the applicable rates shall be loaded with maximum rate of GST for evaluation purpose.

9.4 **Contract Agreement:**

The detailed order issued in accordance with agreed terms and conditions and accepted/acknowledged by the firm shall itself form valid contract along with subsequent amendment, if any, and shall be construed and operated as such in terms of Indian Contract Act-1872 as amended up to date.

It will be obligatory on the part of the successful Tenderer to execute within 30 days of the receipt of detailed order, a legal contract agreement on non-judicial stamp paper of the appropriate value as per format attached. (Annexure VIII). The detailed Purchase Order so issued shall be termed Purchase Order-Cum-Contract Agreement. The contract shall be made in duplicate and each party will retain one copy.

After execution of contract, contractor shall supply if required sufficient number of extra copies of contract, specification drawing/drawings, technical literature, bill of material, as finally approved by the purchaser. The cost of these items shall be deemed to have been included in the tender price and the bidders will not be entitled to any extra payment on this account.

The bidder in the interest of execution of contract within stipulated time must offer his comments against each and every clause of this specification to which he does not agree so that decision could be taken by competent authority to all deviations. The clause against which no comments are offered, shall be considered to have been agreed to by the bidder and shall have to be included in the contract agreement to be executed/signed by the successful bidder.

9.5 Security Deposit :

- i) The successful Tenderer shall be required to submit Security deposit for faithful execution of the purchase order/Contract of value exceeding Rs. 1,00,000/- at the rate of ten percent (10%) of ordered value rounded off to a multiple of Rs. 10/- on the higher side in form of Bank Guarantee (issued from SFMS Compliant bank)/Demand Draft/ Digital mode of payment within 30 days from the award of Contract. Tenderers exempted from EMD upto Rs. 5.0 Lacs will have to submit security deposit for Purchase Orders valued above 1.0 Lacs.
- ii) Ordinarily the Earnest money received against tenders shall be converted into Security Deposit. If the amount of earnest money received against tenders is more than the amount of Security Deposit required against the Purchase Order/contract, the balance shall be refunded within one month of the finalization of the tender enquiry and in case of shortfall, if any; the contractor/Supplier shall be required to deposit the additional/ complete security amount in the form of Bank Guarantee (issued from SFMS Compliant bank)/Demand Draft/ Digital mode of payment within 30 days from the award of Purchase order/ Contract. However, refund of already deposited amount in lieu of depositing the total security in the form of Bank Guarantee will not be allowed. The security deposit deposited in the shape of Bank Guarantee is to be kept valid upto end of extended warranty period.
- iii) The tenderers having permanent earnest money deposit (PEMD) of 25 lacs (Rs. Twenty Five lacs) with PSTCL and hence exempted from depositing Earnest Money with tenders, shall also be required to submit security Deposit at 10% of ordered value in the form of Bank Guarantee/Demand Draft/digital mode of payment within 30 days from the award of Purchase order/contract.
- iv) The following shall be exempted from depositing security against Purchase orders/contracts given to them:-
 - a) Firms owned by the Punjab Govt./Central Govt./ Other State Govts. supplying material directly through units owned by them subject to the submission of documentary evidence of Govt. ownership. Exemption shall not be applicable, if the tender is submitted for supply of material through a private unit/manufacturer.
 - b) Sole Manufacturers/Suppliers of Proprietary items, firms supplying

material at GeM portal rates/DGS&D Rate Contract.

- v) On faithful execution of Purchase Order/Contracts in all respects, including extended warranty period, if any, Security Deposit of the Contractor/ Supplier shall be released by the Contracting/Purchasing Agency.
- vi) The refund of the security deposit shall be made within 30 days from the issue of security release order by the concerned purchasing agency. In the event of default on the part of the Contractor/Supplier in the faithful execution of Purchase Order/contract, his Security deposit shall be forfeited by an order of the contracting/Purchasing agency under intimation to the office of DGM/IT who shall get the same uploaded & displayed on website of PSTCL.
- vii) The forfeiture of security deposit shall be without prejudice to any other rights arising or accruing to the Corporation under relevant provisions of the Purchase Order/Contract like liquidated damages or other damages, if any, for delay in delivery of purchase including suspension of business dealings with the firm/supplier for a specific period.

9.6 Intimation to the AO/ SLDC and Consignee:

The Supplier will intimate the probable date of dispatch followed by telegraphic advance intimation regarding the actual date of R.R. to AO/ SLDC, PSTCL Patiala to enable him to arrange payment failing which demurrage, wharfage etc. will be supplier's account. A copy of such intimation should be sent to the consignee and office of CE/SLDC, PSTCL, Ablawal, Patiala for reference, immediately.

9.6(A) Information Regarding List Of The Bankers, the Purchaser deals with:

The Punjab State Transmission Corporation Limited deals with the following Banks at Patiala:

- a) State Bank of India, The Mall, Patiala.
 - b) Punjab National Bank, The Mall, Patiala
 - c) United Commercial Bank, Old Kotwali Chowk, Patiala
 - d) Central Bank of India, The Mall, Patiala
 - e) Bank of India, Patiala
 - f) Bank of Baroda, Patiala
 - g) Punjab & Sind Bank, Patiala
 - h) Oriental Bank of Commerce, Patiala.
- i) The Railway Receipt/Goods Receipt and invoices etc. should be sent to the authorities to be specified in the Purchase Order.
 - ii) Any demurrage occurring as a result of sending Railway Receipts/Goods Receipts through a Bank other than the one with which the accounts of the Purchaser are operated will be to the account of the Supplier/Contractor.
 - iii) No goods will be accepted by the consignees unless accompanied by priced challans or invoices.

9.7 Invoicing Procedures:

All invoices should be prepared in six-triplicate (6 copies). The original and two copies showing the amount due, description of material, number of packages together with delivery note/Receipted challan as issued by the Consignee should be sent to AO/SLDC, PSTCL Patiala. Fourth copy with a copy of invoice and delivery note/receipted challan should be sent to the consignee and the remaining copies to the Chief Engineers/ SLDC, SLDC Project, 220kV Grid Sub-Station, Ablowal, PSTCL, Patiala-147001 simultaneously.

All payments are to be made by the AO/SLDC, PSTCL, Patiala and no goods will be accepted by the consignees unless accompanied by priced challans or invoices.

9.8 Terms of Payments:**A) For Supply of Main Equipment, Spares & Tools:**

- i) **80% of the contract value** pro-rata for each consignment of operationally complete equipment despatched after approval of Inspecting Authority/test certificates, etc. along with 100% GST and other statutory levies as per contract shall be paid within 45 days from the receipt of material or within 15 days from the receipt of last document (receipted challans alongwith all requisite documents like bills, receipted challans/GRN, Insurance cover, GST Invoice, GST certificates, test certificates, other literature, commissioning clearance certificate of the equipment etc) whichever is later, subject to furnishing a Bank Guarantee of 5% of the amount valid for a period of three months after receipt of material/equipment against that consignment. The 5% BG shall be returned/ released after receipt of GRN from the stores indicating no shortages. In case Bank Guarantee of 5% of amount is not furnished then 5% amount shall be deducted from the bills and the same shall be refunded after receipt of GRN from the stores indicating no shortages.

In case the bills are accompanied with GRN indicating NIL shortages then no deduction shall be made.

- ii) **Balance 20%** of the above shall be payable within 45 days after successful completion of Erection, Testing, Commissioning /Integration and Guaranteed site availability test (G-SAT) of the main equipment.

B) For Erection, Testing, Commissioning & Integration of Control Centre Equipment:

- i) **80% of the contract value** pro-rata for each RTU along with 100 % applicable tax, if any, against documentary proof as per contract, shall be payable within 45 days after successful erection, testing, commissioning & integration of RTUs and its successful Site Acceptance by the Purchaser (i.e. SAT).

- ii) **Balance 20%** of the above shall be payable within 45 days after successful completion of Guaranteed site availability test (G-SAT) as per contract against submission of Bank Guarantee of equivalent value valid for 12 months after handing over the equipment.
- C) **For other Services like Design & Engg., Type Testing, Training & Documentation**
 - i) **85% of the contract value** along with 100% applicable tax, if any as per contract against documentary proof as necessary, shall be payable within 45 days on completion of said activity.
 - ii) **Balance 15%** shall be payable within 45 days after successful erection, testing, commissioning and integration of all the RTUs and its acceptance by the Purchaser.
- D) **Extended Warranty cum Maintenance Support Services (5 Years):**
100 % on quarterly basis, along with 100% applicable taxes, if any at the end of each completed quarter, within 45 days after successful completion of services during the said quarter.

Note: Any extra man-hour/ visit charges towards integration of RTUs payable by PSTCL to RTU Integrator (if any) due to non-conformity to IEC 870-5-101/ IEC 870-5-104 protocol or any shortfall on the part of RTU vendor, shall be chargeable to RTU vendor's account or deductible from the payments to be released to the vendor.

The payment shall be made through RTGS. For this purpose, following details/documents may be provided to AO/SLDC, PSTCL, Patiala while entering contract agreement: -

- i) **Name and address of the beneficiary**
 - ii) **Name and address of the bank**
 - iii) **Account No. of the beneficiary**
 - iv) **IFSC code**
 - v) **Cancelled cheque**
- a. For delay in payments made by PSTCL beyond the stipulated period as per terms of payments clause i.e. within 45 days from the receipt of material or within 15 days from the receipt of last document (receipted challans alongwith all requisite documents like bills, receipted challans/GRN, insurance cover, G5T Invoice, GST certificates, test certificates, other literature, commissioning/ clearance certificate of the equipment etc.) whichever is later, compensation shall be credited @ 0.5% of the payment so delayed per month or part thereof to be adjusted against Liquidated Damages levied or to be levied subject to a maximum of such damages leviable due to delay in deliveries under the contract. However, all-out efforts shall be made to prioritize the payment to all suppliers covered under MSMED Act-2006.

- b. If the supplier submit bills alongwith all requisite documents like bills, receipted challans/GRN, insurance cover, GST invoice, GST certificates, test certificates, bank guarantee, other literature, commissioning/clearance certificate of the equipment etc. within 7 days of receipt of material, the payment will be made within 45 days from the date of receipt of material.

9.9 Order Preference:

The PSTCL would allow an order preference to such tenderers whose works are situated within the State of Punjab as per the procedure laid down as under:-

- a) The rate of Punjab firms would be de-escalated by 15% for all the Units. For Punjab based firms upto 20% of total quantity can be reserved provided they fall in the consideration zone after application of price differential. For this purpose, the merit position of the Punjab firms shall be prepared separately. However, where the Punjab firms qualify amongst the lowest bidders on their own quoted rates, they shall form part of the original quoted list for the purpose of placing orders.
- b) The zone of consideration for placing of purchase order/contract would thereafter be demarcated taking into account the quantity of material required as per NIT and the quantities offered by the different tenderers.
- c) The purchase order on the Punjab firm claiming order preference and falling within this zone would be placed on the lowest rate of a firm not claiming order preference within the zone of consideration or on the concerned Punjab firm's own quoted rate which-ever may be lower.
- d) In the event of zone of consideration ending at the de-escalated rate tendered by a firm claiming order preference, the rate to be allowed to such firms shall be the next quoted rate by the firm not claiming order preference or the concerned firm's own quoted rate, which-ever may be lower.
- e) The Punjab based firms claiming order preference shall be required to furnish an undertaking in prescribed form (Annexure-IX) on a Non-judicial stamp papers of appropriate value to the effect that they shall execute the order if placed on them under 'Order Preference' as per the tender specification. Such undertaking should be submitted by the Punjab based tendering firms latest by the close of day of opening of tenders. In case no such undertaking is furnished by the Punjab based firms who are otherwise eligible for claiming 'Order Preference' as per the tender specification, their tender shall not be considered for placement of any order under Order Preference. In the event of refusal by the Punjab based firms to execute the purchase order/contract at their quoted rates or offers made under Order Preference as per 'C' and 'D' above as the case may be, after having furnished the above under taking, their Earnest money shall be forfeited apart from initiating further administrative action, such as suspending business dealings, blacklisting etc.

9.10 Dispatch Instructions

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The material shall be required to be dispatched as per the dispatch instructions issued by the Purchaser according to purchase order-cum-contract or as intimated separately afterwards during the pendency of the contract.

9.11 Consignee

The material shall be initially consigned and delivered to AEE, P&M Store, Ablawal who shall issue the Receipted Challan/GRN after verifying the safe receipt of material in line with dispatch instructions. The subsequent handling, delivery, storage of all the RTUs at the respective site (s) shall be carried out by the Vendor in co-ordination with designated construction supervision Engineer of the purchaser.

9.12 Delivery/ Commissioning Schedule:

Following delivery / time schedule shall be applicable for contractual purpose:-

9.12.1 In respect of confirmed RTUs as will be mentioned in the Work/ Purchase Order:

- a) Completion of Design & Engineering: Within 2 months from the date of issue of the confirmed Order.
- b) Delivery Schedule: The delivery of whole material/ equipment at the Purchaser store/ Consignee, shall be completed within 4 (four) months from the date of issue of Work/ Purchase Order.
- c) Erection, Testing, Commissioning/ Integration Schedule: The erection, (Dismantlement of old RTU if applicable), testing, commissioning and integration of the RTUs i.e. SAT at the respective location shall be completed within 12 (Twelve) months from the date of issue of Work/ Purchase Order.

9.12.2 In respect of Staggered/ Deferred RTUs:

In case of staggered RTUs, the successful bidder will have to undertake field survey, supply, ETC to successfully integrate the RTUs i.e. SAT within 6 (Six) months of such confirmed order from Purchaser. In case of staggered orders if the Bidders is unable to execute the order within the delivery period of six months, then Purchaser has the right to cancel the order of staggered portion and place Order on other suitable firms to avoid delay etc.

9.13 Date of Delivery/ Commissioning:

The date of delivery shall be reckoned as the date of receipt of material by the Consignee as per the Receipted Challan. Purchase order shall be placed strictly on the above understanding for the quantities offered by him after taking into account all his previous commitments against other pending orders.

The date of commissioning of the RTU shall be considered as the date on which G-SAT is completed successfully as certified jointly by the SCADA

Control Centre Engineers as well as SLDC (concerned CO&C Division).

9.14 Liquidate/ Damages For Delay In Delivery/Commissioning:

If the contractor/supplier fails to deliver the material/equipment within the stipulated delivery period of the Purchase Order/Contract then the same is liable to be rejected and if accepted, contractor/supplier shall be liable to pay liquidated damages to the Corporation a sum equivalent to half percent (0.5%) of the cost of undelivered supply/incomplete equipment per week of delay or part thereof not exceeding 10% of the cost of complete unit of undelivered equipment/material so delayed. The Corporation may, without prejudice to any other method of recovery, deduct the amount of such damages from any monies due or to become due to the contractor. The payment or deduction of such damages shall not relieve the contractor from his obligations and liabilities under the contract. There will be slack of one month that will not involve any additional financial implication. Delay beyond slack period will attract liquidated damages for the period of delay including slack period. No bonus will be given for earlier Completion of the Facilities or part thereof.

9.15 Force Majeure:

Notwithstanding any provisions of this regulation during the pendency of the Contract/Purchase Order, if the performance of the purchase order by either party, in whole/part or any obligation there under, is prevented/delayed by causes arising out of any war, hostilities, civil commotion, acts of the public/enemy, sabotage, fire, floods, explosion, epidemics or non-availability of Government controlled raw material under orders/Instruction of Central/State Government regulations, strikes, lock-outs, embargo, acts of Civil/Military authorities or any other causes of extraordinary nature beyond their reasonable control excepting causes purely of commercial nature, neither of two parties shall be made liable for loss or damages due to delay or failure to perform the contract during the occurrence of Force Majeure conditions, provided that the happening is notified in writing (with documentary proof) within 30 days from the date of the occurrence. The supplies shall be resumed under the contract as soon as practicable after the happening (event) ceases to exist.

9.16 Extension In Delivery /Commissioning Period:

Any genuine delay in the approval of technical details, drawings, samples, issuance of amendment to Purchase Order, carrying out inspection, approval of Test Reports/Test Certificates, issuance of dispatch instructions/stations etc will count towards extension of the delivery period by corresponding period other than that admissible under Force Majeure conditions, if any substantiated by the suppliers, and duly accepted by the Purchaser. No extension in delivery shall be granted in case of delay in payment. In

exceptional circumstances, where the supplier supplies for an extension of the due date of delivery well before that date, and advances good and valid reasons for claiming the extension to the satisfaction of the purchasing agency, that agency may grant such extensions by amending the relevant clause of the purchase order and in such a case, no liquidated damages in term of regulation no. 9 shall be leviable or recoverable from the supplier. Where the reasons given by the supplier are not convincing, the request for extension shall be rejected and all delayed supplies, if accepted, shall be subject to the levy of liquidated damages as per regulation. Provided that where an extension is granted under this clause by the purchasing agency, it shall be made clear to the supplier that the Corporation shall not be liable to pay a higher price in terms of the price variation clause beyond what should have been payable, had the supplies been effected according to the original schedule of deliveries. Such a stipulation will also be made in the amendment issued to the purchase order. Extension of delivery period is to be allowed by the authorities mentioned under clause no. 30.1.2 of main regulations.

9.17 Insurance:

- 9.17.1 The rates are required to be quoted on F.O.R destination basis and it is the responsibility of the Supplier to deliver the goods in sound condition at F.O.R. destination and for that purpose the Supplier may at his option insure the material against all risks at his own cost during transit for full delivered value of the material upto destination. All works in connection with making and settling of claim, if any, with Railway Authorities and/or Insurance Company or any other party shall be carried out by the supplier/contractor for which no extra payment shall be made by the Corporation. However, necessary assistance required in connection with making and settling of such claims, if any, shall be provided by the consignees.
- 9.17.2 All damages and or shortages during transit as covered by the Insurance shall be made good immediately on receipt on such information from the consignees without waiting for settlement of claims. However. In case of apparent damages and/or shortages, the consignees shall obtain the loss/damage certificate from the Railway Authorities/Transport party and send the same to the Supplier/Contractor within a period of thirty days from the date of receipt of material. A certificate shall be submitted by the Suppliers/Contractors with each bill to the effect that the material has been duly insured.
- 9.17.3 The consignees shall report losses and damages to the firm within 30 days of the arrival of the equipment at the site. It will, however, be supplier's responsibility to prefer timely claims on the insurance underwriters and to arrange replacement thereof to the consignees.
- 9.17.4 The suppliers shall be wholly responsible for the loss, shortages and damages etc. during transit. Such shortage and damages etc., will have to be

replaced/repared by the Supplier/Contractor free of cost immediately without waiting for maturing of the Supplier's/Contractor's claims with the Road Transport/Railway Authorities regarding insurance.

- 9.17.5 In case replacement/repair of defective material is not carried out within six months of intimation of damages, supplier shall have to pay interest at the rate 12% per annum on the payments made by the PSTCL from the date of its payment upto the date of the re-commissioning of the equipment in satisfactory working condition after replacement/repair or to the date the default is made good.

9.18 Negligence and Default:

In case of negligence on the part of supplier/Contractor to execute the Purchase order/contract with due diligence and expedition and to comply with any reasonable orders, pertaining to any contravention to the provisions of purchase order/contract, given in writing by the purchasing agency may give 21 days' notice in writing to the Supplier/Contractor with the approval of HOD to make good the failure or neglect or contravention at the sole risk of the supplier and if the supplier/contractor fails to comply with the notice within a timeframe considered to be reasonable by the purchasing agency, the business dealings shall be suspended/terminated with the firm for a specific period or in extreme cases the firm shall be blacklisted forever by the purchasing agency. Apart from the suspension/termination of business dealings/blacklisting of the supplier/contractor, the purchaser shall also forfeit the security & other pending payments of the Purchase Order/ Contract against which the supplier has defaulted, in addition to PEMD/EMD lying with the concerned organization. Further in case of such default by the Supplier/Contractor, the purchaser may also claim reasonable compensation/damages etc. apart from suspension of business dealing with the supplier/Contractor and forfeiture of the security. Note: (not to be incorporated in specifications/Purchase Order) 1. The action taken under this clause regarding suspension/termination shall be intimated to all the organizations of PSTCL. However, action regarding forever blacklisting shall also be intimated to all the other Power Corporations/Power nignams/state utilities. 2. The competent authority to approve action under this clause shall be the same as defined under clause 13 of main regulations. 3. Recoveries of any dues relating to Purchase Order under which supplier/contractor has defaulted shall be made from pending amount of any Purchase Order/Work Order/Contract of the firm or any Security/EMD or PMED lying with the Corporation.

9.19 Inspection of Equipment & Tests:

- a) The PSTCL shall conduct Pre-dispatch inspection, examination and test the equipment/ sub-assemblies/ material through its official(s) and/or through an out-side agency nominated by PSTCL at the manufacturer's/ Supplier's works, during or after the manufacture of goods prior to dispatch, on receipt

of a clear notice of minimum two weeks in advance, to be reckoned from the date of receipt by the Purchaser. The Supplier/ Vendor shall provide all facilities as may be required to carry out the tests in accordance with approved standards, free of cost.

- b) In case the inspection is waived off by the PSTCL the supplier shall be required to submit test certificates in triplicate for approval. No material shall be dispatched without inspection and/or approval of test certificates unless so directed. Any material consumed during testing/ inspection shall be to supplier's account.
- c) The supplier shall be required to furnish to this office/consignee where ever necessary, the following document alongwith the consignment.

i.	Printed Pamphlets/Catalogues	2 Copies
ii.	Instruction books	2 Copies
iii.	Drawing	2 Copies
iv.	Any other relevant information (to be in-corporated at the time of placing the Purchase order)	2 Copies
v.	In case the goods have not been inspected/tested at the manufacturer works by a representative of the PSTCL, the supplier/contractor shall furnish the following certificates alongwith consignment for facility of the consignees. a) Type test certificates b) Acceptance test certificates c) Routine test Certificates	

- d) Random testing of material on its receipt in the Stores irrespective of the fact whether or not it was inspected before dispatch shall be carried out by PSTCL and in case of any failure; the entire lot shall be rejected at the risk and cost of the supplier.

9.20 Fake Inspection Call/s:

The purchasing authority will get the material inspected and issue dispatch instructions within 20 days of the date of receipt of call offering the material for inspection or date of readiness of material, whichever is later. In case date of readiness is not mentioned in the offer letter, then date of receipt of call shall be considered as date of readiness of material. In case the inspecting officer finds on arrival at the supplier's premises that the material less than 80% of the quantity offered in the inspection call is ready for inspection or material of the firm is rejected during testing/inspection, then the call shall be treated as fake call and the firm shall be responsible to pay fake call charges @ 10% of the value of the offered lot calculated as per P.O. rate subject to a maximum of Rs.30,000/- per such occasion. Besides this, a letter of warning shall be issued and it shall be counted towards their performance for all intents and purposes. In case multiple sizes are to be inspected against a single inspection requisition, then the fake call charges shall be applicable on proportionate basis based on the PO value of items which were offered by

the firm for inspection.

9.21 Guaranteed Site Availability Test of the System:

The vendor shall demonstrate continuous availability of 98% for each of the RTU during Guaranteed Site Availability Test (GSAT) to be conducted after Commissioning for a minimum period of three months (90 days) as specified. The availability achieved shall be calculated jointly by the Bidder's representative and the purchaser as per the modalities to be finalized by the Purchaser beforehand. In case the actual achieved availability falls short of the guaranteed availability under the contract, it would be considered as vendor's default. The equipment shall be taken over only after successful demonstration of guaranteed site availability Test and that date will be reckoned as date of commissioning for all intents and purposes and two year warranty period shall start from this date. Till such time full responsibility to operate & maintain the equipment shall be of the Bidder.

9.22 Warranty, Extended Warranty cum Maintenance Support Services & Life Span:

Each RTU & its sub assembly shall have a design life of 15 Years from the date of final acceptance. The Bidder shall make available at no cost to owner the manufacturing drawings and rights to manufacture those subassemblies which the manufacturer will not support or discontinue to support for during this life span including subassemblies not included in the original RTU procurement. For each subassembly, the specific parts supplied shall be identified and referenced in supplied documentation.

The Contractor shall provide two-year Warranty for the RTUs from the date of its commissioning and shall be responsible for its maintenance during this warranty period including supply of spares, if required, without any cost implication to the Purchaser/Owner. The Owner may ask the contractor for providing Extended Warranty cum Maintenance of the system **including supply of spares for a period of Five years after the 2-year warranty period for ensuring the successful operation of the system on similar terms & conditions as in case of two years of warranty.** The Contractor shall accordingly quote a separate price for 5 years.

During Warranty Period of 2 years and thereafter during Extended Warranty cum Maintenance support, Contractor **shall assign a team of at least two qualified and competent persons at a suitable place as may be desired by Purchaser for time bound attendance of the faults/ other problems and to keep the online data from RTUs always available in SLDC.** Extended Warranty shall be extendable further by 5 years as per mutual agreement between PSTCL and the Contractor.

During the Warranty/ Extended Warranty cum AMC period, the Vendor has also to quote charges for the rewiring of the RTU panel and per bay

integration & rewiring charges.

Under this, the Contractor shall supply all spares as required to maintain the RTUs. Further, a lot of spares (as per BOQ) shall also be supplied by the Contractor to the Purchaser and could be used as and when required to achieve 98% uptime and replenish the defective item within 30 days free of cost.

On call response time shall be 24 working hrs. including travel time during 9.00 AM to 5.30 PM six (6) days per week (Monday through Saturday) except on public and company holidays and 1 day (24 Hrs.) for other days. The system has to be attended within maximum period as identified above, which shall be counted since the time of notification by the operator.

- Bidder shall submit detailed Format for achieving above in the bid. Owner shall provide the information in the prescribed format as fault reporting procedure.
- On receipt of these information contractor shall depute their personnel at site. Fault reporting time shall start after requisite information in duly filled up FORMAT is informed to the contractor by fax/email/ phone.
- Contractor's engineer shall reach within 24 hours of fault reporting at fault site (RT) for the fault where the real-time data and the reporting system is not working and within 36 hours of reporting for other type of faults for e.g. anomaly in analog or digital values etc.
- Contractor's personnel shall restore the RTU system within 4 hours of reaching at site (UT) failing which penalty shall start.
- Contractor will maintain the system as per above defined RT and UT failing which 10% of AMC cost of each RTU, per four hours of delay subject to the maximum of 25% of AMC cost of one RTU per day for every breach will be deducted by Owner/Purchaser from the amount due to contractor for maintenance.
- The basis of deduction will be monthly charges of the AMC cost of RTU of that particular location.
- The contractor will be responsible for keeping the latest database backup of RTU of each location.

PSTCL reserves the right to terminate the Extended-warranty cum Maintenance Support provisions at any stage during the pendency of the contract without assigning any reason, and affect the recoveries/ penalties against the vendor, if any.

9.23 Maintenance during Installation, commissioning etc.:

The Vendor shall be responsible to maintain the RTUs during installation, field testing, commissioning, Integration etc. till it's taking over by the Purchaser. During this period, the vendor shall make available the services

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of their hardware and software specialists within 24 hours of the notification of any problem(s) that may exist. The vendor shall repair or replace all defective parts and shall have prime responsibility for keeping the system operational.

9.24 Completeness of Equipment:

All fittings, accessories and apparatus not specifically mentioned in the specification but are actually necessary for completeness of the equipment shall be deemed to be included in the offer. All equipment shall therefore be complete in all respects whether such details are mentioned in the tender document or not.

9.25 Cancellation:

The Purchaser reserves the right to cancel the Purchase order as a whole or in part at any time or in the event of default on the part of the Supplier prior to the receipt of intimation regarding taking in hand of the manufacture of material against the Purchase Order/ dispatch of material to the consignee.

9.26 Raw Material:

The raw material to be used in the manufacture of the goods/equipment to be supplied against Purchase Order/Contract shall be of the best quality of its kind obtainable in the market. The Supplier/Contractor shall be solely responsible for the procurement of raw material required for the purpose.

9.27 Material & Workmanship:

All the materials used in the manufacture of equipment shall be of the best quality obtainable of their respective kinds and whole of the work shall be of the highest class, well finished and of approved design and make. Casting shall be free from blow holes, flaws, cracks or other defects and shall be smooth, close grained and of true forms and dimensions.

9.28 Changes:

No variation or modification or waiver of any of the terms and provisions shall be deemed valid unless mutually agreed upon in writing by both the Purchaser and the Supplier.

9.29 Packing:

All material should be suitably packed for transportation direct to the consignee and the Supplier shall be responsible for all damages/losses due to improper packing. All boxes shall be marked with the signs indicating up and down sides of the boxes and also unpacking instructions considered necessary by the Supplier. The contents of boxes shall have place marks corresponding to the number in the packing lists to enable easy identification. The destination station name of the material shall also be marked on all boxes. The prices quoted by the Tenderers shall be deemed to include the cost of packing.

9.30 Instruction Plates & Markings:

All the name plates, instruction plates, warning signs and any markings whatsoever on the equipment and its parts/ sub-assemblies and other accessories shall be in English language with idioms in current use. Purchase Order number and date be given on the name plates.

9.31 Test Certificates and Documents:

The Supplier/ Vendor shall be required to furnish to the Purchaser's office/ consignees, wherever necessary, the following documents along with the consignment:

i.	Printed pamphlets & catalogues	3 Copies
ii.	RTUs station folder containing key diagram, I/O points, bill of Material, GA layout drawings, erection/ Installation drawings, wiring details/sizes interconnecting/ termination details), etc. for each station (separately) Copies Combined (For All RTUs)	5 Copies
iii.	User (Operation and Maintenance) Manual	5 Copies
iv.	Approved Drawings/As-built drawings	5 Copies
v.	RTU Training Manual (detailed)	5 Copies
vi.	Any other relevant information/document (as to be decided by purchaser)	3 Copies

In addition to the above, the Supplier/ Vendor shall furnish minimum 3 (three) set of the following test certificates along with consignment for facility of the consignees:

- Type Test Certificates
- Routine Test Certificates

9.32 Constitution, Experience and Financial Standing:

The Tenderers shall invariably supply the following information with the Tenders:

a) Constitution and Composition of the firms:-

- If a Joint Stock Company, copy of its Memorandum and articles of Association and other particulars.
- If a partnership firm, a copy of the partnership deed and particulars of its partners.
- If a proprietary concern, the standing of the proprietor and if registered with the Registrar of Companies/Firms, their registration no. etc.
- Documentary evidence (Latest copy of memorandum of Micro Small & Medium Enterprises filed under section-8 of MSMED Act, 2006 duly acknowledged by competent authority.) of being a Micro, Small

& Medium Enterprise. If the bidder does not submit the proof at the time of submission of its bid, it shall be considered as a Large Enterprise.

- (v) A certificate for the last financial year, duly signed by any Director/ Partner/ Proprietor and Chartered Accountant regarding investment in Plant & Machinery or equipment & turnover as prescribed in Section 7 of the MSMED Act, 2006, read with the relevant notifications issued by Government of India from time to time.

b) In case of authorized representative:-

- i. Name and particulars of manufacturers
- ii. Certified copy of the instrument of authorization of the Supplier/Manufacturers.
- iii. Experience and standing in the market.

c) Particulars of the Purchase order/ Contracts executed with PSTCL and/or performance certificates of having executed Purchase Order/Contract of other State/ Central utilities.

d) Financial Position:

- (i) Balance sheets etc. for the last three years, including Trading, manufacturing, Profit and Loss Account should be duly certified by the Chartered Accountant.
- (ii) Copy of PAN Card of the firm and director(s) and IT returns of last 3 years
- (iii) Bank references
- (iv) Solvency certificate not more than 12 months old.
- (v) GST Registration Certificate.

9.33 Civil Suit/ Jurisdiction:

All legal & Arbitration proceedings in connection with the Purchase Order/Contract shall be subject to the territorial jurisdiction of the local Civil Courts at Patiala, Punjab only.

9.34 Undertaking:

All the Tenderers are required to give the following undertakings on their letterhead with the tender documents to be uploaded:

- i) That they would not pay any commission etc. or engage any commission agent or liaison agent for dealing with PSTCL in any matter including purchase of equipment
- ii) That no officer/official of the PSTCL will deal with any person who claims to be a commission agent or liaison agent of any company and that the officers/officials of the PSTCL must deal only with persons directly employed by the Suppliers.

9.35 Place/s Of Manufacture:

The equipment shall be brand new. The Tenderer shall state the make, place(s) of manufacture as well as the places of testing and inspection of the equipment offered in his tender documents to be uploaded on website. It shall also be stated whether the equipment offered carries ISI: certification mark. The material carrying ISI mark will only be preferred.

9.36 Arbitration

- a) If at any time any question, dispute or difference, whatsoever, shall arise, between the Purchaser/PSTCL and the Contractors/Suppliers, upon or in relation, to or in connection with the Purchase Order/Contract, either party may forthwith give to the other, notice in writing of the existence of such question dispute or difference and the same shall be referred for sole arbitration as per the provisions of the Indian Arbitration Act, 1996 (amended upto date) who shall give a reasoned/speaking awards. The award of the Sole Arbitrator shall be final and binding on the parties under the provisions of the Indian Arbitration Act, 1996 (amended upto date) and of the rules there-under. Any statutory amendment, modification or re-enactment thereof for the time being in force, shall be deemed to apply to and be incorporated in the Contract/Purchase Order.
- b) Upon every or any such reference, the cost and incidental expenses to the reference and award shall be at the discretion of the Sole Arbitrator so appointed who may determine the amount thereof or direct the same to be taxed as between Solicitor and Client or as between party and party shall direct by whom and to whom and in what manner the same is to be borne and paid.
- c) The work under the Contract shall, if reasonably possible, be continued during the proceedings of the arbitration and no payment due/ payable by the Purchaser/PSTCL shall be withheld on account of such proceedings.

9.37 Samples:

Whenever asked for, samples must be supplied by the vendor/supplier free of cost at the purchaser's office. Ordinary samples will not be returned to the Tenderer/supplier. However, expensive samples, the return of which is desired by the supplier/vendor will be returned to him at his own risk and cost.

9.38 Approval Of Drawings/ Certificates:

- i) Complete technical details/ specifications of the equipment, Type & Routine Certificates (as already carried out on similar equipment), detailed equipment drawings and any other special requirement for shipping/ transportation of equipment up to destination will be submitted




- by supplier as a part of Design & Engineering activity in line with the provisions of Design and documentation requirements.
- ii) Approval on drawings wherever required, will be conveyed by the Purchaser within 15 days from its receipt. In case any further details or modifications be required, the same shall be conveyed to the Vendor within the said 15 days period for conveying approval where after it will be the responsibility of the supplier to re-submit modified drawings, incorporating all comments/ mark-ups within 2 weeks of receipt of intimation and get the same approved from the Purchaser which will be done within the usual 15 days period from their receipt.

9.39 **Works Appraisal**

- (i) If a new firm submits tender against open tenders, its works appraisal shall be carried out before opening of the Part-III "Price Bid" to ascertain whether the offer of the firm is technically/Commercially/financially acceptable or not.
- (ii) Works appraisal of only manufacturers shall be carried out in such cases where the value of tendered material is more than Rs. 15 Lacs. When the material is to be supplied through its authorized dealer, the works of manufacturer is required to be appraised. Where it is not possible to carry out works appraisal, the facts should be specifically brought to the notice of competent authority as defined at Note 4 given below at the time of approving the purchase proposal.
- (iii) Any firm that has supplied similar material to other Central/State Utilities would be considered as old firm for the sake of distribution of quantities on submission of satisfactory performance certificate but if that firm is new to PSTCL, works appraisal shall be carried out. If the works appraisal of the firm fails, that firm shall not be considered for the opening of its price bid. However, for any firm, works appraisal carried out by PSPCL shall be considered valid and in such a case, no fresh appraisal needs to be carried out. PSTCL - Purchase Regulations 6
- (iv) For the works appraisal, the firms shall have to deposit following charges:- Rs. 50,000/- plus applicable statutory levies for the firms located outside Punjab. Rs. 25,000/- plus applicable statutory levies for the firms located within Punjab. (v) All participating firms (new as well as old) should duly fill the self-appraisal/works appraisal Performa enclosed as Annexure-III while submitting the bids.
- (vi) If a firm has been blacklisted/ business dealings has been suspended for a certain period of time by PSTCL/PSPCL, then, after the expiry of this period of blacklisting/suspended dealings, the firm shall get its works reinspected/reappraised from techno-economic angle prior to the opening

of its price bid. However, no cognizance of blacklisting by other than Punjab Govt. utilities shall be taken for the purpose of works appraisal and processing of tender.

- (vii) If a firm has not supplied Tendered/similar item to PSTCL/PSPCL in the last 5 years or more from the date of opening of Tender and does not furnish satisfactory performance certificate for supply of Tendered/ similar items to any other Central/state utility as well during the above time period, then a fresh works appraisal shall be got carried out irrespective of the fact that whether the works stood appraised by PSTCL/PSPCL or not.
- (viii) If an existing firm quotes from a new works address, the works appraisal of the new works shall be got carried out. The commercial parameters like turnover, experience of the parent company shall be admissible.

Note: -

- (1) The offer of the firms is liable to be rejected in case works appraisal fee is not received. For the works appraisal, new firms have to deposit the above-mentioned charges through RTGS/NEFT/Net banking in Corporation's designated bank account. The above charges are non-refundable, and works appraisal of the firm does not entitle the firm for price bid opening/ placement of order.
- (2) If a firm fails in the works appraisal, then the firm should not be considered during the course of technical evaluation and price bid of the firm should not be opened.
- (3) Apart from the Tendered item(s), the purchasing agency shall also carry out the works appraisal for all the other items being manufactured by the bidder which are relevant to the PSTCL against the charges deposited by the bidder.

10.0 Terms & Conditions for Erection Work

10.1 GENERAL

The following shall supplement the conditions already contained in the other parts of these specifications and documents and shall govern the portion of the work of this Contract to be performed at Site.

The Vendor upon signing of the Contract shall, in addition to a Project Coordinator, nominate a responsible representative for field activities who shall have overall responsibility and co- ordination of the works to be performed at Site.

10.2 REGULATION OF LOCAL AUTHORITIES AND STATUTES

The Vendor shall comply with all the rules and regulations of local authorities during the performance of his field activities. He shall also

comply with the Minimum Wages At, 1948 and the Payment of Wages Act (both of the Government of India) and the rules made there under in respect of any employee or workman employed or engaged by him or his Sub-Vendor.

All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to the account of the Vendor. However, any registration, statutory inspection fees lawfully payable under any statutory laws and its amendments from time to time during erection in respect of the equipment ultimately to be owned by the owner, shall be to the account of the Owner. Should any such inspection or registration need to be re-arranged due to the fault of the Vendor or his Sub-Vendor, the additional fees to such inspection and/or registration shall be borne by the Vendor.

10.3 PURCHASER/OWNER's LIEN ON EQUIPMENT

The Owner shall have lien on all equipment including those of the Vendor brought to the site for the purpose of erection, testing and commissioning of the equipment to be supplied & erected under the Contract. The Owner shall continue to hold the lien on all such equipment throughout the period of contract. No material brought to the site shall be removed from the site by the Vendor and/or his Sub-Vendors without the prior written approval of the purchaser.

10.4 INSPECTION, TESTING AND INSPECTION CERTIFICATES

The provision of the clause entitled Inspection, Testing and Inspection Certificates under Technical Specification shall also be applicable to be erection portion of the Works. The purchaser shall have the right to re-inspect any equipment though previously inspected and approved by him at the Vendor's works, before and after the same are erected at site. If by the above inspection, the purchaser rejects any equipment, the Vendor shall make good for such rejections at his own risk and cost either by replacement or modification/repairs as may be necessary to the satisfaction of the purchaser. Such replacements will also include the replacements or re-execution of such of those works of other Vendors and/or agencies, which might have got damaged or affected by the replacements or re-work done to the Vendor's work.

10.5 ACCESS TO SITE AND WORKS ON SITE

Suitable access to and possession of the site shall be afforded to the vendor by the purchaser in reasonable time. The Vendor shall carry out necessary foundation works for installation of equipment at RTU stations. The vendors shall have the complete responsibilities for the conditions of the work site including the safety of all persons employed by him or his sub-vendor and all the properties under his custody during the

performance of the work. In the execution of the works, no person other than the vendor or his duly appointed representative, Sub-vendor and workmen shall be allowed to do work on the site, except by the special permission, in writing of the purchaser or his representative.

10.6 PROTECTION OF WORK

The vendor shall have total responsibility for protecting his works till it is finally taken over by the purchaser as per contract. No claim will be entertained by the purchaser for any damages or loss to the Vendor's works and the Vendor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings, should any such damage to the vendor's works occur because of any party not being under his supervision or control.

10.7 SITE FACILITIES TO BE PROVIDED BY THE PURCHASER

A) SPACE :

The purchaser shall at his discretion and for the duration of execution of the Contract make available at site, land/space as required for execution of the contract. On completion of work the vendor shall hand over the land duly cleaned to the purchaser.

B) ELECTRICITY/ POWER SUPPLY

The power supply as may be decided by purchaser will be provided free of charge for consumption in works. Vendor shall provide and install all necessary wiring fixtures, bulbs and other temporary equipment as necessary for further distribution and utilization of energy for power and lighting and shall remove the same on completion of the work.

C) WATER

Free supply of water will be made available for the construction purpose wherever water is available and the same shall be given at agreed point at the site

Note: Board's Guest House accommodation facility may be provided to the vendor subject to its availability as per applicable PSEB rules/rates.

10.8 FACILITIES TO BE PROVIDED BY THE VENDOR

A) Tools, tackles and scaffoldings:

The Vendor shall provide all construction equipment, tools, tackles and scaffoldings required for pre-assembly, erection, testing and commissioning of the equipment covered under the contract.

B) COMMUNICATION

The purchaser will extend the telephone & telex, if available at site, for purpose of contract. The Vendor shall be charged at actual for such facilities.

C) FIRST AID

The Vendor shall provide necessary first aid facilities for all his employees, representatives and workmen working at the site.

10.9 FIRE PROTECTION

The work procedures that are to be used during the erection shall be those, which minimize fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the site at least once each day. Corrugated paper fabricated cartons etc. will not be permitted in the construction area either for storage or for handling of materials. All such materials used shall be of waterproof and flame-resistant type. All the other materials such as working drawings, plans etc. which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.

10.10 SECURITY & SAFETY

The Vendor shall have total responsibility for all equipment and materials in his custody/stores, looses, semi-assembled and/or erected by him at site. The vendor 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. All materials of the Vendor shall enter and leave the project site only with the written permission of the purchaser in the prescribed manner. The vendor shall be fully responsible for ensuring safety of his men and material deployed at site. The Vendor shall provide adequate safe working conditions at the site and shall take necessary precautions to enforce safety rules when working under hazardous conditions.

10.11 MATERIALS HANDLING AND STORAGE

All the equipment furnished under the contract and arriving at site shall be promptly received unloaded transported and stored in the allocated storage space by the Vendor. The Vendor shall be responsible for examining all the shipment and notify the purchaser immediately of any damage, shortage, discrepancy etc. for the purpose of information only. The Vendor shall be solely responsible for any shortages or damage in transit, handling and/or in storage and erection of the equipment at Site. All equipment shall be handled very carefully to prevent any damage or loss. The equipment stored shall be properly protected to prevent damage either to the equipment or the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.

All the materials stored in the open or dusty location must be covered with

suitable weatherproof and flame proof covering material wherever applicable.

10.12 SITE OFFICE RECORDS

The vendor shall maintain up to date copies of all drawings, specifications and other Contract Documents and any other supplementary data complete with all the latest revisions thereto. The Vendor shall also maintain in addition the continuous record of all changes to the above Contract Documents, drawings specifications, supplementary data, etc. effected at the field and on completion of his total assignment under the Contract shall incorporate all such changes on the drawings and other engineering data to indicate as installed conditions of the equipment furnished and erected under the Contract. Such drawings and engineering data shall be submitted to the purchaser in required number of copies.

10.13 INSURANCE

The following statutory provisions shall also apply in addition to the Insurance of Material:

A) WORKMEN'S COMPENSATION INSURANCE

This insurance shall protect the Vendor against all claims applicable under the Workmen's Compensation Act, 1948 (Government of India). This policy shall also cover the Vendor against claims for injury, disability, diseases or death of his or his Sub-Vendor's employee, which for any reason are not covered under the Workmen's Compensation Act, 1948. The liabilities shall not be less than Workmen's Compensation as per statutory Provisions Employees liability.

B) COMPREHENSIVE GENERAL LIABILITY INSURANCE

This insurance shall protect the Vendor 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 Vendor, his agents his employees, his representatives and Sub-vendors from riots, strike and civil commotion. The hazards to be covered will pertain to all the works and areas where the Vendor his sub-vendors, his agents and his employees have to perform work pursuant to the Contract.

NOTE: The above are only illustrative list of insurance covers normally required and it will be the responsibility of the Vendors to maintain all necessary insurance coverage to the extent both in time and amount to take care of all liabilities either direct or indirect, in pursuance of the contract.

10.14 CODE REQUIREMENTS

The erection requirements and procedures to be followed during the

installation of the equipment shall be in accordance with the relevant codes and accepted engineering practices, approved Drawings and other applicable Indian recognized codes and laws and regulations of the Govt. of India.

10.15 COMMISSIONING SPARES

It will be responsibility of the Vendor to provide/ maintain all commissioning spares required for initial operation till the end of successful completion of performance and guarantee test/GSAT. All commissioning spares shall be deemed to be included in the scope of the contract at no extra cost to the owner. These spares shall be received and stored by the vendor at least 1(one) month prior to the schedule date of commencement of commissioning of the respective equipment and utilized as and when required. The utilized spares and replaced parts, if any, at the end of successful completion of performance and guarantee test/GSAT, shall be the property of the vendor and he may be allowed to take these parts back at his own cost with the permission of purchaser.

10.16 INSTALLATION REQUIREMENTS

The vendor shall be responsible for the complete adaptation and installation of the RTUs, interface cabinets, and transducers in the Owner substations. This includes the following requirements:

- (a) Preparation of all input and output signals to interface with the substation power system equipment.
- (b) Installation of all RTU's, MFTs/ transducers, interface cabinets, and associated equipment.
- (c) Sizing of all cables and wiring to meet the specified requirements and meet standards.
- (d) Installation of all signals, communication, and power cables required to interface the RTU, interface cabinets, and the MFTs/ transducers with Owner's substation facilities.
- (e) Wiring and termination of all power, communication, and signals in the RTUs, in the interface cabinets, at the MFTs/ transducers, and on the control and relay panels in the control house.

11 Reverse Auction:-

The following procedure and terms & conditions shall be applicable for Reverse Auction in PSTCL:-

- 11.1 In case the no. of bidders are more than 3, the H1 (Highest) bidder shall not be eligible to participate in further process of the tender and his tender shall be rejected.
- 11.2 All other Bidders shall be assigned a unique user name and password by e-tendering agency of PSTCL. Bidders are advised to change the

password after the receipt of initial password from PSTCL to ensure confidentiality. All bids made from Login IDs assigned to bidders shall be deemed to have been made by bidders/bidders' company/ bidders' authorized representatives.

- 11.3 Eligible Bidders shall be required to submit their acceptance to the stipulated terms and conditions before participating in the R.A.
- 11.4 Online Reverse Auction shall be conducted by PSTCL on pre-specified date and time for duration of 1 Hour. The bidders may quote the bids from their own offices /place of their choice. Internet connectivity is to be ensured by bidders themselves.
- 11.5 All Eligible bidders are required to submit their price bid along with submission of Techno-commercial bid as per schedule. Only those bidders who submit their original bids within the scheduled time and who are considered technically and commercially eligible shall be eligible to participate in RA process.
- 11.6 Bidders shall be able to view the following on their screen along with the necessary fields during Online Reverse Auction:-
 - Start Price
 - Decrement Value
 - Current Bid value of the Bidder (Total Bid Price)
 - Best bid in the Auction (Current L1 price)
 - Next Valid Bid (Total Bid Prices to be quoted in order to become L1)
 - Minimum Bid Price (Bidder to enter his minimum Bid Price here)
- 11.7 Bidder may become 'L1 Bidder' by offering a price equal to or lower than the 'Next Valid Bid' and this shall continue as an iterative process.
- 11.8 Auction Extension Time: If a valid bid is placed within 5 minutes of End Time of the RA, then Reverse Auction duration shall get automatically extended for another 5 minutes from the existing end time. It may be noted that the auto extension will take place if a valid Bid comes in those last five minutes. If a bid does not get accepted as the lowest Bid, the auto-extension will not take place even if the bid might have come in last five minutes. The above process shall continue till no valid bid is received in last 5 minutes which shall mark the completion of reverse auction. The bidders are advised not to wait till the last moment to enter their bid so as to avoid complications related to internet connectivity, network problems, system crash down, Power failure etc. No request for extension in time period of RA due to any of the above reasons shall be entertained by PSTCL.
- 11.8.1 If no bid is received within the specified time duration of the online RA, then PSTCL shall reserve the rights to scrap the online RA process and

proceed with the L-1 Bid Price received through e-tendering for further processing.

- 11.8.2 After completion of online Reverse Auction, the Closing Price (CP) shall be considered as L1 rate for further processing including negotiations (if required). Based on the final price quoted by bidders, the successful bidders shall be required to submit summary of Final Price in prescribed format (Summary of Final Price-Reverse auction, Uploaded by PSTCL in Excel Sheet) within 2 working days of conclusion of the RA. In case a bidder fails to submit the above Summary, then it may lead to cancellation of bid and call for action against the bidder which may include forfeiture of EMD/PEMD and suspension of business dealings etc. The final break up of prices will be given in a manner that all quoted prices shall be reduced proportionately by the same percentage and not arbitrarily.

Note:- L-1 (after RA) bidder will submit the final price break up without altering originally quoted F & I. Final price breakup may not be obtained from other bidders. Their final price break up may be worked out proportionately without altering their originally quoted F&I and comparative statement be prepared accordingly.

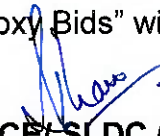
- 11.9 (i) Proxy Bids: - Proxy bidding feature is a pro-bidder feature to safeguard the bidders' interest in event of internet failure or to avoid last minute rush. The proxy bidding feature allows bidder to place an automated bid in the system directly in an auction and bid without having to enter a new amount each time a competing bidder submits a new offer. The bid amount that a bidder enters is the minimum bid price that the bidder is willing to offer. Here, the software shall automatically bid on behalf of the bidder who has quoted the lowest "Minimum Bid Price", the price which is one decrement less than the next bidder's bid price. This obviates the need for the bidder participating in the bidding process until the minimum bid amount is detrimentally reached by other bidders. When any bidder quotes a price lower than the existing lowest bid amount, the bidder (who had earlier submitted lowest proxy bid) has an option to once again start participating in the bidding process by quoting a price equal to or lower than the next valid bid price. However, it may please be noted that if the current bid matches the minimum bid of the lowest bidder submitted earlier, the bid submitted earlier by the lowest bidder will be recognized as the L1 at that instant.

During the course of bidding, the bidder shall not be able to delete or increase the proxy bid amount but can always reduce the same depending upon the amount quoted by other bidders. Proxy bids are fed into the system directly by the respective bidders. As such this information is privy only to the respective bidder(s).




- (i) PSTCL shall reserve the rights to cancel/reschedule the RA process/ tender at any time, with due intimation to all concerned, without assigning any reason.
- (ii) Other terms and conditions shall be as per bidder's Techno-Commercial offers and as per PSTCL's bidding documents and other up to date correspondence (if any).

Note: - The above procedure/system of "Proxy Bids" will only be followed if the software system supports it.


**Dy. CE/SLDC (Market Operation),
PSTCL, Ablawal, Patiala**

Technical Specifications of REMOTE TERMINAL UNIT
(RTU)

Annexure-I**General**

The Remote Terminal Unit (RTU) shall be installed at Substations & Power stations to acquire analog data and device status signals. RTU shall also be used for control of station devices from Master station. The supplied RTUs shall be interfaced with the Control & Relay (C&R) panels, communication equipment, power supply distribution boards; for which all the interface cables shall be supplied by the Contractor.

This document describes the specification for the Remote Terminal Unit (RTU). Contractor shall supply RTU, associated equipment such as MFTs, relays, weather sensors, modems, cabling etc. and required number of panels for housing of all the hardware envisaged for the RTU and system interface cubicle (SIC).

The contractor shall be responsible for supplying all hardware, software, installation, cabling and field implementation for RTU, integration with Purchaser's SCADA system/s as defined in this Specification. The contractor shall also provide complete documentation, training and testing to fully support the hardware and software provided. The RTU shall be used for real-time supervision and control of substation/ power plant through SCADA system. RTU configuration/ point count, MFT count, requirement of weather sensors and modem quantity is given in the specification.

Should the Contractor elect to subcontract manufacturing, installation, testing & commissioning or any other work defined herein, it shall remain the Contractor's responsibility to complete the assigned work.

It is Employer's intent that the Contractor uses as much standard hardware and software as possible; however, all of the functional requirements of this Specification must be satisfied. The use of the Contractor's standard hardware and software may cause the Contractor to conclude that there is a need for additional items not specifically mentioned in this Specification. The Contractor shall supply all such items and provide a complete RTU design that meets all of the Employer's functional requirements defined in this Specification.

In event of the configuration of RTU given in specification undergo changes during detailed engineering, the prices of particular RTU shall also be adjusted based on the unit prices of status Input cards, analog input cards, control output cards, control output relays, CMRs, Modems etc.

Employer may not initially procure all capabilities specified in this document. Regardless of the RTU configuration purchased, the RTUs shall be capable of all functions specified herein with the addition of the necessary hardware and software modules in the field when required by Employer. Each function is presented in sufficient detail to provide the Contractor with as much insight as possible into both the initial and future requirements of the RTUs.

The Weather Sensors to be supplied under the project shall be field

proven and shall have been in successful operation for meteorological application for at least one year as on date of Bid opening. The Bidder shall furnish the documentary evidence in support of the above and submit the same along with the bid.

Design Standards

The RTUs shall be designed in accordance with applicable International Electro- technical Commission (IEC), Institute of Electrical and Electronics Engineer (IEEE), American National Standards Institute (ANSI), and National Equipment Manufacturers association (NEMA) standards, unless otherwise specified in this Technical specification. In all cases the provisions of the latest edition or revision of the applicable standards in effect shall apply.

1.2 RTU Functions

All functional capability described herein shall be provided by the Contractor even if a function is not initially implemented. The term master station is used to denote the SCADA systems. As a minimum, the RTUs shall be capable of performing the following functions:

- a) Collecting and processing the digital status inputs, analog inputs, accumulated values and transmitting to master station(s).
- b) Receiving and processing digital & analog control commands from the master station(s).
- c) Accepting polling messages from at least four master station(s) simultaneously using separate logical databases for each master station.
- (d) Communication simultaneously on all Communication ports (as per cl.1.3) and using multiple concurrent protocols, including the IEC 60870-5-101, 60870-5-104, IEC-61850 & MODBUS protocol (Serial and TCP/IP).
- (e) Data transmission rates from 300 to 9600 baud for serial ports (for both IEC 60870-5-101 & MODBUS) and 10/100 Mbps for TCP/IP Ethernet ports.
- (f) RTU shall be compatible with protocol 61850 for communication with IEDs.
- (g) RTU shall have the capability of automatic start-up and initialization following restoration of power after an outage without need of manual intervention. All restarts shall be reported to the connected master station(s).
- (h) RTU shall support time synchronization through messages received from master station using IEC 60870-5-101 protocol. RTU shall support SNTP server for time synchronization of substation IEDs, wherever local GPS is not available.
- j) RTU shall support downloading of RTU database from the master station using the IEC 60870-5-101 and IEC 60870-5-104 protocol.
- (j) RTU shall support SOE (Sequence of events) feature.
- (k) Acting as a Data Concentrator Unit for acquiring data from at least one Slave

RTUs without the need for additional DCU/ Ports Cards and exercising supervisory control on slave RTUs using IEC 60870-5-101 and IEC 60870-5-104 protocol and MODBUS protocol. (This is must in every RTU proposed to procured by Purchaser).

- (l) Acting as a exclusive Data Concentrator Unit for acquiring data from multiple Slave RTUs (may be with additional DCU/ Ports Cards) and exercising supervisory control on slave RTUs using IEC 60870-5-101 and IEC 60870-5-104 protocol. (This feature shall be optional and shall be procured if required by the Purchaser. For this purpose price of additional DCU/ port card has been asked in the BOQ and must be given in the Price Bid)

- (m) Redundancy in CPU, Power supply and Communication with RCC.

RTU shall invariably have capability for redundant communication with RCC. The RTU shall have redundant CPU and Power Supply unit so that the RTU can communicate with the Master Stations even when one of the redundant units fails. A failover process shall cause the assignment of all the functions of the failed unit to the healthy unit. The failover between the two redundant units shall not require any manual intervention and shall not cause any interruption in the functioning of RTU. The failover process of the CPU shall not take more than 30 seconds after the failure of primary CPU. All the functions of RTU shall be operational within 30 seconds of the failover operation i.e, within one minute from the time of failure of primary CPU.

- (n) RTU shall support SNTP server for time synchronization of substation IEDs, wherever local GPS is not available.
- (o) The RTU shall provide syslog facility for central monitoring of logs generated within the RTU.
- (p) The RTU shall support SNMP protocol for monitoring the RTU health parameters from a network management system.

- (q) Cyber Security Requirements :

The following security functions shall be included in the RTU:

- i. Identity and authentication control
 - a. Role Based User Account Management (UAM), integrated in the web browser/ software.
 - b. Password Complexity enforcement based on at least one upper/ lower/ number/ non-alphanumeric character options.
 - c. User account and its management
- ii. Access/Communication control
 - d. Secure web access (https)
 - e. Provision of Secure protocol (e.g., SSH-Secure Shell) in RTU for file transfer.
 - f. Concurrent communication session control
 - g. Idle remote session termination/session lock after a configurable time
 - h. Account lockout after a configurable time

- i. Communication port access control
- iii. Audit trail
 - j. Security Event (applications and system) Logging and viewing of the same through the web browser. It shall also be possible to upload this log into CSV files
 - k. RTU and other devices shall be compatible with CEF (Common Event Format) or any other standard event/log format for handling events/logs
 - l. Timestamp in audit logs
 - m. Logs storage
 - n. Compatibility with central log server (External security clients)
 - o. RTU configuration software
 - p. View configuration data: Only viewing of configuration is allowed to users
 - q. Change configuration data-Possible to configure data
 - r. Manipulation protection-Won't accept manipulated configuration data
- iv. System Hardening
 - s. Preventing execution of unauthorised applications
 - t. Preventing execution of unauthorised applications
 - u. Blocking unused/unwanted ports
 - v. Update and up-gradation of firmware and application software
 - w. Protection from malicious code execution
 - x. Supervisory and monitoring control
 - y. Compatibility of SNMPv3 for monitoring
- v. GPS synchronization
 - a. Capable of NavIC (Navigation with Indian Constellation) with fallback to Simple NTP/ IRIG-B/ GPS.
- vi. Management of vulnerability
 - a. Vulnerability disclosure policy for RTU and its services/applications
 - b. Attending disclosed vulnerabilities on timely manner
 - c. Continuous monitoring, identifying and rectifying security vulnerabilities in RTU and its services/applications in form of product security lifecycle

All the above security features fulfill basic requirements of IEEE 1686–Standard for Substation Intelligent Electronic Devices (IED) Cyber Security Capabilities.

In general, the bidder shall ensure that the offered RTU hardware, firmware, operating system, and associated communication interfaces comply with the latest cyber security guidelines issued by the Central Electricity Authority (CEA), CERT-In, NCIIPC and other competent authorities under the Government of India.

(r) Web browser support

The RTU shall support web interface for remote diagnostics capabilities. It shall be possible to connect to the RTU from a remote computer in order to analyze the system and error status, check-up of the configuration or signal values of the RTU remotely. No separate software shall be required to be installed for this purpose and should be possible through standard web browsers like Internet Explorer, Firefox etc.

Remote access via Intranet shall be combined with authority privileges for the user. For following activities:

- Monitoring the RTU-produced internal error messages.
- Monitoring and checking the RTU configuration and the status of all

connected process signals.

- Checking the current version of the configuration file.
- Downloading or uploading the RTU configuration file.
- Checking and downloading revised software files for the RTU CPU boards.
- Uploading the archive files.

1.3 Communication ports

The RTUs shall support simultaneous communications with multiple independent master stations (SCADA system), maintenance and configuration terminal (Laptop PC), a local logger (printer), Multi-function transducers and Local Data Monitoring System (LDMS)/ Logger.

The RTUs shall have communication ports as follows:

- (a) Four Ethernet ports for connectivity to Master Station on IEC 60870-5-104.
- (b) Minimum two Ethernet ports for communication with IEDs on IEC 61850, Energy meters on MODBUS TCP/IP, etc.
- (c) Minimum 2 No. RS232 ports –for communication with master stations on IEC 60870-5-101 in dual standby mode (with single master) or active/active mode (with dual master).
- (d) Ports required for cellular data communication.
- (e) One port for the RTU maintenance and configuration terminal.
- (f) One port for Local Data Monitoring System (LDMS)/ local logger (printer).
- (g) Required number (minimum two) of RS 485 ports for polling Multi-function transducers using MODBUS, IEC 60870-5-101 protocol in multi-drop (party line) mode or IEC 60870-5-104 protocol. However, Maximum 8 Numbers of MFTs shall be connected to a single port in multi-drop mode.
- (h) Two RS-232 ports for default/ Basic DCU functionality.
- (i) The RTU shall be provided with 2nos. fiber ports, to support connectivity with IEC61850 substation IEDs, if required in future.

It shall be possible to increase the number of communication ports in the RTU by addition of cards, if required in future. The RTU shall respond to independent scans and commands from Master Station, LDMS and Configuration & Maintenance Terminal simultaneously. The RTU shall support the use of a different communication data exchange rate (bits per second) and scanning cycle on each port.

1.4(a) PLCC Modems:

The modems can be used for RTU communicating to master station. The Contractor shall supply two (2) number modems one at Control Centre/Stand alone and other at RTU end.

The modem for remote end, complete in all respects including power supply unit & rack shall be supplied. These modems can be located either in the FEP at Control Centre end or at other Communication nodes (Stand Alone Modem).

The modems shall meet the following requirements:

- (a) Use CCITT Standards including V.24, V.28.
- (b) Use frequency shift keying (FSK) modulation.
- (c) Communicate at data rates of 300, 600 and 1200 bps.
- (d) Use CCITT R.38a, and R.38b standard tones for the selected RTU data rate.
- (e) Use PLCC bandwidth upto 4khz and shall have capability to accommodate multiple data channels along with voice channels or without voice channels for the flexibility in PLCC routing plan conforming to CCITT-38 / V.23 standards.
- (f) Use both 2-wire and 4-wire communication lines.
- (g) Receive level adjustable from -0 to -40 dBm @ 600 ohms.
- (h) Transmit level adjustable from 0 to -24 dBm @ 600 ohms.
- (i) Have a minimum sensitivity of -48 dBm.
- (j) Shall operate on 48 VDC power supply
- (k) Compatible with IEC 60870-5-101 protocol.

1.4(b) Cellular (GPRS/3G/4G/5G) Modem and Gateway:

The RTU locations shall be equipped with Cellular Modem for data communication with Master Station over IEC 60870-5-101/104. The RTU shall be provided with a GPRS Modem/Router with dual-SIM capability, supporting encrypted VPNs with control center. The modem/router shall support multiple, independent, simultaneous VPNs to allow parallel connections with different control centers. In case PLCC or Optical Fibre network is available at RTU Station, the Cellular Communication Modem will provide a manually switchable redundant communication link to Master Station, which may be enabled by the owner's personnel in the event of failure of PLCC/Optical Fibre network. In such case Cellular Communication will use the same protocol as is used for PLCC or Optical Fibre network. However, in case no PLCC/Optical Fibre network is available at RTU Station, the Cellular Communication will act as main communication link with Master Station.

The RTU shall be provided with a GPRS Modem/Router with dual-SIM capability, supporting encrypted VPNs with control centre. The modem/router shall support multiple, independent, simultaneous VPNs to allow parallel

connections with different control centres. The RTU port used for Cellular communication shall be adequately protected and firewalled to avoid any cyber security attacks.

The provision of PLCC or Optical Fibre Network between RTU and Master Station is in the scope of owner, however the supply, installation and commissioning of necessary cabling and Integration of RTU with Master Station(s) using the owner's communication system will be in the scope of contractor.

The contractor shall also provide and integrate the GRPS Gateway at Master Stations (Main & backup). The Gateway shall be equipped with requisite number of RS 232 Ports for IEC-101 and Ethernet Ports (minimum six) for IEC-104 communication. The Gateway shall have at-least 50% spare ports of each type for future expansion. The provision of M2M SIM and payment of data charges for GPRS and Internet connectivity at master stations shall be in the scope of vendor up to the end of extended warranty period. The communication between RTU and Master Station using Cellular Communication shall be point to point and no intermediate hub shall be used by the contractor to route the Cellular traffic between RTU and Master Station(s). The Gateway shall be accompanied with a suitable external firewall to avoid any cyber security threat emanating from public Interface used for Cellular traffic. Provision of Internet connectivity with Static IP address at Master Stations shall be in the Vendor's scope. The Gateway shall be compatible with all make RTUs.

1.5 Local Logger/Printer Interface

The RTUs shall include the interface to support an optional local logger /printer. The interface shall provide easy access to allow employer to connect the logger at the RTUs installed in the field. This item as such is not required but shall be required as part of Maintenance RTU and should be quoted by including in its price.

1.6 Local Configuration & Maintenance Interface:

The RTUs shall include the interface to support the portable configuration and maintenance terminal (PCMT). The interface shall provide easy access to allow employer to use the maintenance terminal at the RTUs installed in the field.

1.7 Local Data Monitoring System (LDMS) Interface:

The RTUs shall include the interface for communication with the LDMS system.

1.8 Local Data Monitoring System (LDMS) Interface (Optional):

The LDMS shall be used for local data acquisition, monitoring and control of substation parameters through RTU. The scope of LDMS shall include installation and integration of LDMS software on a Personal computer including all necessary accessories.

The LDMS shall be a mini-SCADA system providing MMI capability for use in the sub- station control room building. The LDMS software shall include following functions:

- a) data acquisition for analog, digital and pulse accumulator type data
- b) data processing – Conversion to engineering units, limit monitoring, data validity test, calculated data
- c) calculated data (such as maximum, minimum, average values with associated time-stamping etc.) of all the station parameters.
- d) Time Synchronization
- e) Sequence of Events Processing
- f) Supervisory control
- (g) Alarm, tagging, trending, quality codes etc.
- (h) Single Line Diagrams, Trends, daily, weekly, monthly reports etc. shall be prepared by the bidder and integrated on LDMS system. The LDMS shall also have capability to generate additional displays, single line diagrams, reports, and trends.

The LDMS shall store all real-time telemetered & calculated data every 1 minute (adjustable to 5, 15,30,45,60 minutes). The software and hardware shall be sized for storage of all above data at every 1 minutes for at least one year duration. All alarms, events, SOE etc. shall also be stored on regular basis. It shall be possible to define daily, weekly, monthly Substation reports on LDMS. It shall be possible to generate reports highlighting the maximum, minimum, average with associated time-stamping etc. of all the station parameters. The historical data stored on the storage medium shall be in standard format and necessary tools for its export to standard spreadsheet programs (Excel) shall be provided.

The LDMS shall update analog data from RTU by exception or cyclically after every five to sixty seconds (programmable) and status data by exception. The SOE status data shall be recorded with resolution of 1ms timestamp.

The minimum hardware spec for LDMS PC shall be as under:

Bidder shall quote for Desktop (including accessories etc.) of reputed makes best suitable for its LDMS software with minimum specification may be Latest Gen. intel Core i5; 8GB DDR4 RAM, HDD: 500 GB ,1 years warranty, DVD writer dual layer; 104 keys OEM keyboard and OEM Optical Mouse; all necessary Plug-ins/utilities and driver software, Display Screen size & type: 21" or higher wide range TFT/ Monitor;

Windows 11 Professional or latest, MS Office 2016 or latest, antivirus, UPS 1 kVA 0.5 Hr. backup, B/W A4 Laser printer. In case the bidder LDMS software requires higher specification Hardware, then he shall quote for the same. Required furniture including an executive table & chair shall also be required to be supplied for LDMS.

1.9 Communication interface between RTU & MFTs/ MFMs

The RTU shall acquire data from the MFTs/ MFMs. The MFTs/ MFMs will act as slave to the RTU. The RTU shall have the ability of issuing retry scan to acquire data from the MFTs/ MFMs in case of communication failure between RTU and MFTs. All data from the devices connected on a single port shall be acquired within 1 seconds.

1.10 Communication Protocol between RTU & IEDs

The RTU shall use the IEC 61850 protocol for communication with IEDs over Sub- station LAN. The RTU shall act as a Client and collect data from the IEDs.

The RTU shall store the data acquired from the MFTs & IEDs in its database and do processing like change detection/dead band processing on the data for optimizing its transmission to the Master Station (SCADA Control Centre). The processing shall include requirements of mapping of information from the protocol of MFT/IEDs to the protocol requirement for communication with Control Centre.

1.11 Master Station Communication Protocol

The Contractor shall provide a communication protocol for communicating with SCADA master stations using the IEC 60870-5-101 and IEC 60870-5-104 communication protocol standard. The communication protocol shall support all the requirements of this standard. The communication protocol shall be non-proprietary and the Contractor shall provide complete description and documentation of the protocol to Owner.

The RTU shall perform as a slave to SCADA master station when using the IEC60870-5-101 protocol. All communication shall be initiated by the SCADA master stations. RTU must notify the master stations of unusual conditions at the RTU (such as a power fail/restoration or RTU malfunction), the transfer of changed data etc. All the notifications shall be accomplished within the framework of the periodic data acquisition exchanges.

The RTU shall process the various messages/commands for communication to the Master station using the following priority:

- (a) Control command
- (b) Status data by exception
- (c) Analog data by exception
- (d) Analog data periodic
- (e) Status data integrity scan

The communication interface to the master station(s) shall allow scanning and control of defined points within the RTU independently for each master station

using a separate logical database in the RTU. It shall be possible to pick points from the RTU database randomly and assign it for reporting to a Master station. Further, the RTU shall support the use of a different communication data exchange rate (bits per second), scanning cycle, and/or communication protocol to each master station.

1.11.1 Scan groups

Analog and digital input points (including points reported by exception) shall be assignable to scan groups. A scan group shall be a specified set of data points within the RTU central database which will be communicated to a master station when requested by a specific (addressed) scan request. A scan group size shall only be limited by the communication protocol message length. Any RTU input point shall be assignable to any scan group. The RTUs shall support at least sixteen scan groups and all scan groups per communication port (i.e. master station/ LDMS interface). The Contractor shall provide a convenient and flexible scheme for assigning points in the RTU to scan groups.

1.11.2 Reporting of status points

The RTU communication protocol shall be configured to report digital status changes by exception to master station. Digital status data shall have higher priority than the Analog data. All the digital status data shall also be assigned to scan groups for integrity check by Master stations at every 10 minutes.

1.11.3 Reporting of Analog points

The analog data shall be reported periodically to update all the values at the master station within 10 seconds (configurable from 5 to 10 seconds). Analog data shall also be reported by exception if the analog value exceeds its previous value by more than 20% (Configurable from 1% to 20% in the RTU).

1.11.4 Digital control commands

The RTU shall follow the select-and-execute sequence for operation of digital control commands from the master station. The RTU shall reset its control logic upon any error in the sequence.

1.12 Data Concentrator Communication Protocol

The RTU shall act as a IEC 60870-5-101 and IEC 60870-5-104 protocol master and collect data and also perform supervisory control from/ on the slave RTUs and communicate it to the Control Centre. The Master protocol implementation shall be such that the data polling requirements mentioned at section 1.11 is at least accomplished.

RTU should have built in DCU feature may be in its CPU card itself so that RTUs can be cascaded.

However, RTU could also be used exclusively as a Data concentrator Unit by adding suitable Comm. Port Card and shall be provided with at least ten (10) IEC 101 input may be by adding ports/ cards and shall have capability to report to four master stations on IEC 104 interface.

Data concentrator shall support at least 1,500 (fifteen hundred) data points. The RTU as a Data Concentrator shall be supplied with GPS receiver system with antenna, cable etc. for time stamping of Data concentrator which in turn shall synchronize the IEC 101 protocol connected RTU/device. The RTU as a Data Concentrator shall come complete with built in monitoring mechanism to avoid loss of any data, especially the one reported by exception. The data concentrator shall have dual CPU and dual Power supply unit. The overall data update requirement from any Sub-RTU to Control centre should not affect the functionality defined elsewhere in the specification.

The Data concentrator shall have the provision for remote login from Control centre connected on IEC 104. The SLDC computer system shall be able to configure and poll health of Data concentrator from remote on 104 connected interfaces after due authentication of the users.

It shall support diagnostic & maintenance activities remotely. Individual RTU configuration shall be possible from Data Concentrator including accommodating devices from heterogeneous suppliers. The RTU as a Data Concentrator shall have following communication ports & support for protocols:

- (a) IEC104/ IEC101 for SCADA control centers.
- (b) IEC101/104 for Sub-RTUs
- (c) IEC 101/104 for local SCADA

The other requirements given for RTU elsewhere in the specification shall be applicable to RTU as a Data concentrator also

1.13 Analog Inputs

The RTU shall accommodate analog inputs which are unipolar or bipolar, 2-wire ungrounded differential signals. All analog inputs are of +4 to +20 mA. However, the RTU shall be capable of accepting other standard analog input ranges (0 to 5V, 0 to 10V, 0 to 10mA).

The RTU shall make all appropriate signal level conversion and conditioning to allow full utilization of analog inputs and meaningful reasonability checking. The analog-to- digital converter shall have a minimum resolution of 32767 counts (sign plus 15 data bits). Each type of analog input shall be converted with full resolution. The RTU shall monitor the drift in characteristics of its ADC and mark the analog points with a drift quality code if a drift is detected. This drift quality code shall be sent to the master station also.

The RTU accuracy, for analog input measurement, shall be 99.8% or better at 25 degree C ambient temperature. Mean accuracy shall drift no more than 0.002% per degree C within the temperature range of -5 to +55° C. Determination of accuracy shall be made while the analog multiplexer is operating at rated speed.

Each input shall have suitable protection and filtering to provide protection against voltage spikes and residual current at 50 Hz, 0.1 ma (peak-to-peak) and overload. Loading upto 150% of the input value shall not sustain any failures to the RTU input. The total input impedance offered by the RTU shall not be greater than 250 ohms (for +4 to +20 mA range).

All analog inputs shall be scanned by the RTU from the field at least at 1 second periodicity.

1.14 Status Inputs

RTU shall be capable of accepting isolated Dry Contacts, internally wetted @ 48VDC or Wet contact @ 220VDC or 110VDC ($\pm 30\%$) for status inputs. All status inputs shall be wired by the contractor to MFT or RTU through 220VDC or 110VDC or 48VDC ($\pm 30\%$) Wet Contact wired directly from semaphores in the C&R panels. In case the contacts are wired to MFT, the status input data shall be reported to RTU with time stamp using IEC – 101/104. It is the owner's intent to minimise the use of Contact Multiplying Relays (CMRs), in order to minimise the number of components and its associated failures. The contractor shall use CMR to convert wet contact to isolated dry contact only when it is absolutely necessary for satisfactory performance of the system. For dry contacts, the RTU shall provide necessary sensing voltage, current, optical isolation and de-bounce filtering independently for each status input. The sensing voltage shall not exceed 48Vdc. The sensing voltage source shall be isolated from that of the RTUs logic power so that any noise or a short circuit across the sensing supply of a digital status input terminals would not disrupt the RTU operation other than the shorted digital status input.

The RTU shall be set to capture contact operations of 20 ms or more duration. Operations of less than 20 ms duration shall be considered no change (contact bounce condition). The RTU shall accept two types of status inputs i.e. Single point Status inputs and Double point status inputs.

Single point status input will be from a normally-open (NO) or normally-closed (NC) contact which is represented by 1-bit in the protocol message.

Double point status input will be from two complementary contacts (one NO and one NC) which is represented by 2-bits in the protocol message. A switching device status is valid only when one contact is closed and the other contact is open. Invalid states shall be reported when both contacts are open or both contacts are closed.

All status inputs shall be scanned by the RTU from the field at 1 millisecond periodicity. The RTU shall store all status changes detected for retrieval by the master stations. For communication delays or short term failure of communications with the master station, the RTU shall store a minimum of 300 status change events. The RTU shall report any overflow of this status change buffer to the master stations.

1.14.1 Contact Multiplying Relay

Contact multiplying relays (CMRs) are required to multiply the auxiliary contacts of breaker/isolators etc. The contacts of these relays shall be used to provide status input to the RTUs. The relays shall be of self-reset type. The relay shall have a minimum of two changeover contacts each with minimum current carrying capacity of 5 A at 110V/220V DC.

The relays shall conform to the following requirements:

- (a) Power frequency withstands voltage: 2 kV for 1 minute as per IEC standards.
- (b) Insulation resistance of 100 M ohms at 500 V DC.
- (c) 5 KV impulse test as per IEC standards

The CMRs shall have a LED indication which shall light up when the CMR is energized (picked up) condition. The CMR Coil shall be rated for the voltage existing at the site. The CMRs shall be generally mounted in existing control & Relay panel but in case of non-availability of space, it shall be accommodated in the System Interface Cabinets (being supplied by the Contractor). Detailed Specifications are given in Annexure-IV.

1.14.2 Momentary Change Detection

Two-state status input points with momentary change detection shall be used by Employer for points where multiple operations (changes of state) can occur between scans from the master station (such as breakers with auto-reclosing devices that operate faster than the master station scan rate). The RTU shall capture and maintain all of the momentary changes, up to 4 per MCD digital status point. The MCD status input points shall be set to capture operations of greater than 20 ms duration.

Alternatively, the RTU can store and report the multiple state changes of a digital input as discrete events. It shall be ensured that all the changes are reported to the Master station in the sequence in which they occur in the RTU.

1.15 (a) Digital Telemetry

Digital telemetry input points shall be provided for sixteen-bit inputs from employer telemetry contacts. The digital telemetry may use BCD, (4-bit decimal character without sign) and/or binary (16 bit) codes.

1.15 (b) Pulse Accumulators

The RTU shall be capable of counting and storing the number of contact closures generated by a metering device external to the RTU. The device will supply either an isolated Form A normally open or Form C contact. The accumulator shall be incremented one count for each cycle of the input (operation of the normally open and normally closed contact of the Form C contact). Each accumulator shall have a 24-bit counter for counting input operations before rolling over. The accumulator shall be capable of accepting counts at a rate of ten counts per second. The count shall be "frozen" (transferred to a buffer register) when commanded by the master station

1.16 Sequence of Events (SOE) feature

SOE is the time-stamped digital status data. SOEs will enable Employer's personnel to determine the sequential operation of digital status input devices for their state changes. The RTU shall time-stamp the digital status data with a time resolution of one millisecond.

Initially, all breakers & protection contacts digital status input points in the RTU shall be configured as SOE points. However, it shall be possible to assign any digital status input data point in the RTU as SOE point.

Each time a SOE status input point changes state, the RTU shall time-tag the change and send it to the Master station. The RTU shall maintain a SOE buffer within the RTU for communication delays and communication failure. SOE buffer shall be sized to store, as a minimum, of 5000 events. The RTU shall transmit the SOE data stored in its buffer to master station. An acknowledgement of receipt by the master station shall be made prior to the loss of any data in the RTU SOE buffer. Data not received at the master station shall be retransmitted. The RTU shall send a message to the master station to indicate the RTU SOE data buffer overflow condition.

1.17 Control Outputs

The RTU shall provide the capability for a master station to select and change the state of digital output points. Device control will be used by employer to control power system devices including:

- a) Two-state Devices: Circuit breakers, motor-operated switches, auto/manual switches, relay disable/enable, and other two-state devices
- b) Variable Output Devices: Raise/lower control of generators, transformer load-tap- changers (LTC), and other variable output devices.

The RTUs shall have the capability for control outputs as described in the following sections

1.17.1 Two State Momentary Control

A pair of outputs shall be supplied for each two-state (open/close) control output point that drive control relays. One output shall be supplied for open, the other for close. Upon command from a master station using the check-before-execute sequence, the appropriate control output shall be operated for a preset (momentary) time period. The operation period shall be adjustable for each point from 0.1 to 2 seconds.

1.17.2 Raise/ Lower Pulse Output

A pair of outputs shall be supplied for each (raise/lower) control output point that drive control relays. One output shall be supplied for raise, the other for lower. When commanded from the master station, the appropriate raise or lower output shall be operated for the selected time interval. The closure time interval for raise/lower pulse output points shall be specified in the operate command from the master station. The raise/lower output for each point shall operate over a range of 0.1 to 4 seconds in a minimum of eight equal increments.

1.17.3 Timed Supervisory Control

The RTU shall store Timed Supervisory control command received from the SCADA system. This supervisory control command from the SCADA system shall contain the 'time' up to a resolution of milliseconds and the type of control Operation.

The RTU shall then perform the supervisory control command at the specified time. The SCADA system shall be able to cancel this command prior to the occurrence of the specified Time of Operation.

1.17.4 Control Output Interposing Relays (Double Contact Digital Output)

Control output interposing relays shall be supplied by the Contractor for each control output specified in appendix. Each control relay shall consist of two isolated single- pole double-throw contacts. The output contacts shall be rated to carry minimum current of 10 amps at 220 V DC, and shall provide arc suppression to permit interruptions of an inductive load. Relay coils shall be shunted with diodes to suppress inductive transients associated with energizing and de-energizing of the relay coils. The relays shall conform to the IEC standards.

1.17.5 Latching (Dummy Breaker) Relay

The Contractor shall provide a latching relay to be used to simulate and test supervisory control from the RTU. The simulation relay shall accept the control signals to open and close from the RTU, and shall provide the correct indication response through a single contact indication input point. This point is not included in the RTU point count in BOQ.

1.17.6 Control Security and Safety Requirements

The RTU shall include the following security and safety features as a minimum for control outputs:

- (a) Select-and-execute sequence for control output.
- (b) No more than one control point shall be selected at any given time.
- (c) The control selection shall be automatically cancelled if after receiving the "control selection" message, the "control execute" command is not received within the set time period.
- (d) The control selection shall be automatically cancelled if after receiving the "control selection" message, the "operate" command is not the next received message and is not received within the set time period.
- (e) No control command shall be generated during power up or power down of RTU.

1.17.7 Local/Remote selector switch

A manual Local/Remote selector switch shall be provided for each RTU to disable all control outputs by breaking the power supply connection to the control outputs. When in the "Local" position, the Local/Remote switch shall allow testing of all the control outputs of RTU without activating the control outputs to field devices. A status input indication shall be provided for the Local/Remote switch to allow the SCADA system to monitor the position of the switch. This point is not included in the RTU point count defined in the BOQ.

1.18 Time facility

The RTU shall have an internal clock with the stability as defined in Table-1. The RTU shall be synchronized through synchronization message from master station at every 10 minutes using IEC 60870-5-101 protocol. The RTU shall support the calculation of the propagation delay dynamically by the Master station. However, all the RTUs shall have a suitable interface for receiving synchronization signals from a local GPS receiver.

The RTUs communicating over IEC-60870-5-104 shall be supplied with a GPS receiver for synchronization of RTU clock.

The RTU shall synchronize its internal clock with the master station system clock when time synchronization messages are available and shall mark all the time stamped information/data as invalid when the RTU clock is not synchronized with the Master station.

1.19 Diagnostic features

The RTU design shall facilitate isolation and correction of all failures. The following features which promote rapid problem isolation and replacement of failed components shall be provided:

- (a) Self-diagnostic capabilities within each RTU which can be initiated at the RTU site. The diagnostic software shall check for memory, processor, and input/output ports errors and failures of other functional areas defined in the specification of the RTU.
- (b) On-line error detection capabilities within the RTU and detailed reporting to the connected master station of detected errors. It shall be possible to choose the errors to be sent to the Master station within the framework of the communication protocol.
- (c) Local indication of major RTU failures
- (d) A non-volatile event buffer that shall record all fatal errors/restarts/ faults.

1.20 Input DC/ AC Power Supply

The RTU will be powered from a 48 V DC (+ve earthed) system. The RTU shall not place additional ground on the input power source. The characteristics of the input DC power supply shall be:

- (a) Nominal voltage of 48 Vdc with operation between 41 and 60 Vdc.
- (b) Maximum AC component of frequency equal to or greater than 100 Hz and 0.012 times the rated voltage peak-to-peak.

The RTU shall have adequate protection against reversed polarity, over current and under voltage conditions, to prevent the RTU internal logic from being damaged and becoming unstable causing mal-operation.

The Scope of supply shall include any hardware as required to convert input voltage to the required internal voltages for the RTU hardware in the quoted prices. The RTU shall operate with grounded input power from Purchaser. The RTU shall not place additional ground on the input power.

Further, Secondary power shall be provided to the RTU at 230 Vac, 50 Hz, single-phase for non-critical auxiliary equipment including heaters, internal lighting, and internal maintenance outlets.

1.20.1 Power Supply Protection

Over voltage and under voltage protection shall be provided to the input and output of the power supply in addition to output over current protection to safeguard the RTU internal logic from being damaged as a result of a

component failure in the power supply and to prevent the RTU internal logic from becoming unstable and causing mal- operation as a result of voltage fluctuations.

1.20.2 Power Supply Failure Indicators

The RTU shall have a status point which shall be set if the power to the RTU has been cycled (off-on) for any reason (including maintenance). The successful transfer of this indication to master station shall reset the power fail status point.

1.21 Environmental Requirements

The RTU will be installed in control room buildings with no temperature or humidity control. The RTUs shall be capable of operating in ambient temperature from -5 to +55 degree C with rate of temperature change of 20 degree C/hour and relative humidity less than 95%, non-condensing. At some locations, environmental temperature may go below -5 degree C for which the contractor shall take suitable measures for successful operation of RTU.

1.22 Noise level

The audible noise generated by the RTU equipment shall not exceed 50 dbA one meter from the enclosure.

1.23 RTU Size and Expandability

The software and the database shall be sized to accommodate growth within the ultimate sizing parameters as defined in this specification for the RTU without requiring software or database structure regeneration.

The point counts for the RTUs have been defined in the BOQ. The RTU shall have additional wired available reserve capacity for 2 additional feeders and one additional Transformer. This reserve capacity shall be used without any additional hardware such as I/O Cards and terminal blocks.

The RTUs delivered shall have the capability to accommodate additional I/O modules to expand the overall point count of the RTU by a minimum of fifty percent (50%) i.e. 80% more than the actual RTU count defined in the BOQ. The I/O modules here means Status Input module, Analog input module and the Control output module. Other modules, such as processor module, racks etc. as required to meet the overall expandability requirement defined above shall also be supplied by the contractor. These I/O Modules should be wired upto the TBs.

1.24 RTU panels

The Contractor shall provide RTU panels. All RTU signals shall be connected to the MFTs, interposing relays, and field signals in the respective C&R panels/ cabinet. MFTs shall be mounted in the respective C&R Panels. The RTU panels shall meet the requirements as specified in Annexure-VII.

1.25 Interconnections

All cabling between component units of the RTU, RTU to interface cabinet, RTU to MFTs and to the Employer control and relay panels (located in the substation control room) shall be supplied and installed by the Contractor and shall be shown on Contractor supplied drawings. Plug-type connectors with captive fasteners or compression type connectors shall be used for all internal interconnections. The connectors shall be polarized to prevent improper assembly. Each end of connection cables shall be identified by a marker which includes the cable number and the identifying number and location of each of the cable's terminations. This information shall match with the Contractor's drawings.

Adequate space and hardware shall be provided for routing of the field wiring within the enclosures. Contractor wiring within enclosures shall be neatly arranged and shall not be directly fastened to the enclosure frame. All internal interconnection wiring and cables shall be routed separately from field wiring to the RTU terminals & power wiring. All wiring shall use copper conductors and have flame retardant insulation. Conductors in multi-conductor cables shall be individually colour coded.

The use of non-flammable, self-extinguishing, plastic wire troughs is permissible. Metal clamps must have insulating inserts between the clamps and the wiring. Wiring between stationary and movable components, such as wiring across door hinges or to components mounted on extension slides, shall allow for full movement of the component without binding or chafing of the wiring.

1.26 Wiring/Cabling requirements

For Details, please refer to Specifications for Power & Control Cable Annexure-V.

1.27 Terminal Blocks

For Details please refer to Specifications for Terminal Blocks (TBs) & Wiring Techniques, Material & Practices Annexure-VI.

1.28 RTU Architecture

Bidder has to quote for only Centralized RTU design where all I/O modules are housed in RTU panels and communicating with master station through communication port and DO, Modems, TBs, etc except perhaps MFTs and CMRs, are housed in respective C& R panels.

1.29 Transducer & Weather Sensor Requirements

Transducers shall use a 48 Vdc auxiliary power supply as provided for the RTU. All transducers shall have a maximum power consumption of 10 watts.

1.29.1 Transducer Protection

The input, output and auxiliary circuits shall be isolated from each other and earth ground. The transducer output shall be ungrounded and shall have short circuit and open circuit protection. The transducers shall

comply to the following requirements, in addition to the requirement of IEC 60688, without damage to the transducer:

- (a) Electromagnetic Compatibility: IEC 61000-4-3, Level 1
- (b) Electromagnetic Compatibility: IEC 61000-4-4, Level 1
- (c) Shock Resistance: Minimum severity 50 A, IEC 68-2-27 requirements
- (d) Vibration Strength: Minimum severity 55/05, IEC 68-2-6 requirements.
- (e) Input Circuit Consumption: Less than 0.5 VA for voltage and current circuits.

1.29.2 Multifunction Transducers:

The contractor shall provide the multi-function transducers for acquiring the real time analog inputs through 3 phase 4 wire and/or 3 phase 3 wire CT/PTs circuits. The multi-function transducer shall be designed for nominal 110 V (Ph-Ph voltage) and 1A/5A (per phase current). The MFT shall be suitable for 20% continuous over load and shall be able to withstanding 20 times the normal current rating for a period one second. The MFT shall be able to accept the input voltages upto 120% of the nominal voltage. The MFTs shall have low VA burden. These MFTs shall be mounted in the respective C&R Panels existing in the PSTCL substations.

Multi-function transducers shall provide at least the following parameters as a minimum with the specified accuracies.

Sr. No.	Parameters	Accuracy
(a)	Voltage	±0.2%
(b)	Current	±0.2%
(c)	Frequency	±0.02%
(d)	Active Power/Reactive power	±0.2% / ±0.2%
(e)	Import & Export Energy (active/reactive)	±0.2% / ±0.2%
(f)	Power Factor (measuring range shall be 0.6 to 1.0 lag &	

The parameters to be acquired from multifunction transducers shall be selectable. MFT shall provide the 15-minute values (configurable 5 minute/15 minute/1 hour) of Active Energy Import, Active Energy Export, Reactive Energy Import and Reactive Energy Export.

Multi-function transducers shall accept nominal -48 V DC (positive earthed) as auxiliary power supply. Multi-function transducer shall be provided with RS485 interface to communicate with RTU over Modbus protocol in multi-drop mode.

The MFTs shall be suitable for mounting on DIN rails. The MFT shall have in-built display for display of measured parameters and for configuration purposes. The MFT terminals shall accept upto two 2.5 mm² / 4 mm² for PT/CT circuit terminations as applicable. The MFT shall have a local display to show all the parameters. The parameters being displayed shall be selected through a push button.

Display Parameters:

- i. Three Phase Voltage
- ii. Three Phase Current

- iii. Frequency
- iv. Per Phase & Total Power Factor (PF), Lag/ Lead
- v. Per Phase & Total Active Power (MW), Import/Export
- vi. Per Phase & Total Reactive Power (MVAR), Import/Export
- vii. Per Phase & Total Apparent Power (MVA)
- viii. Import & Export Energy

The MFT shall comply to the MI/EMC level test requirements as specified for the RTU except for Fast transient burst test requirement which shall be for level 4. The test reports shall be submitted during detailed engineering.

1.29.3 Transducers:

Please refer to the detailed specifications of Active, Reactive, Voltage, Frequency and OLTC Transducers as are given in the Annexure-III.

1.29.4 Weather Sensors (Optional)

All weather sensors shall be maintenance free and of Industry standard design. The design of sensors shall permit calibration on site. The sensing mechanism shall be rugged enough to avoid frequent recalibration.

The sensor, support structure shall have built-in protection against lightning stroke/electrical surges.

The output of all the sensors except rainfall sensor shall be 4 to 20 mA at 0-500 ohm impedance.

The output of rainfall sensor shall be in the form of potential free contact and its closure shall be accumulated (over a configurable time period) and reported at master station through RTU. The sensors shall be located in open and in the electrical environment such as 400 KV EHV outdoor stations. The equipment offered should be suitable for satisfactory operation in above environment.

1.29.4.1 Air Temperature Sensor

Sensor	: Air Temperature
Sensor Output	: As per specification 1.29.4
Temperature Range	: -5 ° C to +60 ° C
Resolution	: +/- 0.1 degree C
Accuracy	: < 0.5 degree C or better
Radiation Shield	: Radiation Shield made of weather resistant material and suitable to sensor used.

1.29.4.2 Relative Humidity Sensor

Sensor	: Relative Humidity Sensor
Output	: As per specification 1.29.4
Range	: 0 to 99 % Resolution :
Accuracy	: 3 % or better
Radiation Shield	: Radiation Shield made of weather resistant material and suitable to sensor used.
Operating Temperature Range	: -5 degree C to + 60 degree C

Note: The Air Temperature and Relative Humidity sensors may be supplied

in a single enclosure or separately.

1.29.4.3 Rainfall Sensor

Sensor	: Tipping Bucket Rain Gauge
Output	: As per specification 1.29.4
Capacity / Range	: Unlimited
Resolution	: 0.2 mm per tip or better
Accuracy	: 4 %
Collecting Area	: Minimum 200 sq.mm
Operating Temperature	: -5 degree C to + 60 degree C

1.29.4.4 Wind Direction Sensor

Sensor	: Wind Direction Sensor
Output	: As per specification 1.29.4
Range	: 0 to 359 degrees
Resolution	: 1 degree
Accuracy	: +/- 5 o or better
Radiation Shield	: Radiation Shield made of weather resistant material and suitable to sensor used.
Operating Temperature Range	: -5 degree C to + 60 degree C

1.29.4.5 Wind Speed Sensor

Sensor	: Relative Speed Sensor
Output	: As per specification 1.29.4
Range	: 0 to 60m/sec or better
Sustainability	: upto 75 m/s
Resolution	: 0.1 m/s
Threshold	: 0.5m/s or less
Accuracy	: +/- 0.5 m/s or better
Radiation Shield	: Radiation Shield made of weather resistant material and suitable to sensor used.
Operating Temperature Range	: -5 ° C to + 60 ° C

1.29.4.6 Pressure Sensor

Sensor	: Pressure Sensor
Output	: As per specification 1.29.4
Range	: 600 hPa to 1100 hPa
Resolution	: 0.1 hPa
Accuracy	: +/- 0.2 hPa or better
Radiation Shield	: Radiation Shield made of weather resistant material and suitable to sensor used.
Operating Temperature Range	: -5 degree C to + 60 degree C

1.29.4.4 Weather Sensor Installation Requirement

The weather station/ sensor requirement is purely tentative and may or may not be procured by Purchaser. However, if procured the weather sensors shall be supplied along with necessary accessories (e.g. tripod, stand, clamps etc.) for installation/ fixing of sensors, signal/power cables etc as part of weather sensors station. All the accessories shall be made of stainless steel or other suitable material having sufficient mechanical strength and

corrosion resistance to withstand atmospheric temperature, pressure, wind speed and relative humidity up to the working range (Minimum to Maximum) of sensors for these parameters as defined. These points are not included in the RTU point count in BOQ.

So necessary additional DI/ AI ports may be taken care along with AI & DI cards as may be required while bidding.

The Employer will prefer to install the sensors on roof top of control centre/substation or other building. The mounting arrangement for all the sensors shall be designed suitably for installation on the roof top.

1.30 Test Equipment for RTU

The following RTU test tools shall be provided.

1.30.1 Field Simulator Device (Optional)

Contractor shall supply Field simulator device & test cables to connect to RTU/ test equipment. The field Simulator Device shall be capable of simulation all the I/O signals supported by RTU. Field Simulation device should be general purpose suitable for all types/ makes of RTUs. Accordingly, it must include necessary connecting cables with different types of connectors.

1.30.2 Maintenance RTU (Optional)

Contractor shall provide Maintenance RTU which is identical to a typical field RTU but with a power supply of 230 V AC. The maintenance RTU shall be mounted on an open vertical rack with wheels and include one of each I/O modules supported by RTUs. The maintenance RTU shall be designed to quickly connect any module or board type for testing. The maintenance RTU shall connect to the PCMT for thorough I/O module testing.

1.30.3 Portable Configuration and Maintenance Terminal (PCMT) (Optional)

Contractor shall supply a Portable Configuration and maintenance Terminal (Laptop PC) which shall provide followings capabilities:

- (a) RTU Data base configuration & Maintenance
- (b) Local Operator Interface & RTU Diagnostics
- (c) Master Station and RTU simulator cum protocol analyzer.

a) RTU Data base configuration

The RTU database Configuration software being supplied with the PCMT shall have the following features

- (a) Full graphics windows User Interface
- (b) Standard editing capabilities e.g. cut, paste, copy, sorting etc.
- (c) Capable of controlling revisions of various RTU database files and storing multiple versions of databases for all the RTUs.
- (d) Capable of uploading database from the RTU and compare that with another version of database stored in the PCMT.
- (e) Provide standard template for database 78rorate78 required for I/O

modules, MFTs & IEDs, communication setting.

- (f) Provide mapping of the individual data points acquired from one protocol to another protocol for transmission.

The database configuration software shall use the same terminology for configuration of the various protocol parameters as specified in the communication protocol standard i.e. it shall be possible to define these parameters by the user discreetly. Also it shall be possible to select an ASDU type to be used for transmission of a measurand e.g. measured value to be transmitted as ASDU 9 or ASDU 11.

b) Local Operator interface and RTU diagnostics

The Local Operator interface software shall support operator inquiries to demand current status and data values of various RTU points, or an overall substation snap-shot, or of the status change buffer.

The local operator interface software shall provide the following reports:

- (a) Status Reports: Display of all substation status indications, of all tele-metered values, and the RTU's status.
- (b) Event Report: Display all the stored events in the event buffer of the RTU.
- (c) Print Request: Provide user interface for requesting print out of the
- (d) Reports on the Logger
- (e) Maintenance activities: User interface for interacting with the RTU for maintenance activities like diagnostics, database online requests.

The RTU shall have inbuilt features for monitoring the healthiness of the RTU modules and detecting the type of error. The diagnostics software shall have diagnostics for the RTU's processor(s), memory, I/O ports, and any other functional areas of the RTU. It shall list the errors recorded by the RTU and provide troubleshooting tools for the RTU.

c) Master station-cum-RTU simulator & protocol analyzer software tool

The Master station and RTU simulator cum Protocol Analyzer software shall be used to monitor and test the RTU's operation using the master station communication protocol. It shall have the following features:

- (a) capable of emulating both the master station and the RTU messages in the communication protocols (IEC 60870-5-101, 104 & MODBUS). When the Master station and RTU simulator cum Protocol Analyser software has received or transmitted a message, it shall be possible to immediately "turn around" and transmit or receive a response message.
- (b) capability of interfacing to digital side of the RTU for the above purpose.
- (c) capable of receiving single and repeated messages using the supplied RTU communication protocol. Each received message shall be checked for validity, including the checksum code. The messages shall be displayed in HEX format or in the 'interpreted form' as desired by the user. It shall maintain and display error counters so that the number of errors during a period of unattended testing can be accurately determined.
- (d) capable of formatting and transmitting, both as one-time and periodic

transmissions, any master station-to-RTU command.

- (e) capable of preparing illegal messages, such as messages having invalid check codes, for transmission.

The Master station and RTU simulator cum Protocol Analyser software shall also be capable of passively monitoring all communication traffic on a channel without interfering with channel operation.

Channel traffic captured in the active or passive modes of operation shall be displayed. All fields of a message shall be displayed. A pass/fail indication for the security check code shall be included with each code displayed.

The minimum specification for PCMT Hardware (Laptop) shall be as under :
Latest Gen. intel Core i5; 8GB DDR4 RAM, SSD: 512 GB , 1 year warranty, all necessary Plug-ins/utilities and driver software, Display Screen size & type: 15.6" FHD Anti-Glare LED Display or higher; Windows 11 Professional or latest, MS Office 2016 or latest, antivirus.

1.31 TESTING

1.31.1 RTU/ SIC Testing

a) Type Testing

A complete integrated unit shall be type tested to assure full compliance with the functional and technical requirements of the Specification. The testing sample shall include at least one of each type of cards/modules and devices. The list of Type tests to be performed on the RTU/SIC is mentioned in Table-2 & type test requirements are mentioned in Table-3. The bidder shall also submit certificate of compliance issued by designated certification laboratory for type testing requirement w.r.t cyber security conformance as per GOI MOP order dated 08.06.2021

The contractor may optionally submit type test reports for all the EMI/EMC tests conducted at accredited laboratory for review & approval by Employer. However, in the event, the type test reports are not meeting the specification requirement, Employer may ask for the type testing of any or all of the above tests as required at no additional cost.

The type test of RTU w.r.t. functional tests shall be carried out in all cases. Contractor shall commence commercial production of RTUs/ SICs after successful completion of all type tests and approval from Employer.

Further, type test reports for transducers/MFTs and relays shall be submitted as per relevant standards. All weather sensors shall be calibrated as per Indian Metrological Department standards and certificate shall be submitted in this regard.

b) Routine Testing

Each complete unit shall undergo routine testing. The list of Routine tests to be performed in the factory is mentioned in Table-2.

c) Field Tests

After RTU panel installation and interface cabling with C&R panels and communication equipment, the Contractor shall carry out the field-testing. The

list of field tests is mentioned in Table-2.

d) Availability Tests

After field testing, RTU shall exhibit 98% availability during test period for a minimum period of three months (90 days) as specified. Availability tests shall be performed along with Master station. The RTU/SIC shall be considered available only when all its functionality and hardware is operational. The non-available period due to external factors such as failure of DC power supply, communication link etc, shall be treated as hold-time & availability test duration shall be extended by such hold time.

1.32 Detailed Interoperability Profile

Detailed Interoperability Profile of IEC 60870-5-101 with existing M/s Siemens SCADA/ EMS systems is given in Annexure-II. As such bidder RTU systems should have all the features possible in these two protocols standards and should be fully configurable in the field using the supplied tools. Responsibility to integrate the supplied RTUs with any SCADA system on these protocols is of the Contractor.

Table-1: Brief Technical Particulars of RTU

Sl.	Item Description	Value	Remarks
1	Data transmission rate	300 to 9600 bps for serial port & 10/100 Mbps for Ethernet port.	Configurable
2	Communication ports	<ul style="list-style-type: none"> • 4 Ethernet port for communication with master stations on 104 & IEDs on 61850 and also for configuration. • Minimum 2 Ethernet Ports for communication with IEDs/ Energy Meters. • 2 RS-232 ports for communication with master stations on 101. • 1 Port for cellular data Communication. • 1 Port for RTU configuration & Maintenance tool • 1 port for LDMS and local Logger • Min two of RS-485 ports for polling MFTs Using MODBUS/ 103 protocols, IEC 60870-5-101 protocol in multi-drop (party line) mode or IEC-60870-5-104 protocol. However, maximum 8 Numbers of MFTs shall be connected to a single port in multi-drop mode.. • 2 RS-232 Ports for default/basic DCU capability. 	Configurable
3	RTU shall be compatible with protocol 61850 for communication with IEDs.	must	
4	Communication protocol with Master stations	IEC 60870-5-101/104	
5	Communication Protocol with LDMS	IEC 60870-5-104	
6	Communication Protocol with MFTs/Energy Meters	MODBUS, IEC-60870-5-101/104	
7	Communication Protocol with IEDs	IEC 61850	

8	Status data transfer to Master station	by exception	
9	Analog data transfer to Master station	Normally Periodic For major change– by exception	
10	No. of Scan Groups supported	16	
11	Accepting polling messages from atleast four master station(s)	Must	
12	Separate Logical Database for each Master Station	Must	
13	Capable of automatic start up and initialization following restoration of power after an outage without need of manual intervention.	All restarts shall be reported to the connected master station(s)	
14	Time synchronization through messages received from master	Using IEC 60870-5-101 protocol.	
15	RTU shall be able to capture contact operations	of 20 ms or more duration.	
16	SOE buffer size	At least 5000 events	
17	Time stamping accuracy for SOE	1 ms	
18	Supporting Control of Devices	Two state & OLTC capacitors	
19	Down loading of RTU database from master station using 101 and 104 protocol.	Supported	

20	Acting as a DCU for acquiring data from atleast one slave RTUs without the need for additional DCU/Ports Cards and exercising supervisory control on slave RTUs using 101 and 104 protocol.	Must	
21	Acting as an exclusive DCU for acquiring data from multiple Slave RTUs (may be with additional DCU/Ports cards) and exercising supervisory control on slave RTUs using 101 and 104 Protocol.	Must (But shall be ordered Optionally)	
22	RTU internal clock stability	At least 10 ppm	
23	Nominal Power supply voltage	48V DC	
24	Compliance to cl. 1.29.1 – Transducer Protection		

Table 2
List of Tests on RTU/SIC

Sr. No.	DESCRIPTION OF THE TEST	Type test	Routine test	Field test
FUNCTIONAL TESTS FOR RTU				
1	Check for BOQ, Technical details, Construction & Wiring as per RTU/SIC Drawings	√	√	√
2	Check for RTU database & configuration settings	√	√	√
3	Check the operation of all Analog inputs, Status input & Control output points of RTU	√	√	√
4	Check operation of all communication ports of RTU	√	√	√
5	Test Power Supply Voltage Margin, Ripple Levels and Short Circuit Protection	√		
6	Check for communication with multiple master stations using partitioned Databases or master station simulator for RTU/FRTU	√	√	√
7	Check for auto restoration of RTU on DC power recovery after its failure	√	√	√
8	Test for RTU/FRTU self-diagnostic feature	√	√	√
9	Test for RTU time synchronization from Master and GPS	√	√	√
10	Test for RTU SOE feature	√	√	√
11	Test for downloading of RTU data base from master station	√	√	√
12	End to end test (between RTU & Master station and RTU & LDMS) for all I/O points.			√
13	RTU Analog accuracy test for Analog inputs	√	√	
14	Test for RTU operation with DC power supply voltage variation	√	√	
15	Test for RTU internal Clock stability	√	√	
16	Test for RTU Noise level measurement	√	√	
17	Test for IEC 60870-5 -101 & IEC 60870-5-104 protocol implemented and matching with protocol profile of existing RTU	√	√	
18	Test for Control Security and Safety for Control outputs	√	√	√
19	Other functional tests as per technical specification requirements.	√	√	√
20	Test for RTU as Data concentrator for IEC 60870-5-101 and 60870-5-104 protocol.	√	√	√
21	Test for operation of redundant CPU and Power supply unit.		√	√




22	Test for Local Data Monitoring System (LDMS)		√	√
23	Test for Modems (All the relevant tests as per Standards)	√	√	√
24	Test of Transducers (All the relevant tests as per Standards)	√	√	√
25	Test of CMRs/ Interposing Relays (All the relevant tests as per Standards)	√	√	√
26	Cables (All the relevant tests as per Standards)	√	√	√
	EMI/EMC IMMUNITY TESTS FOR RTU			
26	Surge Immunity Test as per IEC 60870-2-1	√		
27	Electrical Fast Transient Burst Test as per IEC-60870-2-1	√		
28	Damped Oscillatory Wave Test as per IEC 60870-2-1	√		
29	Electrostatic Discharge test as per IEC 60870-2-1	√		
30	Radiated Electromagnetic Field Test as per IEC 60870-2-1	√		
31	Damped Oscillatory magnetic Field Test as per IEC-60870-2-1	√		
32	Power Frequency magnetic Field Test as per IEC-60870-2-1	√		
	INSULATION TEST FOR RTU			
33	Power frequency voltage withstand Test as per IEC 60870-2-1	√		
34	1.2/50 μ s Impulse voltage withstand Test as per IEC 60870-2-1	√		
35	Insulation resistance test	√		
	ENVIRONMENTAL TEST FOR RTU			
36	Dry heat test as per IEC60068-2-2/ 2-3	√		
37	Damp heat test as per IEC60068-2-78	√		
38	Cold Test as per IEC 60068-2-1	√		

Table 3
RTU TYPE TEST REQUIREMENTS

Test Nos.	Test Name	EUT status	Test Level	Power Supply points		I/O points CM	Passing Criteria
1	Surge Immunity Test	on	Level-3	2kV	1kV	2kV	A
2	Electrical Fast Transient Burst Test	on	Level-3	2kV	-	1kV	A
3	Damped Oscillatory Wave Test	on	Level-3	2.5kV	1kV	2.5kV	A
4	Electrostatic Discharge Test	on	Level-3	+/- 6 kV in Contact discharge mode or +/- 8 kV in Air discharge mode			A
5	Radiated Electromagnetic Field Test	on	Level-3	10 V/m electric field strength			A
6	Damped Oscillatory Magnetic Field	on	Level-3	30 A/m at 1MHz of magnetic field strength			A
7	Power frequency magnetic field	on	Level-3	30 A/m of magnetic field strength (Continuous duration sine wave)			A
8	Power frequency voltage withstand	off	-	1 KVrms for 1 minute			No break down or flashover shall occur
9	1.2/50 μ s impulse voltage withstand	off	-	2 kVp			No break down or flashover shall occur
10	Insulation Resistance Test	off	-	Measure Insulation resistance using 500V DC Megger before & after Power Freq & Impulse voltage withstand tests			As per manufacturer standard
11	Dry heat test	on	-	Continuous operation at 55° C for 16 hrs			0
12	Damp heat test	on	-	at 95% RH and 40° C for 16 hrs			0

13	Cold test	on	-	Continuous operation at 0° C for 96 hrs	0
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Note:-

1. EUT – Equipment under Test
 2. CM – Common Mode; DM – Differential mode
 3. I/O pints do not include Communication ports
 4. Passing Criteria
- 0 – no failure: normal performance within the specified limits
A: minor failure: temporary degradation or loss of function or performance which is self-recoverable

Annexure-II**INTEROPERABILITY PROFILE of IEC 60870-5-101 protocol for NR**

This companion standard presents sets of parameters and alternatives from which subsets have to be selected to implement particular telecontrol systems. Certain parameter values, such as the number of octets in the COMMON ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

The selected parameters should be marked in the white boxes as follows:

<input type="radio"/>	Function of ASDU is not used
<input checked="" type="checkbox"/>	Function or ASDU is used as standardized (default)

Note : In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

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1.1 SYSTEM OR DEVICE

(System-specific parameter, indicate the definition of a system or a device by marking one of the following with an '■')

- ☐ System definition
- ☐ Controlling station definition (master)
- ☒ Controlled station definition (Slave)



1.2 NETWORK CONFIGURATION

(Network-specific parameter, all configurations that are used are to be marked with)

- ☒ Point-to-point
- ☒ Multiple point-to-point
- ☒ Multipoint-party line
- ☐ Multipoint-star

1.3 PHYSICAL LAYER (Network-specific parameter)

Transmission speed (control direction) :

Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 Recommended if > 1 200 bit/s	Balanced circuit X.24/X.27
<input type="radio"/> 100 bit/s	<input type="radio"/> 2 400 bit/s	<input type="radio"/> 2 400 bit/s
<input checked="" type="checkbox"/> 200 bit/s	<input type="radio"/> 4 800 bit/s	<input type="radio"/> 9 600 bit/s
<input checked="" type="checkbox"/> 300 bit/s	<input type="radio"/> 9 600 bit/s	<input type="radio"/> 19 200 bit/s
<input checked="" type="checkbox"/> 600 bit/s		<input type="radio"/> 56 000 bit/s
<input checked="" type="checkbox"/> 1 200 bit/s		<input type="radio"/> bit/s
(for transmission unbalanced only) tran		

Transmission speed (monitor direction) :

Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 Recommended if > 1 200 bit/s	Balanced circuit X.24/X.27
<input type="radio"/> 100 bit/s	<input type="radio"/> 2 400 bit/s	<input type="radio"/> 2 400
<input checked="" type="checkbox"/> 200 bit/s	<input type="radio"/> 4 800 bit/s	<input type="radio"/> 4 800

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- | | | |
|-------------------|---------------|----------------|
| ■ 300 bit/s | ○ 9 600 bit/s | ○ 9 600 bit/s |
| ■ 600 bit/s | | ○ bit/s |
| ■ 1 200 bit/s | | ○ 38 400 bit/s |
| (for transmission | | ○ 64 000 ... |

1.4 LINK LAYER (Network-specific parameter)

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission procedure

- Balanced transmission
- Unbalanced transmission

Address field of the link

- Not present (balanced transmission)
- One octet
- Two octets
- Structured
- Unstructured

Frame length

255 Maximum length L (number of octets)

1.5 APPLICATION LAYER

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 870-5-4, is used exclusively in this companion standard.

Common address of ASDU (system-specific parameter)

- One octet
- Two octets

Information object address (system-specific parameter)

- | | |
|--------------|----------------|
| ○ One octet | ○ Structured |
| ■ Two octets | ■ Unstructured |
| Three octets | |

Cause of transmission (system-specific parameter)

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- One octet
- Two octets (with originator address)

Selection of standard ASDUs
(station-specific parameter)

- <1> Single-point information M_SP_NA_1
- := Single-point information with time tag
- <3> Double-point information M_DP_NA_1
- := Double-point information with time tag
- <5> := Step position information M_ST_NA_1
- <6> := Step position information with time tag
- <7> := Bitstring of 32 bit M_BO_NA_1
- <8> := Bitstring of 32 bit with time tag M_BO_TA
- <9> := Measured value, normalized value M_ME_TA_1
- <10> := Measured value, normalized value with time tag
- <11> := Measured value, scaled value M_ME_TB_1
- <12> := Measured value, scaled value with time tag
- <13> := Measured value, short floating point value M_ME_TC_1
- <14> := Measured value, short floating point value with time tag
- <15> := Integrated totals with time tag M_IT_TA_1
- <17> := Event of protection equipment with time tag
- <18> := Packed start events of protection equipment with M_EP_TB_1
- <19> := Packed output circuit information of protection equipment with time tag M_EP_TC_1
- <20> := Packed single-point information with status change detection
- <21> := Measured value, normalized value without quality descriptor

Process information in control direction
(station-specific parameter)

- <45> := Single command C_SC_NA

- <46> := Double command
- <47> := Regulating step command

C_DC_NA
_1

- <48> := Set point command, normalized value C_SE_NA_1
- <49> := Set point command, scaled value(required only for analog output command)* C_SE_NB_1
- <50> := Set point command, short floating point C_SE_NC_
- <51> := Bitstring of 32 bit C_BO_NA

System information in monitor direction
(station-specific parameter)

- <70> := End of initialization M_EI_NA_1

System information in control direction
(station-specific parameter)

- <100> := Interrogation command C_IC_NA_1
- <101> := Counter interrogation command
- <102> := Read command C_RD_NA
- <103> := Clock synchronization command C_CS_NA_1
- (optional, if GPS is used for time synch. of the RTU)* <104> :=
- <105> := Reset process command C_RP_NA
- <106> := Delay acquisition command C_CD_NA_1
- (optional, if GPS is used for time synch. of

Parameter in control direction
(station-specific parameter)

- <110> := Parameter of measured value, normalized value P_ME_NA
- <111> := Parameter of measured value, scaled value P_ME_NB_1
- <112> := Parameter of measured value, short floating
- <113>:= Parameter activation P_AC_NA

File transfer (may not be required)*
(Station-specific parameter)

- <120>:= File ready F_FR_NA_
- <121>:= Section ready F_SR_NA_1
- <122>:= Call directory, select file, call file, call
- <123>:= Last section, last segment F_LS_NA_

16

on

- <124>:= Ack file, ack section F_AF_NA_1
 - <125>:= Segment F_SG_NA
 - <126>:= Directory _1
- Special use
(Private
.....)
- <137>:= regulating delay command (for Raise/Lower command of OLTC .May not be required)* C_RC_NB

1.6 BASIC APPLICATION FUNCTIONS

Station initialization
(Station-specific parameter)

- Remote initialization

General interrogation
(system or station-specific parameter)

- Global
- Group 1 ■ Group 7 ■ Group 13
- Group 2 ■ Group 8 ■ Group 14
- Group 3 ■ Group 9 ■ Group 15
- Group 4 ■ Group 10 ■ Group 16
- Group 5 ■ Group 11
- Group 6 ■ Group 12 Addresses per group have to be defined

Clock synchronization
(Station-specific parameter)

- Clock synchronization (optional, if GPS is used for time synch. of the RTU)*

Command transmission (Required only when control command is envisaged)*
(Object-specific parameter)

- Direct command transmission ■ Select and execute command
- Direct set point command transmission ■ Select and execute set point command
- C_SE ACTTERM used
- No additional definition
- Short pulse duration (duration determined by a system parameter in the outstation)
- Long pulse duration (duration determined by a system parameter in the outstation)

o Persistent output

Transmission of integrated totals
(station or object-specific parameter)

- | | |
|--------------------------------|-------------------|
| ■ Counter request | ■ General request |
| ■ Counter freeze without reset | o counter |
| ■ Counter freeze with reset | o Request counter |
| o Counter reset | o group 2 |
| | o Request counter |

Addresses per group have to be defined

Parameter loading
(Object-specific parameter)

- o Threshold value
- o Smoothing factor
- o Low limit for transmission of measured value
- o High limit for transmission of measured value

Parameter activation
(Object-specific parameter)

- o Act/deact of persistent cyclic or periodic transmission of the addressed object

File transfer
(Station-specific parameter)

- File transfer in monitor direction (for SOE data file from RTU to RLDC, may not be required)*
- File transfer in control direction (for downloading of RTU database from RLDC- May not be required)*

Additional Information on IEC 60870-5-101 for NRLDC

A. Telemetered Data and ASDU mapping

The following table explains the type of the telemetered data and corresponding ASDUs used to transmit this data as per IEC 60870-5-101 protocol. These are same for all the above three RLDCs.

Type of Data	Data Unit type as per IEC	Description as per IEC	Data polling method	Interrogation group	Transmitted after Class-X request	Info Obj. Address range
Analog inputs (P, Q, V, f, OLTC tap position)	ASDU-11	Measured value scaled value	As cyclic data on Class 2 polls		Class 2	844~
Digital inputs – Single status (Isolators, Protection signals) A single status object uses the same IOA address when being sent as ASDU-1 or ASDU-2 or as a file transfer	ASDU-1	Single point information	By exception (spontaneous) and on periodic Group scan	Group-1	Class 1 on exception, Class 1 after Group 1 scan	376-
	ASDU-2	Single point information with time tag	By exception (spontaneous)		Class 1 on exception	376-
Digital inputs – Double status (Circuit breakers) A double status object uses the same IOA address when being sent as ASDU-3 or ASDU-4 or as a file transfer	ASDU-3	Double point information	By exception (spontaneous) and on periodic Group scan	Group-1	Class 1 on exception, Class 1 after Group 1 scan	256-
	ASDU-4	Double point information with time tag	By exception (spontaneous)		Class 1 on exception	256-

Pulse accumulators	ASDU-15	Integrated totals	By periodic counter interrogation	Group-1 (Counter interrogation)	Class 2	12544-
Analog Outputs (Setpoint)	ASDU-48	Set point command Normalized value				37120
Digital Control Command (CB Trip/Close)	ASDU 46	Double command				33024-
SOE (Digital inputs with Time)	File* transfer	See the file format enclosed				

B. Data polling method

1. The RTU shall respond to the Master stations request for the at least the following commands as per the protocol:
 - Status of Link
 - Reset of Link
 - Delay acquisition command *
 - Clock synchronization command *
 - General interrogation command
 - Interrogation of Scan group 1 command (all status data)
 - Interrogation of Scan group 2 command (all analog data)
 - Class 1/2 data polling
 - File transfer in Monitor direction (SOE file)*

If supervisory control commands are envisaged, then SBO procedure is to be used.

2. RTU shall send all Analog and status data in response to the General interrogation command.
3. All digital inputs are to be assigned to Scan group-1.
4. Analogs are defined as periodic data and are sent to RLDC on Class 2 request. The periodicity varies from 10 seconds to 15 seconds depending upon the quantity of data and available bandwidth.
5. Digital input state changes are to be reported spontaneously by RTU as Class 1 data. The Digital input data have higher priority than Analog values. An integrity scan is performed for all the digital inputs using Scan group-1 at every 10 minutes interval.
6. The SOE (Sequence of Events) information is stored in a file in the RTU. The format of SOE data is enclosed in a separate file (please see the details in RTU sequence of event description_nr.pdf document). This file is transferred using the file transfer feature of IEC 60870-5-101 protocol.

* These features may not be required

3 FUNCTIONAL SPECIFICATIONS

3.1 SOFTWARE EVOLUTIONS

3.1.1 RTU evolutions

3.1.1.1 Sequence of events (SOE)

The SOE data is time-oriented ITSiings of status change events collected from RTUs. It is collected by the master station for subsequent review by relevant user personnel.

3.1.1.1.1 File Structure

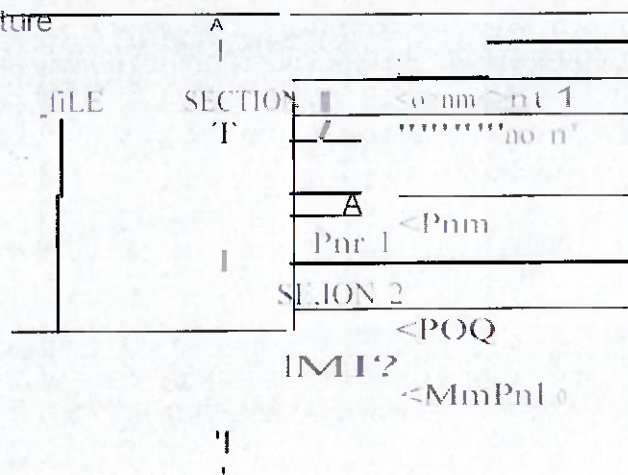


Figure 1. General construction of a file (in IEC 870-3-s;

Special 5900 case:

RTU 5900 use one section to transfer file such database (to RTU) and SOE file (to controlcentre).

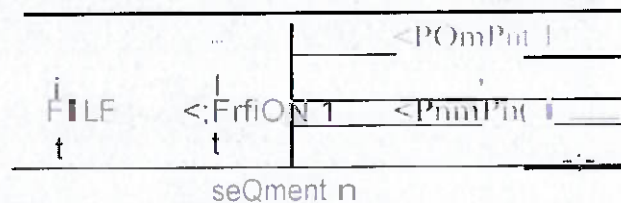


Figure 2 5900 File structure

For the SOE, the file transfer procedure is used. The exchange of data is described in the IEC 870.5 5 document: chapter 6.12 and the message (ASDU) are described in the IEC 870.5 101 document: clapp 7.3.6.





3.1.1.1.3 SOE file

For this project we define a file by unit number part, a header part and information part. Each part has a length sub-part and a data sub-part.

FILE = IDENTIFICATION +
 HEADER + INFORMATION
 IDENTIFICATION = LENGTH +
 DATA + [FILL] INFORMATION
 = LENGTH + DATA + [FILL]

The field "LENGTH" is coded with 14 bytes and is rounded up to a long word boundary. The field "DATA" is described on the next chapters. The field "FILL" if it exists has 1, 2 or 3 bytes long.

The maximum number of bytes per segment is from 63 to 234 < parameter1 ...

3.1.1.1.4 SOE structure

The memory used for SOE has a capacity of 1200 events (1200 if one configured master station, 600 if two configured master stations, 400 if three configured master stations). If the RTU is not polled a long time, and if the SOE file is full, the oldest event is deleted and replaced by a RS with the address zero and the new one is stored into the SOE circular file.

Individual points can be configured for the SOE recording. It means that for these points, when an event occurs, a message M_SP_NA_t, M_SP_TA_t, M_OP_NA_t, M_OP_TA_t (change or status for single or double point) is sent to the control centre and it is also stored in the SOE file. For the others, if the RTU sends only the change of status to the control centre.

Each RS could be configured as SOE or not. SOE.RS are transmitted with hme tag or not (it depends on a global parameter of database). The SOE files are sent through class 2. As it is described in document R2, RS changes of state with hmetag are sent by class 2 and without hmetag are sent by class 2.

On normal condition when the file is < parameter2 > full, the RTU sends to the control centre the ASDU directed to: FctJR_NA_t in the control centre counter. The SOE file from the RTU is sent. parameter1 is a parameter of the system (ranging from 25...10). It is the default value. The RTU keeps the SOE file until the last message of the file transfer is acquired after all the ports.

of the file are transmitted. iii) SOE records sent are deleted from this file (without any loss or new SOE record event) after receive an ASDU FAF_NA_t (ack_file) acknowledging the file transfer (compliant with IEC 870 S.S). But if the SOE file is overwritten, the last transfer in progress will be lost.

Note(s) < parameter1 >, < parameter2 > are configurable parameters and could be easily changed using S9001CETT configuration.

The IEC file name for the SOE r.te is 255 (00FF hexadecimal).

The SOE file could be requested by the control centre by

sending a select file ASDU directly. The SOE file is empty

at the starting of the RTU.

The file transfer for SOE should be completely redundant. It means it is possible to swap the communication line without any perturbation on the file transfer procedure: after a change of path, the r.te transfer should be continue at the point where it was before the change of path.

20

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J.t.1 .1.5 Structure of the SOE file

FILE:: IDENTIFICATION+ H AOER +
INFORMATION
IDENTIFICATION:LENGTH + DATA+
(FILL) INFORMATION = LENGTH +
DATA+ (FILL)

IDENTIFICATION= LENGTH+
DATA • (FILL) LENGTH = 40
(4bytes)

DATA= name + verSiOn
name= 'SEQUENCE OF EVENTS' (32 bytes)
version= version with U6 format (1 byte)
[FILL]= 3 null bytes (3 bytes)

HEADER = LENGTH +
DATA • (FILL) LENGTH
= 8 (4bytes)
DATA= number of SOE (12 bytes)
(FILL) 2 null bytes (bytes)

INFORMATION= t:LENGTH+DATA (FILL)
LENGTH. " (10 • number of SOE) + 4. rounded
longword
boundary DATA = eloiATOMICSOE

ATOMIC SOE = 110 address+ status + time
stamp
110 address = Information object address (12 bytes)
status = SIO or 010 format (1 byte) with new SD flag
(0 = single/1 = double) on the BS1(4) Position
time stamp = (P56 Time2a format
(7 bytes) (FILL) = 0 or 2 null
bytes.

/

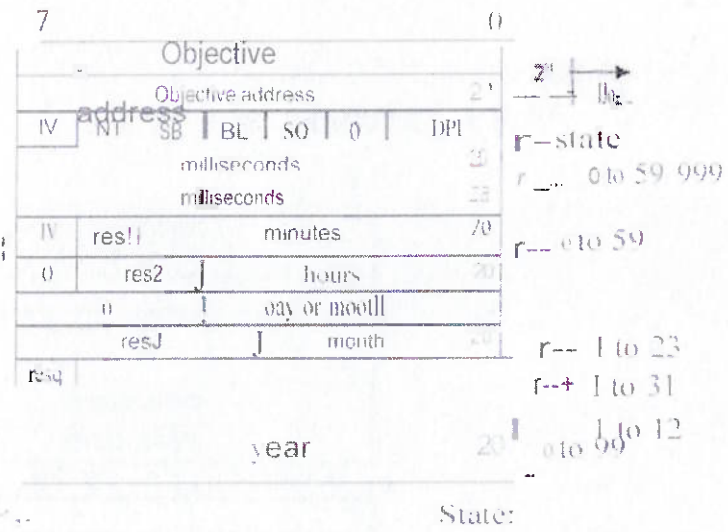


Figure 4: Atomic SOI (single point)

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Validity:
 0: Valid
 1: Invalid



OPI = 0 undetermined state
 OPI = 1 OFF (open)
 DPI = 2 ON (closed)
 OPI = 3 invalid
 IV = 1 Invalid
 0 TS Valid
 BL = 0 Irrelevant
 sa = 0 Irrelevant
 NT = 0 Irrelevant
 SD = 0 (double point)

Figure 5. Atomic SOE (double point)

Annexure-III**SPECIFICATION FOR TRANSDUCER**

The Bidder shall provide the relevant transducers as may be required, as per the following specifications.

1. TRANSDUCERS

The bidder shall supply transducers for the digital and analog input points identified in Annexure-II the transducers procured with this Specification will be installed in the Transducer/ interface cabinet for each power system substation by the bidder.

The analog transducer includes active power, reactive power, voltage, current, frequency, and transformer tap position.

2. ANALOG TRANSDUCERS

The analog transducers shall use state-of-the-art solid-state technology. The transducers shall comply with the latest standards including the IEC 688.

3. SOCKETS

The transducers shall be either modular surface mounted or plug-in printed circuit board type. Plug-in transducer units shall include a safety socket keyed to prevent plugging in the wrong transducer and shall be easily removable and replaceable. Transducers using current sources shall automatically be shorted, not allowing an open circuit, when removed.

All transducers shall be mounted on 48.26-cm (19-inch) panels of the interface cabinet.

4. SOCKET TERMINAL BLOCKS

Electrical socket connections shall be Screw type/Compression Clamp type. The terminals shall accept up to two 2.5/4.0-mm sq. or one 6-mm sq. wires. All current and voltage circuits shall be separated. The socket shall have separate terminals arranged as follows:

(a) Top Row: Measured voltage (or other non-current quantity) inputs, auxiliary supply voltage, and output current loop.

(b) Bottom Row: Measured current inputs and neutral. –

Each transducer shall have an externally visible label that complies with the IEC 688 standards.

5. TRANSDUCER AUXILIARY POWER SUPPLY

All transducers shall use a 48 V dc auxiliary power supply unless it is specified otherwise. The transducers shall have a maximum power consumption of 5 watt.

6. TRANSDUCER PROTECTION

All inputs, outputs and auxiliary circuits shall be isolated from each other and earth ground. The transducer output shall be ungrounded with short circuit and open circuit protection. The transducers shall be tested for the following tests/characteristics conforming to applicable IEC or its Indian equivalent standards requirements without damage to the transducer:-



- Voltage Test and other safety requirements: IEC 688 and IEC 414
- Impulse withstand: IEC 688
- Electromagnetic compatibility: IEC 688 and IEC 801-3 level 1
- Permanent overload protection: IEC 688
- Temporary Overload Protection: IEC 688
- High Frequency distribution test: IEC 688
- Shock Resistance: IEC 68-2-27 requirements
- Vibration strength: IEC68-2-6 requirements.
- Temperature rise: IEC 688.
- Input circuit consumption: Less than 0.2 VA for voltage and current circuits.
- Reference Conditions for Accuracy Class: Compliance with IEC 688 standards

7. ACTIVE POWER TRANSDUCER

The active power transducer shall measure 3- phase active power providing an output to the RTU analog input points. Active and reactive power transducers shall be separate devices. The active power transducer shall have the following characteristics;

- (a) 3 wire, 3 phase balanced /unbalanced load type
- (b) Two watt meter measuring method is used
- (c) Bi- directional power flow
- (d) Rated quantities:
 - 1) Voltage 110 V phase to phase
 - 2) Current 1A or 5A
 - 3) Nominal Frequency 50 Hz : Range 45 to 55 Hz
- (e) Output signal shall be 4to 20 ma dc , $\pm 0.2\%$, accuracy class IEC 688 .

8. REACTIVE POWER TRANSDUCER

The reactive power transducer shall measure 3- phase reactive power, providing an output to the RTU analog input points. Active and reactive power transducers shall be separate devices. The reactive power transducer shall have the following characteristics:

- (a) 3- wire , 3- phase balanced/unbalanced load type
- (b) Two var meter measuring method is used
- (c) Bi- directional power flow
- (d) Rated quantities
 - (1) Voltage 110 V phase-to-phase
 - (2) Current 1A or 5A
 - (3) Nominal frequency 50 Hz ; Range 45 to 55 Hz
- (e) Output signal shall be 4 to 20 ma dc , $\pm 0.2\%$, accuracy class IEC688.

9 VOLTAGE TRANSDUCER

The voltage transducer shall measure 3-phase voltage providing an output to the RTU analog input points. The voltage transducer shall have the following

characteristics;

(a) Phase-to-phase voltage

(b) Input Quantities:

(1) Rated Voltage 110 V phase to phase

(2) Nominal frequency 50 Hz; Range 45 to 55 Hz

(3) Voltage range: 0 to 120 % of the rated voltage

c.) Output signal shall be 4 to 20 ma dc, $\pm 0.2\%$, accuracy class IEC 688.

10 FREQUENCY TRANSDUCER

The frequency transducer shall measure line frequency deviation providing an output to the RTU analog input points. The frequency transducer shall have the following characteristics:

(a) Frequency deviation output equals $F_{\text{measured}} - 50 \text{ Hz}$

(b) Input quantities:

(1) Rated voltage of 110 V ac

(2) Rated center frequency 50 Hz

(3) Frequency range 45 to 55 Hz

(4) Voltage range 0 to 120 % of the rated voltage

(c) Output signal shall be 4 to 20 ma dc, 0.02% , accuracy class

11 TRANSFORMER TAP POSITION

There are three types of tap position signals provided from the Purchaser field devices: current, voltage, and resistance. The supplier shall provide buffering transducers for these signals as input to RTU analog input points. Necessary interfacing instruments like suitable resistance box to convert the voltage input signals and local panel mounted Tap position indicator (input 4-20 mA,) shall be provided by the Vendor as per site requirements. OLTC transducer should have Dual output for local as well as remote indication with readable size display.

(i) The current tap position buffer transducers shall have the following characteristics:

(a) Input Ranges: The input measuring ranges shall be :

(1) 0 to +1ma

(2) 0 to +5ma

(3) 0 to 10ma

(4) 0 to 20ma

(5) +4 to +20ma

(b) The voltage drop of the measured input shall be $\leq 2 \text{ V DC}$

(c) The continuous overload capacity shall be $\leq 100\text{ma}$.

(d) Output signal shall be 4 to 20 ma dc, $\pm 0.5\%$, accuracy class IEC 688.

(ii) The existing voltage tap position signals have a variable voltage output. The Bidder shall provide buffering transducers for these signals as input to RTU analog input points. The voltage tap position buffer transducers shall have the following

characteristics.

Input Ranges : The input measuring ranges shall be :

- (1) 0 to 6 Vdc
- (2) 0 to +24 Vdc
- (3) 0 to 110Vdc
- (4) 0 to 115Vac
- (5) 0 to 240Vac

(b) Output signal shall be 4 to 20 ma dc, $\pm 0.5\%$, accuracy class IEC 688.

(iii) The existing resistance tap position signals have a variable resistant: output. The Bidder shall provide buffering transducers for these signals as input to RTU analog input points. The resistance tap position buffer transducers shall have the following, characteristics:

- (a) The input measuring ranges shall be from 0 to 200 ohms. And/ or 1k to 17k ohms as the case may be.
- (b) Output signal shall be 4 to 20 ma dc, $\pm 0.5\%$, accuracy class IEC 688.

Annexure-IV
Annexure-IV

CONTACT MULTIPLYING RELAYS (CMRs)

Contact Multiplying Relays (CMRs) where ever required to multiply the contacts of breaker, isolators and protection relays etc. shall be arranged by the bidder. The contacts of these relays shall be used to provide status inputs to the RTUs. The relays shall be DC operated; self reset type. The rated operating coil voltage for relay shall be 220V DC or AC (as per site requirement). The relay shall be able to operate for +/-20% variation from nominal voltage.

The CMRs with silver alloy or better contacts shall have a minimum of two change over contacts (2NO & 2 NC) out of which one set shall be used for telemetry purposes and the other to be wired out at the TB, shall be used as spare, meeting with interfacing requirement. The cable required from contacts point to CMR to RTU shall be supplied by the bidder.

The contacts shall be rated to carry minimum current capacity of 5A and breaking capacity of 2500 VA. The relay shall conform to following requirement;

- a) Power Frequency withstands voltage-2KV for 1 minute as per IEC 255-5.
- b) Insulation Resistance of 100M ohms measured using 500V DC megger.
- c) 5KV Impulse test as per IEC 255-5

The relays coils shall be shunted with diodes to suppress inductive transients associated with energizing and de-energizing of the relay coils. The relays shall conform to the IEC 255-1-00 and IEC 255-5 requirements. The relays must be protected against the effects of humidity, corrosion & provide with a dust tight cover. The connecting terminals shall be screw type & legibly marked. The relays shall have a visual operation indicator with push to test button feature with locking key. The plug in type relays to be equipped with suitable DIN rail /panel mounting screw type socket arrangement (conforming to IS: 3231 :1987 with latest amendments) for mounting in the existing Control & Relay (C&R) panels.

Note: Quantity of CMRs as indicated under BOQ (Annexure-VI (A) to be included for tendering /evaluation purpose.

Annexure-V**Specification for Power & Control Cable**

The RTU/Transducer panels shall gather all signals from the devices located in Control & Relay panels/ in the substation control room or Communication room. All wires that carry low-level signals shall be adequately protected and separated from power wiring. All wires shall be identified either by using ferrules or by colour coding. In addition, cables shall be provided with cable numbers at both ends, attached to the cable itself at the floor plate where it enters the cubicles. Shielded cables shall be used for external Cabling from the RTU/ Transducer panels. The external cables (except communication cables) shall have the following characteristics:

- a) All cables shall have stranded copper conductor.
- b) Copper core meeting IEC 228 class 2 requirements.
- c) Minimum core cross-section of 2.5 mm² for PT cables, 2.5 mm² for 1 Amp CT cables, 4.0 mm² for 5 Amp CT cables (as applicable) and 2.5 mm² for Control outputs and 1.5mm² for Status inputs and 0.5 mm² for signal cables.
- d) Rated voltage U_0/U of 0.6/1.1KV
- e) External sheathing of cable shall have oxygen index not less than 29 & temperature index not less than 250. Cable sheath shall meet fire resistance test as per IS 1554 Part- I.
- f) The transducer signal output cable connected to RTU shall be screened signal cable. The Communication cable shall be of shielded, twisted pairs and of minimum 0.5sq-mm size.
- g) The cable shall be FRLS type and shall conform to the requirements as per the applicable IS.
- h) Shielding longitudinally laid with overlap.
- i) Dielectric withstand 2.5 kV at 50 Hz for 5 minutes
- j) External marking with manufacture's name, type, core quantity, cross-section, and year of manufacture.

Note: Make and technical data sheet of the all field, signal cables and interconnecting wires/cables shall be provided by the bidder alongwith the tender.

Annexure-VI**SPECIFICATION FOR TERMINAL BLOCKS (TBS) & WIRING TECHNIQUES,
MATERIAL & PRACTICES****TERMINAL BLOCKS (TBS)**

Terminal blocks shall be having provision for disconnection (isolation), with full-depth insulating barriers made from molded self-extinguishing material. Terminal blocks shall be appropriately sized and rated for the electrical capacity of the circuit and wire used. No more than two wires shall be connected to any terminal. Required number of TBs shall be provided for common shield termination for each cable. Terminal blocks shall be screw type. Rust proofing of metallic components shall be provided by means of the metal used or a suitable coating. Terminal blocks shall be appropriately sized and rated for the electrical capacity of the circuit and wire used. CT connections shall have shorting link/disconnecting type terminals.

The surface for the wires shall be flat with only slight ridges for maintaining the integrity of the connection. The mechanical design shall be such that the wires maintain a tight connection to the terminals. All terminals and blocks shall be clearly labeled. The vendor shall provide two input terminals and a shield termination for each analog input signal. Contact inputs and output signals shall require two terminals per point plus shield termination

Each bay shall have independent terminal block with transparent cover/ protection and shall be suitably arranged for easy identification of its usages such as CT circuits, PT circuits, analog inputs, status inputs, control outputs, auxiliary power supply circuits, communication signals etc. TBs for CT circuits shall have feature for CT shorting (on CT side) & disconnection (from load side) to facilitate testing by current injection. Similarly, TBs for PT circuit shall be Fuse link type and have feature for disconnection to facilitate voltage injection for testing.

WIRING TECHNIQUES, MATERIAL & PRACTICES

The following techniques, materials, and practices shall be used in the internal wiring;

- (a) Terminations – All connections for interconnecting wiring integral to the supplier's equipment shall be of a durable and reliable type.
- (b) Signal Separations – All wires that carries low-level signals shall be adequately protected and separated as far as possible from power wiring.
- (c) Pin and socket Identifications – Each pin and its associated socket connection shall be clearly identified by a coding scheme that is uniform with in each subsystem.
- (d) Connector Alignment features –Plugs and receptacles shall have keys, aligning pins, or other devices to indicate and ensure proper insertion of

26

Dr

- connectors.
- (e) Mating to adjacent Connectors – plugs and matching receptacles shall be physically positioned or constructed to preclude improper mating with adjacent plugs or connectors.
 - (f) Plugs and Receptacle Accessibility – All plugs and receptacles shall be mounted and positioned for ease of replacement or repair.
 - (g) Cable Harnesses- wherever possible, wires shall be bundled into harnesses formed by plastic or nylon cable ties.
 - (h) Cable Routing – Cables shall be routed so that wires or insulation cannot be over flexed, pinched, or damaged by doors, drawers, disassembly, or by other operations required for installation, testing, and maintenance.
 - (h) Cable Accessibility – Cables and wiring shall be easily accessible by maintenance personnel and shall be installed in a conspicuous location.
 - (i) Cable Bending – Cables shall connect or disconnect easily without bending or crimping.
 - (k) Cable Mounting – Cables or wiring shall be mounted on stationary panels where practical; stress points shall not occur on connectors. Cable glands shall be provided wherever required.
 - (l) Cable Protection – Grommets or other protective devices shall be used to protect cables or Wires that are routed through panel holes or over sharp – edged surfaces.
 - (m) Card Edge Connections- All printed circuit card edge connectors shall have gold-plated contact surfaces and shall have positive contact wiping action.

Annexure-VII**TECHNICAL SPECIFICATION FOR ENCLOSURES/ PANELS**

The bidder will provide enclosures for RTU and Transducer cabinets meeting the following requirements:-

- (a) The enclosures shall be free-standing, floor mounted and height shall not exceed 2300 mm. (from floor). All doors and removable panels shall be fitted with long life rubber beading. All non-load bearing panels/doors shall be fabricated from minimum 1.6 mm thickness steel sheet and all load bearing panels, frames, top & bottom panels shall be fabricated from minimum 2.0 mm thickness steel sheet. Tolerance in above dimensions shall be as per relevant IS standards.
- (b) Maintenance access to the hardware and wiring through lockable full height doors.
- (c) Provisions for top and/or bottom cable entry (as per site requirements) with wiring gaskets and stuffing glands on cabinet mounting plates.
- (d) Signal and safety ground network within the enclosure shall be provided. The safety ground shall be isolated from the signal ground and shall be connected by the Vendor to the ground network and to the ground wire of the ac power input. The signal ground shall terminate at a separate stud connection sized for a lugged 16-mm² ground wire. Each ground network shall be a copper bus bar, braid or cable. Use of the enclosure frame, skins, or chassis mounting hardware for the ground network is not acceptable. The vendor shall also provide Independent signal grounding with electrode wherever not available.
- (e) All enclosures shall be supplied with 230 V AC, 50 Hz single-phase switch, space heater and a 15/5A duplex socket arrangement for maintenance.
- (f) All enclosure shall be provided with an internal maintenance lamp with door switch and gaskets and eyelets for bundling and routing internals wiring.
- (g) All panels shall be indoor, dust-proof with rodent protection, and meet ISO-IP41 class of specification as per IS.
- (h) There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
- (i) Document Holder shall be provided inside the panels to keep test report, drawing, maintenance register etc.
- (j) Panels shall be finished a semi gloss smoke grey colour.
- (k) All materials used in the panels including cable insulation or sheathing, wire troughs, terminal blocks and enclosure trim shall be made of flame-retardant material and shall not produce toxic gasses under fire conditions.
- (l) The enclosures shall be finished inside and out. All cabinet metal shall be thoroughly cleaned and sanded, and welds chipped to obtain a clean, smooth finish. All surfaces shall be treated to resist rust and to form a bond between the metal and the paint.
- (m) Panels shall have visual annunciation and audio alarm systems to indicate different conditions with accept/ reset buttons to cater for local indication for substation operators in case of Remote controlling of Breakers besides other alarm conditions/ situations. The details shall be defined during design engineering phase.




Annexure-VIII

CONTRACT AGREEMENT FORM

(To be entered on a non-judicial Stamped Paper and may be modified/amended before signatures at the option of PTSCL)

This contract agreement made this..... Day ofin the year.....between the Punjab State Transmission Corporation Limited hereinafter called Purchaser and M/s..... having their Registered office athereinafter called 'Contractor' for supply and delivery/ construction of.....in accordance with Purchase enquiry No..... datedand Contractor's Proposal No..... dated.....

This is in confirmation of the advance acceptance notified in the Purchaser's letter No..... wherein the Purchaser has accepted the proposal of Contractor for Design, Engineering, supply, delivery, erection, commissioning and successful integration of.....as per purchase/Work order No.....

In view of the foregoing the Purchaser and contractor have agreed to the scope of work and Terms and Conditions of the order settled between them.

The NIT/Tender specification, the contractor's Proposal and related correspondence and Purchase Order acknowledged/ accepted by the contractor from part of this agreement.

This agreement contains.....pages.

In witness whereof the parties here have to have affixed their signatures on the day, month and year written as above.

CONTRACTOR

PURCHASER





Annexure-IX

Undertaking Form

(To be entered on a Non Judicial Stamped paper of Rs.....only)

We..... states that our works are situated in the State of Punjab and we claim "order Preference " as stipulated in the P.S.T.C.L. tender specification No..... due on.....against which we have submitted our tender No..... date..... We undertake to execute the order/contract if place/awarded on to us even by counter offer at the rates worked out by Punjab State Transmission Corporation Limited in accordance with its Purchase Regulations. It is further understood that in the event of refusal by us or failure on our part to execute the order/contract (full or part) placed/awarded on us under 'Order Preference 'on any account what so ever, the Punjab State Transmission Corporation Limited shall have the right to forfeit the earnest money deposited by us and we shall have no claim for the refund thereof. The Punjab State Transmission Corporation Limited shall also have the right to suspend business dealing with us and to back list our firm, without prejudice to other rights accruing to the Punjab State Transmission Corporation Limited under the Purchase order/contract if placed/awarded on to us.

Signature of constituted
attorney with Seal



Annexure-X

Schedule-C

**PROFORMA FOR GENERAL INFORMATION FOR APPRAISAL OF FIRM'S
CAPABILITY AND CAPACITY TO MANUFACTURE ITEM(S)**

- 1.(A)
 - i) Name of the tendering Firm.
 - ii) Complete address of the office.
 - ii) Telegraphic Address
 - iii) Telephone Number(s).
 - iv) Telex Number.
 - vi) Fax Number.
 - vii) e- mail
- (B)
 - i) Name of the Responsible Officer with designation. (Managing Director/Partner/Chief Engineer/Works Engineer etc.)
 - ii) Day on which weekly holiday is observed.
- (C) Complete Address of the works.
 - i) Telegraphic address.
 - ii) Telephone Number(s) & Telex Number.
 - iv) Names of two responsible persons with designation (Managing Director/Partner/Chief Engineer/Works Engineer etc.).
 - v) Day on which weekly holiday is observed.
- (D) Name & Address and Telephone number of two references having facilities of P&T Telephones
 - a)
 - i) Name.
 - ii) Address.
 - iii) Telephone No.
 - b)
 - i) Name.
 - ii) Address.
 - iii) Telephone No
2. Year of Establishment.
3. Constitution of the firm.
 - a) Private or public limited.
 - b) Registered under the companies ACT or any other ACT. Give Registration No. & Date.
4. FINANCIAL POSITION:
 - i)
 - a) Land (Area & Value)
 - b) Building (Covered Area & Value).
 - c) Plant & Machinery.
 - d) Total drawing limit from Banks.
 - ii) Annual Financial turnover duly audited for the last two years.
 - iii) Latest Income Tax clearance certificate.
5. MAN POWER:

- a) Graduate Engineer(s).
 - b) Diploma Holder(s).
 - c) Skilled work.
 - d) Non-skilled workers.
6. Production capacity per month of the item covered in your quotation and justification for assessment.
- a) Details of plant and machinery installed (please attached separate sheets, if necessary).
 - b) Details of raw material required.
 - c) Source of raw material.
 - d) Stock in hand.
 - e) In case, any raw materials are required to be imported, indicate arrangement of raw material procurement.
 - f) Quality controls exercised in procurement of its materials.
7. a) Details of manufacturing process.
- b) Scheme of quality controls.
- i) During manufacturing process.
 - ii) At the finished stage.
- c) Whether any records being maintained in respect of quality controls exercised.
8. Details of testing facilities available with the firm. (Information may be supplied in the enclosed performa as per annexure-I).
9. Details of orders executed/under execution during the last three years (including quantity and value).
- a) With PSTCL
 - b) Other State Electricity Boards/Govt. of India and their institutions/undertakings.
 - c) Other important customers.
10. a) Whether the item(s) are on Punjab Govt./DGS&D/Central Govt. approved Rate Contracts (Attach copies of rate contracts).
- b) Whether the firms works is having ISO for the item quoted, if yes, please mention ISO No. and validity.
- c) Whether the firm is licenses to use ISI mark or any other Govt. quality Mark for the item quoted. Please specify No. and validity of license. (Copies of latest test certificates issued by Govt. Laboratories/any recognized Test House be attached).

Signature of authorized Signatory of the firm
Seal of the firm.

- NOTE:- 1. Please attached additional sheets, where required.
2. Copies of documents attached with the performa should be attested by the firm's authorized representative with stamp mark of the firm.

Signatures
Name & Designation
(SEAL)

Schedule of Deviations - Schedule-'D'**Annexure-XI**

Tenderers shall carefully state below any and all points in this tender which are not in accordance with technical specifications and the general conditions.

Sr. No.	Para No. & Page.	Deviations, if any.
	A) TECHNICAL 1. 2. 3.	
	B) GENERAL/ COMMERCIAL 1. 2. 3.	

Tenderer hereby certifies that the above mentioned are the only deviations from Purchaser's afore-mentioned specification and general conditions.

Signatures
Name & Designation
(SEAL)
(On each page)




Annexure-XII**Schedule of Testing Facilities - Schedule-'E'**

Name of the Test	Details of Testing facilities available.	Remarks.
1. TEST OF RAW MATERIALS. i. ii. etc.		
2. ROUTINE TEST. i. ii. etc.		
3. ACCEPTANCE TEST. i. ii. iii.etc.		
4. TYPE TEST. i. ii. iii.. etc.		
5. Site/ GSAT TEST. i. ii. iii.. etc.		

NOTE:-In case, testing facilities are not available for certain tests, indicate in the remarks column from which testing house(s) Institution(s) these will be got carried out.

Signatures
Name & Designation
(SEAL)
(On each page)

Annexure-XIII**Guaranteed Technical Particulars**

(Complete RTU system meeting all the GTP or better will be accepted)
(To be submitted with the Technical Bid)

Sr. No.	Description	Guaranteed Technical Requirements	Bidder's to fill in actual particulars and/ or comments	Cross Ref in the bid
1.0	Remote Terminal Unit			
1.1	Vendor	NRPC Approved		
1.2	Make	NRPC Approved		
1.3	Model	NRPC Approved		
1.4	Applicable Standards	Please mention		
1.5	Type Testing Requirement	As per TE Specs.		
1.6	Baud rate configurable at	300, 600, 1200 bps as specified for IEC 60870-5-101		
1.7	Collecting and processing the digital status inputs, analog inputs, accumulated values and transmitting to master station(s)	Give details & whether meets the specifications		
1.7.1	Receiving and processing digital & analog control commands from the master station(s)	Give details & whether meets the specifications		
1.7.2	Accepting polling messages from at least four master station(s)	Give details & whether meets the specifications		
1.7.3	Simultaneously using separate logical databases for each master station.	Give details & whether meets the specifications		
1.7.4	Communication simultaneously on all Communication ports (as per cl.1.3) and using multiple concurrent protocols, including the IEC 60870-5-101, 60870-5-104 & MODBUS protocol.	Give details & whether meets the specifications		




1.7.5	Data transmission rates from 300 to 9600 baud for serial ports (for both IEC 60870-5-101 & MODBUS) and 10/100 Mbps for TCP/IP Ethernet ports.	Give details & whether meets the specifications		
1.7.6	RTU shall be compatible with protocol 61850 for communication with IEDs.	Give details & whether meets the specifications		
1.7.7	RTU shall have the capability of automatic start-up and initialization following restoration of power after a master station(s).	Give details & whether meets the specifications		
1.7.8	RTU shall support time synchronization through messages received from master station using IEC	Give details & whether meets the specifications		
1.7.9	RTU shall support downloading of RTU database from the master station using the IEC 60870-5-101 and IEC 60870-5-104 protocol.	Give details & whether meets the specifications		
1.7.10	RTU shall support SOE (Sequence of events) feature	Give details & whether meets the specifications		
1.7.11	Acting as a Data Concentrator Unit for acquiring data from at least one Slave RTUs without the need for additional DCU/ Ports Cards and exercising supervisory control on slave RTUs using IEC 60870-5-101 and IEC 60870-5-104 protocol.	Give details & whether meets the specifications		

1.7.12	Acting as an exclusive Data Concentrator Unit for acquiring data from multiple Slave RTUs (may be with additional DCU/ Ports Cards) and exercising supervisory control on slave RTUs using IEC 60870-5-101 and IEC 60870-5-104 protocol. (This feature shall be optional)	Give Details & whether meets the specifications		
1.7.13	Status data transfer to Master station	by exception		
1.7.14	Analog data transfer to Master station	Normally Periodic For major change— by exception		
1.7.15	No. of Scan Groups supported	16		
1.7.16	Separate Logical Database for each Master Station	Must		
1.7.17	RTU shall be able to capture contact operations	Of 20 ms or more duration.		
1.7.18	SOE buffer size	At least 5000 events		
1.7.19	Time stamping accuracy for SOE	1 ms		
1.7.20	Supporting Control of Devices	Two state & OLTC, capacitors		
1.7.21	RTU internal clock stability	At least 10 ppm		
1.8	Feature of Redundant Communication with Masters (Capability in the RTU- No additional items are to be considered in the BOQ on account of this feature)	Give details & whether meets the specifications		
1.9	Feature of Redundant CPU	Give details & whether meets the specifications		
1.9.1	Feature of Redundant Power Supply Unit (Capability in the RTU- No additional items are to be considered in the BOQ on account of this feature)	Give details & whether meets the specifications		

1.10	No. of Communication channels/ Ports RTU have	Give details & whether meets the specifications		
1.11	LDMS Software	Give details& whether meets the specifications		
1.11.1	LDMS Hardware (including Desktop, UPS (min 1 KVA) & B/W Printer) (Give details), System Software and Furniture (Computer Table and Chair)	Give Details along with make & model & whether meets all the specifications		
1.11.2	Communication Protocol with LDMS	IEC 60870-5-101/104 Give details & whether meets all the specifications		
1.12	Communication interface between RTU & MFTs/ MFM	MODBUS, etc. Give details & whether meets all the specifications		
1.13	Communication Protocol between RTU & IEDs	IEC 61850 Give details & whether meets all the specifications		
1.14	Master Station Communication Protocol	IEC 60870-5-101/ 104 Give details & whether meets all the specifications		
1.15	Whether meets the requirement as specified in respect of	Give details & whether meets the specification		
1.15.1	Analog Inputs	Give details & whether meets the specification		
1.15.2	Status Inputs	Give details & whether meets the specification		
1.15.3	Digital Telemetry/ Pulse Accumulator	Give details & whether meets the specification		
1.16	SOE feature	Give details & whether meets the specification		

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1.17	Control Outputs	Give details & whether meets the specification		
1.17.1	Two State Momentary Control	Give details & whether meets the specification		
1.17.2	Raise/ Lower Pulse Output	Give details & whether meets the specification		
1.17.3	Times Supervisory Control	Give details & whether meets the specification		
1.17.4	Double Contact Digital Outputs	Give details & whether meets the specification		
1.17.5	Latching Relay (Dummy Breaker)	Give details & whether meets the specification		
1.17.6	Control Safety and Safety Requirements	Give details & whether meets the specification		
1.18	Local & Remote selector switch	Give details & whether meets the specification		
1.19	Time facility	Give details & whether meets the specification		
1.20	Diagnostic Features	Give details & whether meets the specifications		
1.21	Input AC/ DC Power supply	Give details & whether meets the specifications		
1.22	Interconnections	Give details & whether meets the specifications		
1.23	Wiring/ Cabling Requirements	Give details & whether meets the specifications		

1.24	RTU Architecture	Centralized Architecture (As specified) (Give details & whether meets the specifications)		
1.25	Transducer & Weather sensor Protection and other requirements	Give details & whether meets the specification		
1.26	Weather Sensors (Optional)	Give details & whether meets the specifications		
1.26	Air Temperature	Make, Model & Give details & whether meets the specifications		
1.26.1	Relative Humidity Sensor			
1.26.2	Rainfall Sensor			
1.26.3	Wind Direction Sensor			
1.26.4	Wind Power Sensor			
1.26.5	Pressure Sensor			
1.26.6	Weather Station Installation Requirements	Give details & whether meets the specifications		
1.27	Test Equipment for RTU			
1.27.1	Field Simulator Device	Make, Model & Give details & whether meets the specifications		
1.27.2	Maintenance RTU (Optional)			
1.27.3	Portable Configuration and Maintenance Terminal (PCMT) (Optional)			
1.28	Visual annunciation and audio alarm systems	Give details & whether meets the specifications		
1.29	Whether meets the Interoperability Profile for IEC60870-5-	Give details & whether meets the specifications		
1.30	Environmental conditions	As per TE Specs.		
2.0	Transducers			
2.1	Auxiliary power supply	48 V DC		
2.2	Protection of Transducer	As per spec.		
2.3	Type Test Requirements	As per TE Spec		
2.4	Multifunction Transducer			
2.4.1	Make			
2.4.2	Model			

2.4.3	Connections	3 Phase 3 wire or 3 Phase/ 4 wire balanced/ unbalanced as per site requirement.		
2.4.4	Input current per phase	1 / 5A		
2.4.5	Input Voltage	Ph-Ph 110V		
2.4.6	Power flow	Bi-directional		
2.4.7	Nominal frequency	50 Hz; Range 45 to 55		
2.4.8	Output signal	4 to 20 ma dc		
2.4.9	Accuracy class	0.2s IEC688		
2.5	Voltage Transducer			
2.5.1	Make	.		
2.5.2	Model			
2.5.3	Rated Voltage	110 V phase to		
2.5.4	Nominal frequency	50 Hz ; Range 45 to 55Hz		
2.5.5	Voltage range	0 to 120 % of the rated		
2.5.6	Output signal	4 to 20 ma dc,		
2.5.7	Accuracy class	0.2s, IEC 688.		
2.6	Frequency Transducer			
2.6.1	Make			
2.6.2	Model			
2.6.3	Frequency deviation output	Freq measured - 50 Hz		
2.6.4	Rated voltage	110 V ac		
2.6.5	Rated center frequency	50 Hz		
2.6.6	Frequency range	45 to 55 Hz		
2.6.7	Voltage range	0 to 120 % of the rated		
2.6.8	Output signal	4 to 20 ma dc		
2.6.9	Accuracy class	±0.1 % , IEC 688		
2.7	Transformer Tap Position Transducer and independent display			
2.7.1	Make			
2.7.2	Model			
2.7.3	Input measuring Range	As per Spec.		
2.7.4	Output Signal	4 to 20 ma dc		
2.7.5	Accuracy Class			
2.7.6	Display Height			
2.8	Multi Function Transducers			
2.8.1	Make			
2.8.2	Model			
2.8.3	Rated Voltage	110 V phase to		
2.8.4	Voltage range	0 to 120 % of the rated		

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2.8.5	Rated Current	1A/ 5 A		
2.8.6	Suitable for systems	3P3W & 3P4W		
2.8.7	Accuracy Class	0.2s as per IS-14697 for energy 0.2 as per IEC 60688 for analog signal		
3.0	Modems			
3.1	Make			
3.2	Model			
3.3	Type Test Requirements	As per TE Spec		
3.4	CCITT Standards	Including V.24, V.28.		
3.5	Modulation.	Frequency shift keying		
3.6	Data Communicate rates	300, 600 and 1200 bps.		
3.7	Standard tones for the selected RTU data rate	a) CCITT R.38a and R.38b for 200/ 300 baud rate		
		c) V.23 for 600 & 1200 Baud		
3.8	Compatible with IEC 60870-5-	Required		
3.9	Use of communication lines.	Full duplex 2-wire and		
3.10	Receive level adjustable	0 to – 40 dBm @ 600		
3.11	Transmit level adjustable	0 to – 24 dBm @ 600		
3.12	Minimum Sensitivity	-48 dBm		
	PLCC modem shall use bandwidth up to 4 kHz and shall have capability to accommodate multiple data channels along with voice channels or without voice channels for the flexibility in PLCC routing plan	Required as per spec.		
3.13	The Modem should have self test feature such as manual mark/ space keying, analog loop-back and digital loop back. It should have the testing feature according to	Required as per spec.		
3.14	Modem Power supply	48V DC (nominal)		
4.0	Contact Multiplying Relays			
4.1	Make			
4.2	Model			
4.3	Type Test Requirements	As per TE Spec		
4.4	The relays shall be DC			

4.5	The relays shall be self reset type			
4.6	Rated operating coil voltage for	220V DC		
4.7	Operating nominal voltage variation.	+/-20%		
4.8	CMRs Contacts	silver alloy or better		
4.9	CMRs change over contacts	Minimum of two 2NO		
4.10	Rated to carry minimum current	5A		
4.11	Rated breaking capacity of the	2500 VA		
4.12	Power Frequency withstands voltage as per IEC 255-5.	2KV for 1 minute		
4.13	Insulation Resistance.	100M ohms measured		
4.14	Impulse test as per IEC 255-5	5KV		
4.15	Applicable standard	IEC 255-1-00 and IEC255-5		
4.16	Connecting terminals	screw type & legibly marked		
4.17	Relays must be protected against the effects of humidity, corrosion			
4.18	Relays shall have a visual operation indicator with push to test button feature with locking key			
4.19	The plug in type relays to be equipped with suitable DIN rail /panel mounting screw type socket arrangement (conforming to IS: 3231 :1987 with latest amendments) for mounting in the existing Control & Relay			
4.20	Size of relay	Compact		
5.0	Terminal Blocks			
5.1	Make			
5.2	Model			
5.3	Type of TTBs	screw-type/ stud type/ cage clamp type/ self stripping/ spring type		
5.4	TBs for PTs shall be with fuse	As per spec		




5.5	TBs for CTs with feature for CT Shorting on CT side and	As per spec		
6.0	Cables of different Types			
6.1	Manufacture's Name			
6.2	Type of insulating of wiring	FRLS, PVC insulated Annealed Copper		
6.3	Applicable Standard	As per spec		
6.4	Dielectric strength	2.5 kV at 50 Hz for 5 minutes		
7.0	RTU panel	As per specs		
8.0	SIC/ Transducer panel size	NA		
9.0	Type Testing Requirement	As per TE Specs.		
9.1	Whether Type Test certificates			
	RTUs	Required (As specified)		
	Modems	Required (As specified)		
	Weather Station	Required (As specified)		
	Weather Sensors	Required (As specified)		
	Cables of all types	Required (As specified)		
	Panels	Required (As specified)		
	OLTC Transducers with dual output & display	Required (As specified)		
	Multifunction Transducers	Required (As specified)		
	Contact Multiplying Relays	Required (As specified)		
10.0	Local GPS receiver at Substation for Clock synchronizing of RTU	Make, Model & Give details & whether meets the		
	Time stability of internal time base	minimum 2 ppm		
	Propagation Delay compensation	Yes		
	Include an offset to permit correction to local time	Yes		
	Reverting to internal time base upon loss of signal from UTC source	Yes		

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	Resynchronization Delay	Not more than 5 minutes		
	Accuracy of resynchronization	< 1.5 Micro Sec		
	Interfaces	Ethernet Ports: 2, IRIG-B: 2		
	Power Supply (in Watts)			

Note: The above Performa shall be submitted by the bidder along with the Technical Bid.

*Jb**Qw*

TECHNICAL EXPERIENCE**Annexure-
XIV(A)**

Name of Bidder/ Concern _____

PSTCL Tender Specification No. _____

Sr. No	Name of Project/ User	Description of works done including Nos. of RTUs.	P.O. No. & Date	Date of completion as per purchase	Date of actual Completion	Contract Price (In Indian Rs. Equivalent)	Performance Certificate from end user (to be attached)	Cross Ref.

Signature
Name & Designation
(Seal of the Company)

Annexure-XIV-(B)

Net Worth/Current Assets/Current liabilities details as per balance sheet

S.No	Description	Amount (Rs)
1	Paid up equity share Capital	
2	Add: Reserves (Not being the revaluation reserves)	
3	Subtract: Intangible Assets	
4	Subtract: Miscellaneous Expenditure to the extent not written off & carry forward losses	
5	Balance	

Note: The above information shall be as per latest audited balance sheets

Signature
Name & Designation
(Seal of the Company)

Annexure-XV

**CERTIFICATE REGARDING PAST DEALINGS WITH ERSTWHILE
PSEB/ PSTCL (On Official Letter Head)**

PSTCL Tender Specification No. _____

With reference to the above mentioned tender specification for SCADA/EMS System in PSTCL, we do here by the following undertaking pursuant to clause 3.3 of tender specification.

- a) ____ (Name of the bidder) ____ does not have any litigation with erstwhile PSEB/ PSTCL.
- b) ____ (Name of the bidder) ____ does not stands as debarred and/or blacklisted firm
- c) ____ (Name of the bidder) ____ is not a defaulter for 25% or more quantity for more than 9 months or any quantity for more than 15 months in making supplies against earlier purchase order placed on them at the time of issue of the documents.

Signatures
Name & Designation
(SEAL)

Annexure-
XVI(a)

General Capability Requirement

7) **CERTIFICATE REGARDING LITIGATION HISTORY (On Official letter head)**

Ref: PSTCL Tender Specification No.____

With reference to the above-mentioned tender specification for SCADA/EMS System in PSTCL, we do hereby give the following undertaking pursuant to clause of tender specification.

____(Name of the bidder) ____does not have any litigation or arbitration arising out of contacts completed or under execution by us over the last five years.

Or

____(Name of the bidder) ____ have following litigation or arbitration arising out of contacts awarded on the firm over the last five years.

Signatures
Name & Designation
(SEAL)

Id

or

Annexure-XVI(b)**General Capability Requirement (Contd.)**

Name of Bidder/ Concern _____

PSTCL Tender Specification No. _____

7) PROFIE OF THE KEY PERSONNEL HANDLING RTU JOB

Sr. No.	<u>Name of Engineer</u>	<u>Designation</u>	<u>Details of Experience</u>	<u>Remarks/ Cross Ref</u>

Signatures
Name & Designation
(SEAL)

Annexure-XVI(c)**General Capability Requirement (Contd.)**

Name of Bidder/ Concern _____

PSTCL Tender Specification No. _____

7) DETAILS OF ORDER IN HAND OF PIPE LINE

Sr. No	Description of Work	Name & address of the ordering authority	Value of the contrac	Remarks/ Cross Ref

Signatures
Name & Designation
(SEAL)



Annexure-XVII

(On Official letter head)

PSTCL Tender Specification No. _____

Date _____

To

Dy. CE/SLDC (Market Operation),
SLDC Building, 220 KV Grid Sub-Station,
PSTCL, Ablowal (Patiala)

Sub: Tender Enquiry No. _____

Dear Sir,

We are pleased to enclose herewith our proposal in line with your requirement. We have also enclosed a demand draft (No. _____) for Rs. _____/- against Earnest Money Deposit in favour of AO/SLDC, PSTCL, Ablowal, Patiala. The offer contains all the schedules and annexure as specified. The copy of the index of the bid proposal is enclosed.

Signatures
Name & Designation
(SEAL)

Annexure-XVIII

TENTATIVE LIST OF RTU SUBSTATIONS**New RTU Requirement:**

Sr. No.	Name of Sub Station	Voltage Level	Type (Critical/ Non Critical)
1	Ablowal (Patiala)	220	Critical
2	Jamsher (Jalandhar)	220	Critical
3	Lalton Kalan (Ludhiana)	220	Non Critical
4	Malerkotla	220	Non Critical
5	Rajpura	220	Critical
6	Ropar	132	Critical
7	RSDPH	220	Critical
8	Sarna	220	Critical
9	Shanan HEP Joginder Nagar	132	Critical
10	Rajla	220	Non Critical
11	Bhari	220	Critical
12	Firozpur Road, Ludhiana	220	Non Critical
13	Focal Point, Nabha	220	Non Critical
14	Humbran	220	Non Critical
15	Jhunir	220	Critical
16	Bahadurgarh	220	Non Critical
17	Bajakhana	220	Critical
18	Dhuri	220	Non Critical
19	GGSSTP, Ropar	220	Critical
20	GHTP, Lehra Mohabat.	220	Critical
21	Ghubaya	220	Non Critical
22	GNDTP, Bathinda	220	Non Critical
23	Himmatpura	220	Non Critical
24	Kapurthala (Kanji)	220	Non Critical
25	Kotli Surat Mali	220	Non Critical
26	Malout(Katorewala)	220	Critical
27	Moga	220	Non Critical
28	Muktsar	132	Non Critical
29	Muktsar	220	Non Critical
30	Patran	220	Non Critical
31	Sadiq	220	Non Critical
32	Algaon	220	Non Critical
33	ASPH- II	132	Critical
34	Badshahpur	220	Non Critical

Sr. No.	Name of Sub Station	Voltage Level	Type (Critical/ Non Critical)
35	Banga	132	Non Critical
36	Banur	220	Non Critical
37	Chohla Sahib	220	Non Critical
38	Dharamkot	220	Non Critical
39	Doraha	220	Non Critical
40	Gobindgarh-III (Amloh Road)	220	Non Critical
41	Kakrala	220	Non Critical
42	Khassa	220	Non Critical
43	MPH-I	132	Critical
44	MPH - II	132	Critical
45	MPH-III	132	Critical
46	MPH- IV	132	Critical
47	Pakhowal	220	Non Critical
48	Rehana Jattan	220	Non Critical
49	Tibber	220	Critical
50	UBDC-I	132	Critical
51	UBDC-II	132	Critical
52	UBDC III	132	Critical
53	Udhoke	220	Non Critical
54	Amloh	220	Non Critical
55	Botianwala	220	Non Critical

1. **Note:** The Name, Voltage Level & Type of sub-station defined i.e. Critical/ Non-Critical is tentative for evaluation purposes only. Purchaser shall specify the final requirement in this respect during tender award stage. Further, RTUs for Cannibalizing as well as Retrofitting is purely tentative and may or may not be required at all, at the option of PSTCL, during the pendency of the contract.
2. Purchaser receiver the right to purchase or cancel the quantity for Deferred RTUs as per PSTCL requirement deferred RTUs can be confirmed to the firms upto 2 years from date of contract.

Annexure-XIX (A)

Consolidated BOQ					
(To be submitted by the bidder alongwith the Technical Bid)					
Sr. No.	Description	Make/ Model	Total for all the RTU Stations	Spare Qtys. (10%)	Total Qty
A	B	C	D	E	F
1	MFTs (Nos.)		1421	142	1563
2	OLTC Transducer with Dual output & display (Nos.)		256	25	281
3	CMRs (Nos.)		4519	452	4971
4	HDR (DO Relays)		178	11	189
5	RTU Panel (Pre Wired) (Nos.)		55	0	55
6	RTU Rack with its accessories (Nos.)		55	0	55
7	CPU Card (Nos.)		110	11	121
8	PSU Card (Nos.)		110	11	121
9	Communication Port card for RTU to be used exclusively as Data Concentrator Unit as per PSTCL specification Requirement (optional)		55	0	55
10	Local GPS for clock synchronizing of RTU & LDMS (Optional) (Nos.)		55	0	55
11	Analog Input Card (Lots)		55 Lot (Nos to be filled by bidder)	5	(Nos. to be filled by bidder)
12	Digital Input Card (Lots)			16	
13	Digital Output Card (for CB/Tap changing) (Lots)			5	
14	LDMS with accessories as specified (Optional) (Nos.)		55	0	55
15	PLCC Modems (Nos.)		154	11	165
16	GPRS (5G/4G with fallback to 2G) Modems (Nos.)		0	0	0

17	Bi-Directional Serial Data Splitters/Duplicators		33	0	33
18	2 core 2.5 mm ² Cu Cable		19250	1950	21200
19	3 core 2.5 mm ² Cu Cable		9900	990	10890
20	4 core 1.5 mm ² Cu Cable		10240	1050	11290
21	4 core 2.5 mm ² Cu Cable		21165	2120	23285
22	4 core 4 mm ² Cu Cable		150	100	250
23	6 core 1.5 mm ² Cu Cable		37680	3770	41450
24	Weather Station Complete with accessory for interfacing with RTU as specified (Optional) (Nos.):-		2		2
(a)	Air Temperature Sensor				
(b)	Relative Humidity Sensor				
(c)	Rainfall Sensor				
(d)	Wind Direction Sensor				
(e)	Wind Speed Sensor				
(f)	Pressure Sensor				
25	Portable Configuration and Maintenance Terminal (Optional) (Nos.)		5	0	5
26	Maintenance RTU (Optional) (Nos.)		1	0	1
27	Field Simulator Device (Optional) (Nos.)		1	0	1

Schedule of Detailed Bill of Quantities/ Material (BOQ)

Annexure-XIX(B)

(THIS MUST ACCOMPANY THE TECHNICAL OFFER) (Tentative subject to field survey)

BOQ (Bill of Quantities) for 55 nos. substations

Sr. No.	Name of the substations	OLTC Transducer with Dual output and display	MFTs	CMRs/DI Relays	HDRs/DO relays	RTU Rack with its accessories (Nos.)	CPU Card (Nos.)	PSU Card (Nos.)	Communication Port card for RTU to be used exclusively as Data Concentrator Unit as per PSTCL specification Requirement (optional)	Local GPS for clock synchronizing of RTU	Digital input Module	Digital output Module	Analog input Module	RTU panel (pre- wired)	LDMS with Accessories	GPRS Modems	PLCC Modems	Bi-Directional Serial Data Splitters	2 core 2.5 mm2 Cu Cable for DC supply	3 core 2.5 mm2 Cu Cable for AC Supply	4 core 1.5 mm2 Cu Cable OLTC	4 core 2.5 mm2 Cu Cable for CT & PT	4 core 4 mm2 Cu Cable for 5A (CT)	6 core 1.5 mm2 Cu Cable (CB and Isolator status)	Weather station with accessory	Extended warranty cum maintenance support (10yrs.)	E.T.C. of new RTUs	Dismantling Handling over/ Transportation of RTUs replaced & E.T.C.as specified
RTUs to be replaced																												
	Units	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Mtr.	Mtr.	Mtr.	Mtr.	Mtr.	Mtr.	No.	No.	No.	No.
1	220 KV Ablowal (Patiala)	6	37	132	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	240	555	-	1020	-	Y	Y	Y
2	220 KV Jamsher (Jalandhar)	5	35	124	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	200	525	-	960	-	Y	Y	Y
3	220 KV Lalton Kalan (Ludhiana)	6	30	104	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	450	-	810	-	Y	Y	Y
4	220 KV Malerkotla	6	42	152	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	630	-	1170	-	Y	Y	Y
5	220 KV Rajpura	6	36	128	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	240	540	-	990	-	Y	Y	Y
6	132 KV Ropar	6	31	106	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	240	465	-	840	-	Y	Y	Y
7	220 KV RSDPH	1	18	64	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	40	270	-	450	-	Y	Y	Y
8	220 KV Sarna	5	33	110	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	200	495	-	900	-	Y	Y	Y
9	132 KV Shanan HEP Joginder Nagar	6	28	90	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	240	270	150	750	-	Y	Y	Y
10	220 KV Rajla	5	26	72	6	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	390	-	690	-	Y	Y	Y
11	220 KV Bhari	2	23	76	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	80	345	-	600	-	Y	Y	Y
12	220 KV Firozpur Road, Ludhiana	6	26	88	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	390	-	690	-	Y	Y	Y
13	220 KV Focal Point, Nabha	5	26	81	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	390	-	690	-	Y	Y	Y
14	220 KV Humbran	6	26	72	5	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	390	-	690	-	Y	Y	Y
15	220 KV Jhunir	5	22	72	3	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	200	330	-	570	-	Y	Y	Y
16	220 KV Bahadurgarh	5	26	72	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	390	-	690	-	Y	Y	Y
17	220 KV Bajakhana	5	28	78	6	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	200	420	-	750	-	Y	Y	Y
18	220 KV Dhuri	6	31	108	5	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	465	-	840	-	Y	Y	Y
19	220 KV GGSSTP, Ropar	3	38	136	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	120	570	-	1050	-	Y	Y	Y

Sr. No.	Name of the substations	OLTC Transducer with Dual output and display	MFTs	CMRs/DI Relays	HDRs/DO relays	RTU Rack with its accessories (Nos.)	CPU Card (Nos.)	PSU Card (Nos.)	Communication Port card for RTU to be used exclusively as Data Concentrator Unit as per PSTCL specification Requirement (optional)	Local GPS for clock synchronizing of RTU	Digital input Module	Digital output Module	Analog input Module	RTU panel (pre-wired)	LDMS with Accessories	GPRS Modems	PLCC Modems	Bi-Directional Serial Data Splitters	2 core 2.5 mm2 Cu Cable for DC supply	3 core 2.5 mm2 Cu Cable for AC Supply	4 core 1.5 mm2 Cu Cable OLTC	4 core 2.5 mm2 Cu Cable for CT & PT	4 core 4 mm2 Cu Cable for 5A (CT)	6 core 1.5 mm2 Cu Cable (CB and Isolator status)	Weather station with accessory	Extended warranty cum maintenance support (10yrs.)	E.T.C. of new RTUs	Dismantling Handling over/ Transportation of RTUs replaced & E.T.C. as specified
20	220 KV GHTP, Lehra Mohabat.	3	44	160	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	120	660	-	1230	-	Y	Y	Y
21	220 KV Ghubaya	6	24	66	5	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	360	-	630	-	Y	Y	Y
22	220 KV GNDTP, Bathinda	8	43	148	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	320	645	-	1200	-	Y	Y	Y
23	220 KV Himmatpura	5	25	84	7	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	375	-	660	-	Y	Y	Y
24	220 KV Kapurthala (Kanji)	5	23	66	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	345	-	600	-	Y	Y	Y
25	220 KV Kotli Surat Mali	5	23	63	6	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	345	-	600	-	Y	Y	Y
26	220 KV Malout(Katorewala)	5	26	88	3	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	200	390	-	690	-	Y	Y	Y
27	220 KV Moga	6	40	126	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	600	-	1110	-	Y	Y	Y
28	132 KV Muktsar	6	24	60	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	360	-	630	-	Y	Y	Y
29	220 KV Muktsar	5	28	91	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	420	-	750	-	Y	Y	Y
30	220 KV Patran	7	29	81	7	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	280	435	-	780	-	Y	Y	Y
31	220 KV Sadiq	5	23	63	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	345	-	600	-	Y	Y	Y
32	220 KV Algaon	5	25	84	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	375	-	660	-	Y	Y	Y
33	132 KV ASPH- II		11	40	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	165	-	240	-	Y	Y	Y
34	220 KV Badshahpur	6	25	84	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	375	-	660	-	Y	Y	Y
35	132 KV Banga	8	30	87	3	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	320	450	-	810	-	Y	Y	Y
36	220 KV Banur	5	28	84	6	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	420	-	750	-	Y	Y	Y
37	220 KV Chohla Sahib	5	22	67	5	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	330	-	570	-	Y	Y	Y
38	220 KV Dharamkot	5	26	88	6	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	390	-	690	-	Y	Y	Y
39	220 KV Doraha	7	23	70	3	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	280	345	-	600	-	Y	Y	Y
40	220 KV Gobindgarh-III (Amloh Road)	8	23	63	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	320	345	-	600	-	Y	Y	Y
41	220 KV Kakrala	5	22	60	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	330	-	570	-	Y	Y	Y
42	220 KV Khassa	5	22	60	5	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	330	-	570	-	Y	Y	Y
43	132 KV MPH-I		8	24	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	120	-	150	-	Y	Y	Y
44	132 KV MPH - II		11	36	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	165	-	240	-	Y	Y	Y
45	132 KV MPH-III		9	28	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	135	-	180	-	Y	Y	Y
46	132 KV MPH- IV		27	83	3	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	405	-	720	-	Y	Y	Y

Sr. No.	Name of the substations	OLTC Transducer with Dual output and display	MFTs	CMRs/DI Relays	HDRs/DO relays	RTU Rack with its accessories (Nos.)	CPU Card (Nos.)	PSU Card (Nos.)	Communication Port card for RTU to be used exclusively as Data Concentrator Unit as per PSTCL specification Requirement (optional)	Local GPS for clock synchronizing of RTU	Digital input Module	Digital output Module	Analog input Module	RTU panel (pre-wired)	LDMS with Accessories	GPRS Modems	PLCC Modems	Bi-Directional Serial Data Splitters	2 core 2.5 mm2 Cu Cable for DC supply	3 core 2.5 mm2 Cu Cable for AC Supply	4 core 1.5 mm2 Cu Cable OLTC	4 core 2.5 mm2 Cu Cable for CT & PT	4 core 4 mm2 Cu Cable for 5A (CT)	6 core 1.5 mm2 Cu Cable (CB and Isolator status)	Weather station with accessory	Extended warranty cum maintenance support (10yrs.)	E.T.C. of new RTUs	Dismantling Handling over/ Transportation of RTUs replaced & E.T.C. as specified
47	220 KV Pakhowal	6	25	69	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	375	-	660	-	Y	Y	Y
48	220 KV Rehana Jattan	6	29	100	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	435	-	780	-	Y	Y	Y
49	220 KV Tibber	3	19	51	3	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	120	285	-	480	-	Y	Y	Y
50	132 KV UBDC-I		9	24	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	135	-	180	-	Y	Y	Y
51	132 KV UBDC-II		11	30	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	0	165	-	240	-	Y	Y	Y
52	132 KV UBDC III	4	29	94	2	1	2	2	1	1	-	-	-	1	1	0	4	0	350	180	160	435	-	780	-	Y	Y	Y
53	220 KV Udhoke	5	22	72	4	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	200	330	-	570	-	Y	Y	Y
54	220 KV Amlah	6	22	60	3	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	330	-	570	-	Y	Y	Y
55	220 KV Botianwala	6	29	100	2	1	2	2	1	1	-	-	-	1	1	0	2	1	350	180	240	435	-	780	-	Y	Y	Y
TOTAL		256	1421	4519	178	55	110	110	55	55	0	0	0	55	55	0	154	33	19250	9900	10240	21165	150	37680	2			
Spares (10%)		25	142	452	11	0	11	11	0	0	16	5	5	0	0	0	11	0	1950	990	1050	2120	100	3770	0			
Total Qty. including Spares		281	1563	4971	189	55	121	121	55	55	-	-	-	55	55	0	165	33	21200	10890	11290	23285	250	41450	2			

Note:

- The bidder shall have to assess the requirements of I/O cards and associated hardware in the RTU panel based on the above Input/ Output Counts and expandability requirements given in the TE Specifications.
- Any other associated items not included in BOQ but required as per the scope of work / specification shall be deemed to be included in contract price and no extra payment shall be claimed by bidder/contractor in this regard.
- The Name, Voltage Level & Type of substation defined i.e. Critical/ Non Critical is tentative for evaluation purposes only. Purchaser shall specify the final requirement in this respect during tender award stage and/ or during survey, Design & Engineering phase.
Further requirement of Confirmed RTUs, Future RTUs, RTUs for Cannibalizing as well as Retrofitting is purely tentative and may or may not be required at all, at the option of PSTCL, during the pendency of the contract, without liability to PSTCL.
- Requirement and quantity of additional DCU cards, Weather Station, or which all weather sensors shall be required, optional items etc. is purely tentative and shall be ordered only if required finally by SLDC at Purchaser's option.
- In Price bid Schedule 1 (Supply Schedule), Schedule 2 (Supply of mandatory spares) & Schedule 4 (Installation & Commissioning Schedule of RTU), the quantity of DI, DO & AI cards has been mentioned in LOTS.
- The bidder shall submit the station wise quantity of DI, DO & AI cards considered by him in the above BOQ with its technical bid.
- The above BOQ has been calculated including provision for additional 2 No. feeders as well as one additional transformer as per the PSTCL requirement.

ANNEXURE-XX

PERFORMA FOR MSME FIRMS

1. Name of the firm:
2. PAN No.:
3. UAN (UdyogAdhar No.) :
4. Type of Enterprises/Firm:
As per MSMED (Micro/Small/Medium):
5. Social Category:
6. Major Activity: Manufacturing/Services
7. Copy of registration Certificate (Attached): Yes/No
8. Validity of certificate: From _____ to _____
9. (A) Investment in plant machinery or equipment (Rs. In Crores)
 - (a) Manufacturing
 - (b) Services

ANNEXURE-XXI

Model Certificate for Tenders

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Model Certificate for Tenders for Works involving possibility of sub-contracting

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Q

12