



ODISHA POWER TRANSMISSION CORPORATION LTD

OFFICE OF THE SENIOR GENERAL MANAGER,

CENTRAL PROCUREMENT CELL,

JANPATH, BHUBANESWAR - 751022

TENDER SPECIFICATION

**SUB-STATION AUTOMATION FOR 132/33kV GRID SUBSTATION ANANDPUR,
ARGUL,BASTA,BHAWANIPATNA, KARANJIA,KESURA,KONARK,KUCHINDA &
SHAMUKA**

e-Tender Notice No.CPC 28/2016-17

(E tendering mode only)

BID SPECIFICATION NO

Sr.G.M-CPC-TENDER-SAS-28/2016-17

PART – I

SECTION – I : INSTRUCTION TO TENDERERS

SECTION – II : GENERAL TERMS AND CONDITIONS OF CONTRACT

(G.T.C.C.)

SECTION – III : SCHEDULE OF FORMATS (COMMERCIAL)

SECTION –IV : TECHNICAL SPECIFICATION

PART – II : PRICE BID.

**Request for online tender documents – From dt-27.07.2016 (10.00 Hrs) to dt-
23.08.2016(12.30 Hrs)**

Last date of submission of online tender - dt-23.08.2016(13.00Hrs)

Date of opening of Tender - 23.08.2016(15.00 Hrs)

Pre bid meeting- 08/08/2016 (11-00 Hrs)

ODISHA POWER TRANSMISSION CORPORATION LTD.

REGD. OFFICE: JANPATH, BHUBANESWAR – 751 022,

ODISHA

e-Tender No.CPC 28/2016-17

For and on behalf of ODISHA POWER TRANSMISSION CORPORATION LTD, Sr.G.M. [C.P.C.] invites Tenders from reputed Original Equipment Manufacturer (OEM) having installed/retrofitted & commissioned the automation system with trouble free operation for minimum three years in any of the power system utilities in India for automation in India in two part bidding system towards **SUB-STATION AUTOMATION FOR 132/33kV GRID SUB-STATION ANANDPUR, ARGUL,BASTA,BHAWANIPATNA, KARANJIA,KESURA,KONARK,KUCHINDA & SHAMUKA.**

The interested bidders would be required to enroll themselves on the tender portal www.tenderwizard.com/OPTCL. Complete set of bidding documents are available at www.tenderwizard.com/OPTCL from 27.07.2016 (10.00 Hrs) to dt-23.08.2016(12.30 Hrs) Interested manufacturers may visit OPTCL's official web site <http://www.optcl.co.in> and www.tenderwizard.com/OPTCL for detail specification.

Package.	Tender Specification No.	Description of work	Qty.	Earnest Money Deposit (In Rs.)	Cost of Tender document	Tender processing fees.	Last date of receipt & opening of tender	Schedule period of completion
I	Sr.G. M-CPC-TENDER-SAS-28/2016-17	SUB-STATION AUTOMATION FOR 132/33k V GRID SUB STATION	ARGUL	2,98,860/-	Rs10000/- + VAT 5% = Rs10500/-	Rs5750/-	23.08.2016(13.00Hrs) & opening on dt 23.08.2016(15.00 Hrs)	Four months from the date of issue of purchase / work order for supply of materials and two months thereafter for erection and commissioning
I			SHAMUKA					
I			KESURA					
I			KONARK					
II			ANANDPUR	2,42,212/-	Rs10000/- + VAT 5% = Rs10500/-	Rs5750/-		
II			KARANJIA					
II			BASTA					
III			KUCHINDA	1,48,198/-	Rs10000/- + VAT 5% = Rs10500/-	Rs5750/-		
III	BHAWANIPATNA							

N.B. All subsequent corrigendum / addendums to the tender notice shall be floated in the OPTCL's official web site <http://www.optcl.co.in> and www.tenderwizard.com/OPTCL only.

The bidders can view the tender documents from website free of cost.

SENIOR GENERAL MANAGER
CENTRAL PROCUREMENT CELL

The bidders who want to submit bid shall have to pay **Rs. 10,500/- (Rupees Ten thousand five hundred only)**- non refundable including VAT @ 5%) towards the tender cost, in the form of Demand draft/Cash only, drawn in favour of the D.D.O Head qrs, OPTCL, Bhubaneswar.

The bidders shall have to pay nonrefundable amount of **Rs. 5750/- (Rupees Five thousand seven hundred & Fifty only)** towards the tender processing fee to K.S.E.D.C.Ltd, in e-payment mode. The e-payment of above amount is to be made to enable the bidder to download the bid proposal sheets and bid document in electronic mode.

The bidders shall scan the Demand Draft/Pay order/ Bank guarantee, towards tender cost, EMD/ notarised hard copy of valid registration as Odisha based local MSE(if any) and upload the same in the prescribed form in .gif or .jpg format in addition to sending the original as stated above on or before the date time of submission of tender.

The prospective bidders are advised to register their user ID, Password, company ID from website www.tenderwizard.com/OPTCL by clicking on hyper link “Register Me”.

Any clarifications regarding the scope of work and technical features of the project can be had from the undersigned during office hours.

Minimum qualification criteria of bidders: AS STIPULATED IN SECTION-II, PART-I (G.T.C.C) OF THE TENDER SPECIFICATION.

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CENTRAL PROCUREMENT CELL

PART – I.

SECTION – I.

INSTRUCTIONS TO TENDERERS

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COMMERCIAL SPECIFICATION.

PART-I

SECTION-I

INSTRUCTIONS TO TENDERER

1. Submission of Bids: -

The bidder shall submit the bid in Electronic Mode only i.e. www.tenderwizard.com/OPTCL. The bidder must ensure that the bids are received in the specified website of the OPTCL by the date and time indicated in the Tender notice. Bids submitted by telex/telegram will not be accepted. No request from any bidder to the OPTCL to collect the Bids in physical form will be entertained by the OPTCL.

The OPTCL reserves the right to reject any bid, which is not deposited according to the instruction, stipulated above. The participants to the tender should be registered under ODISHA Sales Tax, Act, VAT Act / Central sales Tax Act.

1. For all the users it is mandatory to procure the Digital Signatures.
2. Contractors / Vendors / Bidders / Suppliers are requested to follow the below steps for **Registration**:
 - a. Click “Register”, fill the online registration form.
 - b. Pay the amount of Rs. 2300/- through DD in Favour of KSEDCL Payable at Bangalore.
 - c. Send the acknowledgment copy for verification.
 - d. As soon as the verification is being done the e-tender user id will be enabled.
3. After viewing Tender Notification, if bidder intends to participate in tender, he has to use his e-tendering User Id and Password which has been received after registration and acquisition of DSCs.
4. If any Bidder wants to participate in the tender he will have to follow the instructions given below:

a. Insert the PKI (which consist of your Digital Signature Certificate) in your System.

(Note: Make sure that necessary software of PKI be installed in your system).

b. Click / Double Click to open the Microsoft Internet Explorer (This icon will be located on the Desktop of the computer).

c. Go to Start > Programs > Internet Explorer.

d. Type **www.tenderwizard.com/OPTCL** in the address bar, to access the Login Screen.

e. Enter e-tender User Id and Password, click on “Go”.

f. Click on “Click here to login” for selecting the Digital Signature Certificate.

g. Select the Certificate and enter DSC Password.

h. Re-enter the e-Procurement User Id Password

5. To make an request for Tender Document Bidders will have to follow below mentioned steps.

- Click “Un Applied” to view / apply for new tenders.
- Click on Request icon for online request.

6. After making the request Bidders will receive the Tender Documents which can be checked and downloaded by following the below steps:

- Click to view the tender documents which are received by the user.
- Tender document screen appears.
- Click “Click here to download” to download the documents.

7. After completing all the formalities Bidders will have to submit the tender and they must take care of following instructions.

- Prior to submission, verify whether all the required documents have been attached and uploaded to the particular tender or not.
 - Note down / take a print of bid control number once it displayed on the screen
8. Tender Opening event can be viewed online.
 9. Competitors bid sheets are available in the website for all.
 10. **For any e-tendering assistant contact help desk number mentioned below.**
 - Bangalore – 080- 40482000.

The participants to the tender should be registered under ODISHA Sales Tax Act, VAT Act/Central sales Tax Act.

2. Division of Specification.

The specification is mainly divided into two parts viz. Part-I & Part-II.

Part-I Consists of

- | | |
|-------------------|---|
| [i] Section-I | Instruction to Tenderers. |
| [ii] Section-II | General Terms & conditions of contract. |
| [iii] Section-III | Schedules and forms etc. |
| [iv] Section-IV | Technical Specification. |

Part-II Consists of

- [i] Schedule of prices as per Annexure-V

3. Tenders shall be in Two Parts.

The Tenderers are required to submit the tenders in two parts viz. Part-I (Techno commercial) & Part-II (Price bid).

The Tenderers are required to submit the tenders in two parts Part-I, technical and commercial and Part-II “Price Bid”.

4. Opening of Bids.

- [a] The part-I shall be opened on the date and time fixed by the OPTCL for opening of bids in Electronic mode in presence of such of the Tenderers or their authorized representatives [limited to one person only] on the due date of opening of tender who opt remain present. After scrutiny of the technical particulars and other commercial terms, clarifications, if required, shall be sought for from the bidders. The Tenderers shall be allowed 15 days' time for such activity.
- [b] On receipt of technical clarification, the bids shall be reviewed, evaluated and those not in conformity with the technical Specification / qualifying experience, shall be rejected. If any of the technical proposal requires modification to make them comparable, discussion will be held with the participating bidders.

All the responsive bidders shall be given opportunity to submit the revised technical and revised price proposals as a follow up to the clarification (modification if any) on the technical proposals. The qualified bidders shall be given opportunity to submit revised price proposals within 15 days from the date of such discussion or within time frame mutually agreed, whichever is earlier.

- [c] When the revised price proposals are received, the original price proposals will be returned to the bidders unopened along with their original technical proposals. Only the revised technical and price proposals will be considered for bid evaluation. The price bids [Part-II] of such of the Tenderers, whose tenders have been found to be technically and commercially acceptable, including those supplementary revised price bids, submitted subsequently, shall be opened in the presence of the bidder's representative on a date and time which will be intimated to all technically and commercially acceptable Tenderers.
- [d] The bidders are required to furnish sufficient information to the Purchaser to establish their qualification, capacity to manufacture and/or supply the materials/perform the work. Such information shall include details of bidder's experience, its financial, managerial and technical capabilities.
- [e] The bidders are also required to furnish details of availability of appropriate technical staff and capability to perform after sales services. The above

information shall be considered during scrutiny and evaluation of bids and any bid which does not satisfactorily meet these requirements, shall not be considered for price bid evaluation.

- [f] The price bids of the technically and otherwise acceptable bids shall only be evaluated as per the norms applicable in terms of this Specification.

5. Purchaser's Right Regarding Alteration of Quantities Tendered.

The Purchaser may alter the quantities of materials/equipment at the time of placing orders. Initially the purchaser may place orders for lesser quantity with full freedom to place extension orders for further quantity under similar terms and conditions of the original orders. Orders may also be split among more than one tenderer for any particular item, if considered necessary in the interest of the Purchaser to get the goods/equipment earlier.

6. Procedure and opening time of tenders.

Tenders will be opened in the office of the Senior General Manager [C.P.C.] on the specified date and time in presence of the Tenderers or their authorized representatives [limited to one person only] in case of each bidder who may desire to be present, at the time of opening the bids.

7. Bidder's Liberty to deviate from Specification.

The Tenderer may deviate from the specification while quoting, if in his opinion, such deviation is in line with the manufacturer's standard practice and conducive to a better and more economical offer. All such deviations should however be clearly indicated giving full justifications for such deviation. [Read with Clause-9, Section-II of the Specification].

8. Eligibility for submission of bids.

Only those manufacturers who have deposited the cost of tender specification are eligible to participate in the tender. They should submit the money receipt as a proof of such payment. The local Micro and small Enterprises(MSEs) based in Odisha and registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC can participate without payment of the cost of tender specification

9. Purchaser's right to accept/reject bids:

The purchaser reserves the right to reject any or all the tenders without assigning any reasons what so ever if it is in the interest of OPTCL, under the existing circumstances. [Read with clause-10, Section-II of the specification].

10. Mode of submission of Tenders.

[A] Tenders shall be submitted in electronic mode only.
(www.tenderwizard.com/OPTCL)

[B] **Telegraphic or FAX tenders** shall not be accepted under any circumstances.

11. Earnest money deposit:

The tender shall be accompanied by Earnest Money deposit of value specified in the notice inviting tenders against each lot / bid. Tenders without the required EMD as indicated at **Annexure-VIII** will be rejected outrightly

The local Micro and small Enterprises(MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC can participate by submitting Earnest Money Deposit @ fifty percent of the amount indicated in the Notice Inviting Tender.

The earnest money deposit shall be furnished in one of the following forms subject to the conditions mentioned below:

- (a) **Cash:-** Payable to drawing & disbursing Officer, OPTCL (Hd.qrs. Office), Bhubaneswar - 751022
- (b) **Bank Draft:** -To be drawn in favour of Drawing & Disbursing Officer, OPTCL [H.Qrs.Office], Bhubaneswar-751 022.
- (c) Bank Guarantee from any Nationalized/Scheduled Bank strictly as per enclosed proforma vide **Annexure-VI** to be executed on non-judicial stamp paper worth Rs.29.00 or as applicable, as per prevailing laws in force and also to be accompanied by the confirmation letter of the issuing Bank Branch.

NOTE:

- (i). The validity of the EMD in the form of Bank Guarantee shall be at least for 240 days from the date of opening of tender failing which the tender will be liable for rejection.
- (ii) No interest shall be paid on the Earnest Money Deposit.

- (iii) E.M.D. in shape of cash may be submitted up to Rs. 25,000/- (Rupees Twenty-five Thousand) only. Above Rs. 25,000/- (Rupees Twenty-five thousand) the Earnest Money Deposit shall be furnished in any one of the forms indicated above (i.e. Through Bank Draft, Bank Guarantee/ National Savings Certificate).
- (iv) No adjustment towards EMD shall be permitted against any outstanding amount with the **ODISHA POWER TRANSMISSION CORPORATION LTD.**
- (v) The chart showing particulars of EMD to be furnished by Tenderers of different categories is placed at **Annexure-VIII.**
- (vi) In the case of un- successful tenderer, the EMD will be refunded after the tender is decided. In the case of successful Tenderer, this will be refunded only after furnishing of security money referred to at clause-19of Section-II.
- (vii) Suits, if any, arising out of this clause shall be filed in a Court of law to which the jurisdiction of High Court of ODISHA extends.
- (vii) EMD will be forfeited if the tenderer fails to accept the letter of intent and/or purchase order issued in his favour or to execute the order, placed on them.
- (viii) Tenders not accompanied by Earnest Money shall be disqualified.

12. Validity of the Bids: -

The tenders should be kept valid for a period of **180** days from the date of opening of the tender, failing which the tenders will be rejected.

13. PRICE: -

Tenderers are requested to quote-'FIRM' Price. No deviation from **FIRM PRICE** will be entertained irrespective of deviation clause No.7 of this part of the specification.

14. Revision of tender price by Bidders: -

[a] After opening of tenders and within the validity of period, no reduction or enhancement in price will be entertained. If there is any change in price, the tender shall stand rejected and the EMD deposited shall be forfeited.

[b] After opening of price bid if the validity period is not sufficient to place purchase order, the tenderer may be asked by the purchaser to extend the

validity period of the bid under the same terms and condition as per the original tender.

However, the tender are free to change any or all conditions including price except delivery period of their bids at their own risk, if they are asked by the purchaser to extend the validity period of the bid prior to opening of price bid.

15. Tenderers to be fully conversant with the clauses of the Specification: -

Tenderers are expected to be fully conversant with the meaning of all the clauses of the specification before submitting their tenders. In case of doubt regarding the meaning of any clause, the tenderer may seek clarification in writing from the Senior General Manager (Central Procurement Cell) OPTCL. This, however, does not entitle the Tenderer to ask for time beyond due date, fixed for receipt of tender.

16. Documents to Accompany Bids.

Tenderers are required to submit tenders in the following manner:

Part-I of the Tender shall Contain the following documents.

- [i] Declaration Form. [As per Annexure-I]
- [ii] Earnest Money. [As per **Annexure-VIII**]
- [iii] Technical specification and Guaranteed Technical Particulars conforming to the Purchaser's Specification along with drawings, literatures and all other required Annexures, duly filled in.
- [iv] Photostat copies of type test certificates of materials/equipments offered as stipulated in the Technical Specification.
- [v] Abstract of Terms & conditions in prescribed proforma as per **Annexure-II**.
- [vi] General Terms & Conditions of supply offer as per Section-II of the Specification.
- [vii] List of orders executed for similar materials/equipments during preceding 2 (two) years indicating the customer's name, Purchase Order No. & Date, date of supply and date of commissioning etc.
- [viii] Data on past experience **as per Clause-7 of Section-II** of the Specification.

- [ix] Sales tax clearance certificate for the previous year. The permanent account number [PAN] of the firm is required under Income tax Act.
- [x] Audited Balance sheet & profit loss accounts of the bidder, for past (3) three years.
- [xi] Schedule of quantity and delivery in the prescribed Proforma vide Annexure, as appended.
- [xii] List of Orders in hand to be executed.
- [xiii] Deviation schedule.
- [xiv] Notarized hard copy and soft copy of valid registration as local MSE(if any).

17. Documents/Papers to accompany Part-II Bid.

- (a) Part – II of the tender shall consist of the following
 - (i) Abstract of Price Component, as per Annexure-IV
 - (ii) Schedule of prices in the prescribed proforma as per Annexure-V

18. Conditional Offer:

Conditional offer shall not be accepted.

19. General: -

- (i) In the event of discrepancy or arithmetical error in the schedule of price, the decision of the purchaser shall be final and binding on the Tenderer.
- (ii) For evaluation, the price mentioned in words shall be taken if there is any difference in figures and words in the price bid.
- (iii) Notice inviting tender shall form part of this specification.
- (iv) The price bids of the technically and otherwise acceptable bids shall only be evaluated. The EMD of others, if any, shall be returned to the bidders.
- (v) Tenderer can offer any lot or all the lots of the tender, if there are more than one lots. But the tender (bid) must be furnished separately for each lot. For each lot, the tenderer has to submit PART-I & PART-II of the bids separately.

- (vi) It should be distinctly understood that the part-II of the bid shall contain only details/documents relating to price, as outlined in clause-17 mentioned herein above. Inclusion of any of the documents/information etc. shall render the bid liable for rejection.

20.0 Expenses in respect of OPTCL's representative for witnessing the inspection & testing of the offered equipment/materials at the inspection and testing site.

The testing and inspection of the equipment/ materials at manufacturer works are in the scope of work of the Contractor/Supplier.

OPTCL inspecting officer, on receipt of offer for inspection from the contractor/supplier, proceeds to the manufacturer works to witness the Type/Acceptance/Routine test.

Important:

It is hereby informed to all the bidders that the relevant clauses of the contract specification, pertaining to inspection and testing of equipment/materials, are hereby supplemented with following additional terms and conditions.

The expenses under the following heads, in respect of OPTCL's representative for witnessing the inspection & testing of the offered equipment/materials at the inspection and testing site, shall be borne by the contractor / supplier.

a) Hotel Accommodation:

I. Single room accommodation in 4 star hotel for the OPTCL inspecting officer of the rank of Assistant General Manager (Grade E-6) and above.

II. Single room accommodation in 3 star hotel for the OPTCL inspecting officer of the rank below Assistant General Manager (Grade E-6).

N.B.: *It is the responsibility of the contractor to arrange the hotel accommodation matching with their inspection and testing schedule, so that the inspecting officer can check-in the hotel one day prior to the date of inspection and check out after the completion of the inspection, subject to availability of the return travel ticket. In case of extended duration of inspection or non-availability of the return travel ticket, Contractor/supplier/manufacturer shall arrange for the extended stay of the inspecting officer in the Hotel accordingly. In case there is no hotel with prescribed standard in*

and around the place of inspection, the contractor/supplier/manufacturer shall suggest alternative suitable arrangement at the time of offer for inspection, which is subjected to acceptability of OPTCL inspecting officer.

b) Journey of the inspecting officer:

(i) To and fro travel expenditure from the Head Quarters of the inspecting officer to the place of inspection/testing shall be borne by the contractor/supplier/manufacturer. Journey from the Head Quarters of the inspecting officer to the nearest Air Port by train (Ist/Ind A.C) & A/C Taxi then by Air to the place of inspection/ testing or to the nearest place of inspection/testing and then by train (Ist/Ind A.C) & A/C taxi to the place of inspection/ testing shall be arranged by the contractor/supplier/manufacturer.

(ii) For train journey, inspecting officer of the rank Assistant General Manager and above shall be provided with 1st class AC ticket and inspecting officer below the rank of Assistant General Manager shall be provided with 2nd class AC ticket.

(iii) The Air-ticket / train-ticket booking/cancellation is the responsibility of the contractor / supplier.

(iv) Moreover, if during the journey there is an unavoidable necessity for intermediate travel by road/ waterway/sea-route, the contractor/supplier shall provide suitable conveyance to the inspecting officer for travel this stretch of journey or bear the cost towards this. Any such possibilities shall be duly intimated to OPTCL at the time of their offer for inspection.

c) Local Conveyance:

At the place of the inspection/ testing, for local journey of the inspecting officer between Hotel and inspection/ testing site and or any other places, Air-conditioned four wheeler vehicle in good condition shall be provided by the contractor/supplier/manufacturer.

d) Following points are also to be considered:

(i) All the above expenses shall be deemed to be included in the bidder's quoted price for that supply item. Bidder shall not be eligible to raise any extra claim in this regard.

(ii) Contractor/supplier/manufacturer may assume that only in 40% of the inspection and testing offer cases, OPTCL inspecting officer, not below the rank of Assistant General Manager will witness the inspection and testing.

(iii) In case of inspection and testing of some critical equipment/materials like Power transformers, OPTCL may depute more than one inspecting officer.
(iv) Contractor/supplier/manufacturer shall judiciously plan the inspection/testing schedule and place of inspection/testing, so that optimum number of inspection/testing and minimum time shall be required to cover all the equipment/materials of the relevant contract package.

(v) It shall be the responsibility of the Contractor/Supplier to organize the above tour related matters of OPTCL inspecting officer including the matters related to overseas inspection/testing, if any.

21. Litigation/Arbitration

(i)- Bidder has to furnish detailed information on any litigation or arbitration arising out of contracts completed or under execution by it over the last five years. A consistent history of litigation by or against the bidder may result in rejection of bid.

(ii) The bidder should not have any pending litigation or arbitration with OPTCL with regard to any project or related activity. The bidder should certify/declare the same in unequivocal terms by way of an affidavit duly sworn before a magistrate. Bid furnished by the bidder shall not be eligible for consideration if it is not accompanied by the affidavit. Further, the bid/LOA/LOI shall be liable for outright rejection/cancellation at any stage if any information contrary to the affidavit/declaration is detected.

SECTION – II.

GENERAL TERMS AND CONDITIONS OF CONTRACT [G.T.C.C.]

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PART-I

SECTION-II

GENERAL TERMS AND CONDITIONS OF CONTRACT [G.T.C.C.]

1. **Scope of the contract:**

The scope of the contract shall be to design, manufacture, supply of equipments as per the specification at the consignee's site, and rendering services in accordance with the enclosed technical specification and bill of quantity.

2.0 **Definition of terms:**

For the purpose of this specification and General Terms and Conditions of contract [GTCC], the following words shall have the meanings hereby indicated, except where otherwise described or defined.

2.1 "The Purchaser" shall mean the Senior General Manager[Central Procurement Cell] for and on behalf of ORISSA POWER TRANSMISSION CORPORATION LTD., Bhubaneswar.

2.2 "The Engineer" shall mean the Engineer appointed by the Purchaser for the Purpose of this contract.

2.3 "Purchaser's Representative" shall mean any person or persons or consulting firm appointed and remunerated by the Purchaser to supervise, inspect, test and examine workmanship and materials of the equipment to be supplied.

2.4 "The supplier" shall mean the bidder whose bid has been accepted by the purchaser and shall include the bidder's executives, administrators, successors and permitted assignees.

2.5 "Equipment" shall mean and include all machinery, apparatus, materials, and articles to be provided under the contract by the suppliers.

2.6 "Contract Price" shall mean the sum named in or calculated the bid.

2.7 "General Condition" shall mean these General Terms and Conditions of Contract.

- 2.8 The Specification” shall mean both the technical as well as commercial parts of the specification annexed to or issued with GTCC and shall include the schedules and drawings, attached thereto as well as all samples and pattern, if any.
- 2.9 “Month” shall mean “Calendar month”.
- 2.10 Writing” shall include any manuscript, type written, printed or other statement reproduction in any visible form and whether under seal or under hand.
- 2.11 “FOR Destination costs” shall mean the cost of equipment and material at the consignee’s store/site. The cost is inclusive of Excise duty, Sales tax and other local taxes, packing, forwarding and insurance and freight charges.
- 2.12 The term “Contract document” shall mean and include GTCC, specifications, schedules, drawings, form of tender, Notice Inviting Tender, covering letter, schedule of prices or the final General Conditions, any special conditions, applicable to the particular contract.
- 2.13 Terms and conditions not herein defined shall have the same meaning as are assigned to them in the Indian Contract Act, failing that in the Orissa General Clauses Act.

3. **Manner of execution:**

All equipments supplied under the contract shall be manufactured in the manner, set out in the specification or where not set out, to the reasonable satisfaction of

the Purchaser’s representative.

4. **Inspection and Testing:**

- [i] The purchaser’s representative shall be entitled at all reasonable times during manufacture to inspect, examine and test at the supplier’s premises, the materials and workmanship of all equipments/materials to be supplied under this contract and if part of the said equipment/material is being manufactured in other premises, the supplier shall obtain for the purchaser’s representative permission to inspect, examine and test as if the equipment/material were being manufactured in the contractor’s premises. Such inspection,

examination and testing shall not relieve the supplier from his obligations under the contract.

- [ii] The Supplier shall give to the purchaser adequate time/notice (at least clear 15 days for inside the state suppliers and 20 days for outside the state suppliers) in writing for inspection of materials indicating the place at which the equipment/material is ready for testing and inspection and shall also furnish the shop Routine Test Certificate, Calibration certificates of Testing instruments, calibrated in Govt. approved laboratory with authenticity letter of that laboratory along with the offer for inspection. A packing list along with the offer, indicating the quantity which can be delivered in full truck load/Mini truck load to facilitate issue of dispatch instruction shall also be furnished.
- [iii] Where the contract provides for test at the Premises of the supplier or any of his sub-vendors, the supplier shall provide such assistance, labour, materials, electricity, fuel and instruments, as may be required or as may be reasonably demanded by the Purchaser's representative to carry out such tests efficiently. The supplier is required to produce shop routine test Certificate, calibration certificates of Testing Instruments before offering their materials/equipment for inspection & testing. The test house/laboratory where tests are to be carried out must be approved by the Govt. A letter pertaining to Govt. approved laboratory must be furnished to the purchaser along with the offer for inspection.
- [iv] After completion of the tests, the Purchaser's representative shall forward the test results to the Purchaser. If the test results conform to the specific standard and specification, the Purchaser shall approve the test results and communicate the same to the supplier in writing. The supplier shall provide at least five copies of the test certificates to the Purchaser.
- [v] The Purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is dispute regarding the quality of supply.
- [vi] If the firm fails to present the offered items for inspection/testing as per their inspection call due to any reason(s) during the visit of inspecting officer at the testing site ,the firm shall have to bear all expenses towards repetition of inspection and testing of the total offered quantity or part thereof.

5. **Training facilities.**

The supplier shall provide all possible facilities for training of Purchaser's Technical personnel, when deputed by the Purchaser for acquiring first-hand knowledge in assembly of the equipment, its erection, commissioning and for its proper operation & maintenance in service, wherein it is thought necessary by the purchaser.

6. **Rejection of Materials.**

In the event any of the equipment/material supplied by the manufacturer is found defective due to faulty design, bad workmanship, bad materials used or otherwise not in conformity with the requirements of the Specification, the Purchaser shall either reject the equipment/material or ask the supplier in writing to rectify or replace the defective equipment/material free of cost to the purchaser. The Supplier on receipt of such notification shall either rectify or replace the defective equipment/material free of cost to the purchaser within 15 days from the date of issue of such notification by the purchaser. If the supplier fails to do so, the Purchaser may:-

- [a] At its option replace or rectify such defective equipment/materials and recover the extra costs so involved from the supplier plus fifteen percent and/or.
- [b] Terminate the contract for balance work/supplies, with enforcement of penalty Clause as per contract for the un-delivered goods and with forfeiture of Performance Guarantee/ Composite Bank guarantee.
- [c] Acquire the defective equipment/materials at reduced price, considered equitable under the circumstances.

7. **Experience of Bidders:**

The bidders should furnish information regarding experience particularly on the following points:

- [i] Name of the manufacturer:
- [ii] Standing of the firm and experience in manufacture of equipment/material quoted:
- [iii] Description of equipment/material similar to that quoted, supplied and installed during the last two years with the name(s) of the Organisations to

whom supplies were made wherein, at least one (1) certificate shall be from a state/central P.S.U.

- [iv] Details as to where installed etc.
- [v] Testing facilities at manufacturer's works.
- [vi] If the manufacturer is having collaboration with another firm [s], details regarding the same.
- [vii] A list of purchase orders of identical material/equipment offered as per technical specification executed during the last two years along with users' certificate. User's certificate shall be legible and must indicate user's name, address, designation, place of use, and satisfactory performance of the equipment/materials for at least two years from the date of commissioning. Wherein at least one (1) certificate shall be from a State/Central or P.S.U. Bids will not be considered if the past manufacturing experience is found to be unsatisfactory or is of less than 2 (two) years on the date of opening of the bid and bids not accompanying user's certificate will be rejected.

8. **Language and measures:**

All documents pertaining to the contract including specifications, schedule, notices, correspondence, operating and maintenance instructions., drawings or any other writing shall be written in English language. The metric system of measurement shall be used exclusively in this contract.

9. **Deviation from specification:**

It is in the interest of the tenderers to study the specification, specified in the tender schedule thoroughly before tendering so that, if any deviations are made by the Tenderers,(both commercial and Technical), the same are prominently brought out on a separate sheet under heading "Deviations Commercial" and "Deviations Technical".

A list of deviations shall be enclosed with the tender. Unless deviations in scope, technical and commercial stipulations are specifically mentioned in the list of deviations, it shall be presumed that the tenderer has accepted all the conditions, stipulated in the tender specification, notwithstanding any exemptions mentioned therein.

10. **Right to reject/accept any tender:**

The purchaser reserves the right either to reject or to accept any or all tenders if the situation so warrants in the interest of the purchaser. Orders may also be split up between different Tenderers on individual merits of the Tenderer. The purchaser has exclusive right to alter the quantities of materials/ equipment at the time of placing final purchase order. After placing of the order, the purchaser may defer the delivery of the materials. It may be clearly understood by the Tenderer that the purchaser need not assign any reason for any of the above action [s].

11. **Supplier to inform himself fully:**

The supplier shall examine the instructions to tenderers, general conditions of contract, specification and the schedules of quantity and delivery to satisfy himself as to all terms and conditions and circumstances affecting the contract price. He shall quote price [s] according to his own views on these matters and understand that no additional allowances except as otherwise provided there in will be admissible. The purchaser shall not be responsible for any misunderstanding or incorrect information, obtained by the supplier other than the information given to the supplier in writing by the purchaser.

12. **Patent rights Etc.**

The supplier shall indemnify the Purchaser against all claims, actions, suits and proceedings for the infringement of any patent design or copy right protected either in the country of origin or in India by the use of any equipment supplied by the manufacturer. Such indemnity shall also cover any use of the equipment, other than for the purpose indicated by or reasonably to be inferred from the specification.

13. **Delivery:-**

[a] Time being the essence of the contract; the equipment shall be supplied within the delivery period, specified in the contract. The Purchaser, however, reserves the right to reschedule the delivery and change the destination if required. The delivery period shall be reckoned from the date of placing the Letter of Intent/Purchase order, as may be specified in LOI/Purchase order.

[b] The desired delivery period shall be as indicated at **Annexure-D** (Quantity & Delivery Schedule) of Section-IV (Technical Specification).

14. **Despatch instructions.**

I] The equipment/ materials should be securely packed and dispatched directly to the specified site at the supplier's risk by Road Transport only.

II] **Loading & unloading of Ordered Materials.**

It will be the sole responsibility of the supplier for loading and unloading of materials both at the factory site and at the destination site/ store.

The Purchaser shall have no responsibility on this account.

15. **Supplier's Default Liability.**

[i] The Purchaser may, upon written notice of default to the supplier, terminate the contract in circumstances detailed hereunder.

[a] If in the judgment of the Purchaser, the supplier fails to make delivery of equipment/material within the time specified in the contract or within the period for which if extension has been granted by the Purchaser in writing in response to written request of the supplier.

[b] If in the judgment of the Purchaser, the supplier fails to comply with any of the provisions of this contract.

[ii] In the event, Purchaser terminates the contract in whole or in part as provided in Clause-15 (I) of this section, the Purchaser reserves the right to purchase upon such terms and in such a manner as he may deem appropriate in relation to the equipment/material similar to that terminated and the supplier will be liable to the Purchaser for any additional costs for such similar equipment/material and/or for penalty for delay as defined in clause-22 of this section until such reasonable time as may be required for the final supply of equipment.

[iii] In the event the Purchaser does not terminate the contract as provided in clause 15(I) of this Section, supplier shall be liable to the Purchaser for penalty for delay as set out in Clause-22 of this section until the equipment is accepted. This shall be based only on written request of the supplier and written willingness of the Purchaser.

16 **Force Majeure:**

The supplier shall not be liable for any penalty for delay or for failure to perform the contract for reasons of force majeure such as acts of god, acts of the public enemy, acts of Govt., Fires, floods, epidemics, Quarantine restrictions, strikes, Freight Embargo and provided that the supplier shall within Ten (10)days from the beginning of delay on such

account notify the purchaser in writing of the cause of delay. The purchaser shall verify the facts and grant such extension, if facts justify .

17. Extension of time:-

If the delivery of equipment/material is delayed due to reasons beyond the control of the supplier, the supplier shall without delay give notice to the purchaser in writing of his claim

for an extension of time. The purchaser on receipt of such notice may or may not agree to extend the contract delivery date as may be reasonable but without prejudice to other terms and conditions of the contract.

18. Guarantee period: -

[i] The stores covered by this specification should be guaranteed for satisfactory operation and against defects in design, materials and workmanship for a period of 36 months from the date of commissioning. The above guarantee certificate shall be furnished in triplicate to the purchaser for his approval. Any defect noticed during this period should be rectified by the

supplier free of cost to the purchaser provided such defects are due to faulty design, bad workmanship or bad materials used, within one month upon written notice from the purchaser failing which provision of clause 22 (ii) shall apply.

[ii] Equipment/material failed or found defective during the guarantee period shall have to be guaranteed after repair/replacement for a further period of 36 months from the date of commissioning. The Bank Guarantee is to be extended accordingly. Date of delivery as used in this clause shall mean the date on which the materials are received in OPTCL'S stores/site in full & good condition which are released for Despatch by the purchaser after due inspection.

19 B.G. towards security deposit, 100% payment and performance guarantee:

[i] For manufacturers situated Inside & out side the state of Orissa.

A Composite Bank Guarantee as per the Proforma enclosed at Annexure-VII of the specification for 10% [ten percent] of the total FORD cost of the purchase order (In case of successful bidder who is a local Micro and small Enterprise (MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC 5% (five percent)), shall be furnished from any nationalized/scheduled bank having a place of business at Bhubaneswar, to the office of Sr. General Manager [Central Procurement Cell] OPTCL within 15 days from the date of issue of the purchase order. The BG shall be executed on non-judicial stamp

paper worth of Rs.29.00 [Rupees twenty nine] only or as per the prevalent rules, valid for a period of 38 months from the last date of stipulated completion period, for scrutiny and acceptance, failing which the supply order will be liable for cancellation without any further written notices. The BG should be accompanied by a confirmation letter from the concerned bank and should have provision for encashment at Bhubaneswar, before the Bank Guarantee is accepted and all concerned intimated. The B.G should be revalidated as and when intimated to you to cover the entire guarantee period.

- [ii] No interest is payable on any kind of Bank Guarantee.
- [iii] In case of non-fulfillment of contractual obligation, as required in the detailed purchase order/Specification, the composite Bank guarantee shall be forfeited.

20. Import License

In case imported materials are offered, no assistance will be given for release of Foreign Exchange. The firm should arrange to import materials from their own quota. Equipment of indigenous origin will be preferred.

21. (A) Terms of Payment.

- (i) 100% value of each consignment with 100% Excise duty, Entry Tax, if any, sales tax and Service Tax in full as applicable along with freight & Insurance charges will be paid /reimbursed by OPTCL at the applicable rate at the time of despatch, schedules or actual, whichever is lower along with freight & Insurance charges will be paid on receipt of materials in good condition at stores/desired site and verification thereof, and on successful commissioning of the work as per the scope, subject to

furnishing and approval of Composite Bank Guarantee at the rate of 10% (Ten percent) of the cost of supplied materials, as stipulated under clause-19 of this specification & on prior approval of guarantee certificate & Test certificate by the Purchaser . **Statutory deductions as applicable shall be made from the erection price component.**

(ii) Any imposition of new tax or revision of tax shall be paid/reimbursed at the time of dispatch, scheduled or actual whichever is lower (i.e. If delivery is within schedule period, tax variation is applicable, and if delivery is made beyond schedule date, any additional financial implication due to statutory variation in tax shall be to bidder's account).

(iii) **Payment of Freight & Insurance charges and Entry Tax.**

Freight & Insurance Charges & Entry Tax, incorporated in the Purchase contract shall be paid after receipt of materials at stores/desired site in good condition **and on successful commissioning of the work as per the scope**, and on production of authenticated documentary evidence, otherwise no Freight, Insurance charges & entry taxes shall be payable.

[B] The supplier shall furnish Composite Bank Guarantee of appropriate amount to OPTCL covering 10% of F.O.R. Destination cost of the purchase order well in advance (within 15 days from the date of issue of the purchase order) before despatch of materials.

22. Penalty for Delay in Completion of Contract

I) **If the Supplier fails to complete delivery/installation of the materials/equipments within the delivery schedule, specified in the contract including delivery time extension, if any, granted thereto, the Purchaser shall recover from the Supplier, penalty for a sum of half percent (0.5 percent) of the Ex-works/basic price of the undelivered/uncompleted equipment/item for each calendar week of delay or part thereof. For this purpose, the date of receipted chalan/completion date as per JMC shall be reckoned as the date of delivery/completion. The total amount of penalty shall not exceed five percent (5%) of the ex-works/basic price of the unit or units so delayed. Equipment will be deemed to have been delivered only when all its components and accessories as per technical Specification are also delivered. If certain components & accessories are not delivered in time,**

the equipment will be considered delayed until such time as the missing parts are delivered.

- II) If the Supplier fails to rectify /replace the equipment/material within 30 days from the date of intimation of the defect, so noticed by the purchaser within the guarantee period then the penalty for sum of one half of the one percent (0.5%) of the total Purchase order amount for each calendar week of delay shall be recovered by the purchaser within the guarantee period. For this purpose, penalty date will start from the 30th. day from the date of issue of letter on defectiveness of equipment/material, so supplied, by the purchaser. The total amount of penalty in this case shall not exceed 10% (TEN PERCENT) of the purchase order amount. The purchase order amount shall mean ex-works price + freight & insurance and all taxes & duties. If the defects so intimated within the guarantee period will not be rectified by the Supplier within the stipulated period as per clause 18 (i), then whole of the B.G. will be forfeited by the purchaser, without any intimation to the Supplier.

23. **Insurance**

The Supplier shall undertake insurance of stores covered by this Specification unless otherwise stated. The responsibility of delivery of the stores at destination in good condition rests with the Supplier. Any claim with the Insurance Company or transport agency arising due to loss or damage in transit has to be settled by the supplier. The Supplier shall undertake free replacement of materials damaged or lost, which will be reported by the consignee within 30 days of receipt of the materials at destination without awaiting for the settlement of their claims with the carriers and underwriters.

24. **Payment Due from the Supplier.** All costs and damages, for which the supplier is liable to the purchaser, will be deducted by the purchaser from any money, due to the supplier, under any of the contract (s), executed with OPTCL.

25. **Sales Tax clearance certificate and Balance sheet and profit & Loss Account:**

- i. Sales Tax clearance certificate for the previous year shall be enclosed with the tender.

- ii. Audited Balance Sheet and Profit & Loss Account of the bidder for the previous three years shall be enclosed to assess the financial soundness of the bidder(s).

26. Certificate of Exemption from Excise Duty/Sales tax.

Offers with exemption from Excise duty including sales tax shall be accompanied with authenticated proof of such exemption. Authenticated proof for this clause shall mean attested Photostat copy of exemption certificate. Any claim towards Excise duty/ Sales Tax shall be paid on actual basis subject to production of authenticated documentary evidence.

27. Supplier's Responsibility.

Notwithstanding anything mentioned in the Specification or subsequent approval or acceptance by the Purchaser, the ultimate responsibility for design, manufacture, materials used and satisfactory performance shall rest with the Tenderers. The Supplier(s) shall be responsible for any discrepancy noticed in the documents, submitted by them along with the bid(s)

28. Validity.

Prices and conditions contained in the offer should be kept valid for a minimum period of 180 days from the date of opening of the tender, failing which the tender shall be rejected.

29. EVALUATION.

(i) Evaluation of bids will be on the basis of the FOR DESTINATION PRICE (By Road Transport) including Excise Duty, sales Tax & other levies as may be applicable. The FORD PRICE shall consist of the following components

- a) Ex-works price.
- b) Packing & Forwarding charges.
- c) Freight
- d) Insurance.
- e) Excise Duty.
- f) Sales Tax.

- g) Other levies.
- h) Mandatory spares, if any for maintenance of equipment. (At the discretion of the purchaser)
- i) Test charges, if any.
- j) Erection, testing and commissioning charges, if any.
- k) Any other items, as deemed proper for evaluation by the purchaser.
- l) Loading factors will be taken in to account during evaluation if the prices of some of the items, not quoted.
- iii. Any imposition of new tax or revision of tax shall be considered at the time of price bid evaluation.

(II) **Weightage shall be given to the Following factors in the Evaluation & Comparison of Bids.**

In comparing bids and in making awards, the Purchaser will consider other factors such as compliance with Specification, minimum qualification criteria as per clause-30, outright rejection of tenders clause-34 of this tender, relative quality, adaptability of Supplies or services, experience, financial soundness, record of integrity in dealings, performance of materials/equipments earlier supplied, ability to furnish repairs and maintenance services, the time of delivery, capability to perform including available facilities such as adequate shops, plants, equipment and technical organization.

- (III) The local MSE bidders shall be required to furnish their willingness to match their bid price with that of the lowest evaluated bidder without any price preference and in case they agree, they shall be eligible to get up to 30% of the tendered quantity to be distributed suitably among the willing MSE bidders failing which the said 30% of the tendered quantity be awarded to the lowest evaluated bidder.

30. Minimum Qualification Criteria of Bidders.

The bidder shall be Original Equipment Manufacturer (OEM). The offered equipment have to be designed, manufactured and tested as per relevant IS/IEC with latest

amendments. The bidder should have installed/retrofitted & commissioned the system with trouble free operation for minimum three years in any of the power system utilities in India. Further, the bidders should fulfil the following criteria & supporting documents to the effect should be accompanied with the tender document.

1) The minimum requirement of manufacturing capacity of offered type, size and rating of equipment shall be FIVE times tender/ bid quantity per annum. The bidder should indicate manufacturing capacity by submitting latest updated certificate of a Chartered Engineer (CE).

2) The Substation Automation system shall be offered from a manufacturer who must have designed, manufactured, tested, installed and commissioned substation automation system which must be in satisfactory operation on 400/220/132/33KV system in India for at least 3 (Three) years as on the date of bid opening.

3) The bidder should furnish performance report of SAS system supplied installed and commissioned by them indicating the quantity and Single Value Contract executed during last FIVE (5) years, for the offered equipment. The details are to be submitted in following format,

Sl.No	Name of the Utility.	Order No. & Date.	Items supplied With quantity & work done.	Date of Completion.	If completed Within Stipulated Period.	Performance of the system as on date.	Remark .

4) Equipment offered shall have Type Test Certificates from accredited laboratory (accredited based on ISO/IEC Guide 25 / 17025 or EN 45001 by the National accreditation body of the country where laboratory is located), as per IEC / IS / technical specification. The type test reports shall not be older than FIVE years and shall be valid up to expiry of validity of offer.

31. Jurisdiction of the High Court of Orissa.

Suits, if any, arising out of this contract shall be filed by either Party in a court of Law to which the jurisdiction of High court of Orissa extends.

32. Correspondences.

- i) Any notice to the supplier under the terms of the contract shall be served by Registered Post or by hand at the Supplier's Principal Place of Business.
- ii) Any notice to the Purchaser shall be served at the Purchaser's Principal Office in the same manner.

33. Official Address of the Parties to the Contract

The address of the parties to the contract shall be specified:-

- [i] **Purchaser:** Senior General Manager (Procurement)(CPC) OPTCL
Bhubaneswar-751022 (Orissa)

Telephone No. 0674 - 2541801

FAX No. 0674 - 2542964

- [ii] **Supplier:** Address

Telephone No.

Fax No.

34. Outright Rejection of Tenders

Tenders shall be outrightly rejected if the followings are not complied with.

- [i] The tenderer shall submit the bid in electronic mode only and shall submit the tender cost on or before the date and time of submission of technical bid. In case of local Micro and small Enterprises(MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC participating in the tender they have to submit notarised hard copy of valid registration as local MSE as above on or before the date and time of submission of technical bid.
- [ii] The tenderer shall submit the bid in electronic mode only
- [iii] The Tender shall not be submitted telegraphically or by FAX.
- [iv] The prescribed EMD shall be submitted on or before the date and time of submission of technical bid.

- [v] The Tender shall be kept valid for a minimum period of 180 days from the date of opening of tender.
- [vi] The Tender shall be submitted in two parts as specified.
- [vii] The minimum requirement of manufacturing capacity of offered type, size and rating of equipment shall be FIVE times tender/ bid quantity per annum. The bidder should indicate manufacturing capacity by submitting latest updated certificate of a Chartered Engineer (CE).
- [viii]** Equipment offered shall have Type Test Certificates from accredited laboratory (accredited based on ISO/IEC Guide 25 / 17025 or EN 45001 by the National accreditation body of the country where laboratory is located), as per IEC / IS / technical specification. The type test reports shall not be older than FIVE years and shall be valid up to expiry of validity of offer.
- [ix] The schedule of prices should be filled up fully to indicate the break-up of the prices including taxes and duties. Incomplete submission of this schedule will make the tender liable for rejection. Vide Clause-4(ii) of Part-II.
- [x] The Tenderer should quote 'FIRM' price only and the price should be kept valid for a minimum period of 180 days from the date of opening of the tender.
- (xi) The Substation Automation system shall be offered from a manufacturer who must have designed, manufactured, tested, installed and commissioned substation automation system which must be in satisfactory operation on 400/220/132/33KV system in India for at least 3 (Three) years as on the date of bid opening.
- (xiii) The bidder should not have any pending litigation or arbitration with OPTCL with regard to any project or related activity. The bidder should certify/declare the same in unequivocal terms by way of an affidavit duly sworn before a magistrate. Bid furnished by the bidder shall not be eligible for consideration if it is not accompanied by the affidavit. Further, the bid/LOA/LOI shall be liable for outright rejection/cancellation at any stage if any information contrary to the affidavit/declaration is detected.

35. **Documents to be treated as confidential.**

The supplier shall treat the details of the specification and other tender documents as private and confidential and these shall not be reproduced without written authorization from the Purchaser.

36. **Scheme/Projects**

The materials/equipment covered in this specification shall come under “O&M WORKS “

SECTION – III

[LIST OF ANNEXURES]

The following schedules and proforma are annexed to this specification and contained in Section-III as referred to in the relevant clauses.

1	Declaration form	ANNEXURE-I
2	Abstract of terms and conditions to accompany Section-II of Part-I	ANNEXURE-II
3	Schedule of Quantity and Delivery	ANNEXURE-III
4	Abstract of price component [to accompany Part-II of this specification]	ANNEXURE-IV
5	Schedule of prices to accompany Part-II	ANNEXURE-V
6	Bank Guarantee form for earnest money deposit	ANNEXURE-VI
7	Composite Bank Guarantee form for security deposit, payment and performance	ANNEXURE-VII
8.	Chart showing particulars of E.M.D.	ANNEXURE – VIII
9.	Data on Experience.	ANNEXURE – IX
10.	Schedule of spare parts.	ANNEXURE-X

11.	Schedule of Installations.	ANNEXURE-XI
12.	Schedule of deviations.	ANNEXURE-XII

ANNEXURE - I

DECLARATION FORM

To

The Sr. General Manager (CPC)

OPTCL Head Qrs.BBSR,751022

Sub:- Tender Specification No-_____

Sir,

1. Having examined the above specification together with terms & conditions referred to therein * I/We the undersigned hereby offer to supply the materials/equipments covered therein complete in all respects as per the specification and General conditions, at the rates, entered in the attached contract schedule of prices in the Tender.
2. * I/We hereby undertake to have the materials/equipments delivered within the time specified in the Tender.
3. * I/We hereby guarantee the technical particulars given in the Tender supported with necessary reports from concerned authorities.
4. * I/We certify to have submitted the bid electronically by remitting *cash/money order/D.D./ remitting the cost of tender, herewith and this has been acknowledged by your letter/ money receipt No. Dated,
5. In the event of Tender, being decided in *my/our favour, * I/We agree to furnish the Composite B.G. in the manner, acceptable to ORISSA POWER TRANSMISSION CORPORATION LTD., and for the sum as applicable to *me/us as per clause-19 of section-II of this specification within 15 days of issue of letter of intent/purchase order failing which *I/We clearly understand that the said letter of Intent/Purchase order will be liable to be withdrawn by the purchaser, and the EMD deposited by us shall be forfeited by OPTCL.

Signed this _____ day of _____ 2014

Yours faithfully

Signature of the Tenderer with seal of the company

[This form should be dully filled up by the tenderer and uploaded at the time of submission of tender.]

* (Strikeout whichever is not applicable).

ANNEXURE-II

ABSTRACT OF GENERAL TERMS AND CONDITIONS OF CONTRACT [COMMERCIAL] TO ACCOMPANY PART-I

1	<p>(a) The tenderer shall submit the bid in electronic mode only and shall submit the tender cost on or before the date and time of submission of technical bid. In case of local Micro and small Enterprises (MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC participating in the tender they have to submit notarised hard copy of valid registration as local MSE as above on or before the date and time of submission of technical bid.</p> <p>(b) Earnest money furnished.</p> <p>(A) Bank Guarantee, (B) Bank Draft.</p>	
2	Manufacturer's supply experience including user's certificate furnished or not. [As per clause No.7 of Section-II.]	Yes/No
3	Deviations to the specification if any [list enclosed or not] [As per clause-9 of the Section-II]	Yes/No
	(a) Commercial	Yes/No
	(b) Technical.	
4	Delivery (period in months from the date of purchase order) Four months from the date of issue of purchase / work order for supply of materials and two months thereafter for erection and commissioning	
5	Guarantee:- Whether agreeable to OPTCL's terms.	Yes/No

	[As per clause-18 of Section-II]	
6	Whether agreeable to furnish Composite B.G. in case his tender be successful [As per clause-19 of Section-II]	Yes/No
7.	Terms of payment:- Whether agreeable to OPTCL's terms or not [As per clause-21 of Section-II]	Yes/No.
8.	Nature of price:- FIRM	Yes/No
9.	Penalty:- Whether agreeable to OPTCL's terms or not (As per clause-22 of Section-II)	Yes/No
10.	Whether STCC/ P&L A/C, Balance Sheet for the required period are furnished as per clause-25 of Section-II	Yes/No
11.	Validity: - Whether agreeable to OPTCL's terms or not [As per clause-28 of Section-II]	Yes/No
12.	Whether recent type test certificates from any Government approved laboratory are furnished or not. [As per clause-34[viii] of section-II]	Yes/No
13.	Whether guaranteed technical particulars in complete shape are furnished or not	Yes/No
14.	Whether dimensional design/drawings furnished or not	Yes/No
15.	Whether materials are ISI/ISO marked.	Yes/No
16.	Manufacturer's name and it's trademark.	Yes/No

17.	Whether registered under ODISHA Sales Tax Act. 1947	Yes/No
18.	Whether declaration form duly filled in furnished or not.	Yes/No.

Place: -

Date: -

Tenderer

Signature of the

with seal of the company

ANNEXURE-III

SCHEDULE OF QUANTITY AND DELIVERY

(To be filled up by the tenderer)

SL No	Description of materials	Quantity required	Desired Delivery	Destination	Remarks.
1	2	3	4	5	6

Place:

Date:

Signature of Tenderer

with seal of Company.

ANNEXURE-IV

ABSTRACT OF PRICE COMPONENT [TO ACCOMPANY PRICEBID]

1	Price basis	F.O.R. Purchaser's destination Stores/sites.
2	Packing & forwarding	
3	Rate of Insurance charges	
4	Rate of Freight charges	
5	Rate of excise duty	
6	Rate of sales Tax	
7	Rate of other taxes/levies /duties etc.	
8	Rate of entry tax.	
9.	Rate of Service Tax on supervision of erection testing and commissioning	
10.	Nature of price.	
11.	Whether MODVAT benefit if any, has been fully passed on to the purchaser.	Yes / No.

Place

Date:

Signature of Tenderer

With seal of company

NB:- Abstract of price component shall be done for equipment/material offered, for testing & commissioning charges, if any. All the above prices will be taken during bid price evaluation.

ANNEXURE-V.

SCHEDULE OF PRICES

TENDER SPECIFICATION No.

Item No.	Description.	Qty (unit)	Unit Ex-factory Price.	Unit Packing & Forwarding.	Unit Freight Charge.	Unit Insurance Charges.	Unit landing cost at destination store/site excluding ST,ED & Entry tax.
1.	2.	3.	4.	5.	6.	7.	8.

Unit E.D.	Unit S.T.	Unit Entry Tax.	Unit landing Cost including All taxes & Duties.	Total landing cost Including all taxes & duties.
9.	10.	11.	12= (8+9+10+11)	13= (3X12)

Signature of Tenderer

Name, Designation and Seal

NB: -

1. The tenderer should fill up the schedule properly and in full. The tender will be rejected, if the schedule of price is submitted in incomplete form. No post tender correspondence will be entertained on break-up of prices. Also, the supplier should agree for delivery at sub-station site.

2. In case, where F&I components are not specifically indicated in this schedule, 5% of the ex-works price shall be taken towards F&I components for the purpose of comparison of price.
3. The Tenderer shall certify in the price bid that MODVAT benefit, if any, has been fully passed on to the purchaser while quoting the tender price.
4. Conditional offers will not be acceptable.
5. The bidder is to clearly indicate the period up to which the tax holidays are available to them.
6. Price bid in any other format will not be acceptable and the offer will be rejected
7. Test charges (Routine/type) if any, mandatory spares, if any, maintenance equipment charges, if any, as per Technical Specification, supervisory charges, if any, (in case of equipments by taking 30 Man days) shall be indicated separately, row-wise.
8. All the above charges will be taken into account, during bid price evaluation.

[date] and if any further extension to this is required, the same will be extended on receiving instructions from the _____ on whose

behalf this guarantee has been issued.

2. We the _____ do hereby, further undertake

[Indicate the name of the bank]

to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the OPTCL stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the OPTCL by reason of any breach by the said supplier [s] of any of the terms or conditions or failure to perform the said Bid . Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

3. We undertake to pay the OPTCL any money so demanded notwithstanding any dispute or disputes so raised by the contractor [s] in any suit or proceeding instituted/pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the supplier(s) shall have no claim against us for making such payment.

4. We, the _____ further agree that the guarantee

[Indicate the Name of the Bank]

herein contained shall remain in full force and effect during the aforesaid period of 240 days [two hundred forty days] and it shall continue to be so enforceable till all the dues of the OPTCL under or by virtue of the said Bid have been fully paid and its claims satisfied or discharged or till Managing Director, ODISHA POWER TRANSMISSION CORPORATION LTD. certifies that the terms and conditions of the said Bid have been fully and properly carried out by the said Supplier [s] and accordingly discharges this guarantee. Unless a demand or

claim under this guarantee is made on us in writing on or before the _____

we shall be discharged from all liability under this guarantee thereafter.

5. We, the _____ further agree with the OPTCL that

[Indicate the name of the Bank]

the OPTCL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Bid or to extend time of performance by the said Supplier [s] from time to time or to postpone for any time or from time to time any of the powers exercisable by the OPTCL against the said supplier [s] and to forbear or enforce any of the terms and conditions relating to the said bid

and we shall not be relieved from our liability by reason of any such variation, postponement or extension being granted to the said Supplier [s] or for any forbearance act or omission on the part of the OPTCL or any indulgence by the OPTCL to the said Supplier[s] or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the name, style and constitution of the Bank or the supplier [s].

7. We, _____ lastly undertake not revoke this

[Indicate the name of the Bank]

Guarantee during its currency except with the previous consent of the OPTCL in writing.

8. We the _____ Bank further agree that this guarantee shall also be invokable at our place of business at ----- Branch of Bhubaneswar (indicate the name of the branch)in the state of ODISHA.

Notwithstanding anything contained herein.

- 1) Our liability under this bank guarantee shall not exceed Rs.-----
-----(Rupees-----).

- 2) The bank guarantee shall be valid up to dt.-----
- 3) We are liable to pay the guaranteed amount or any part there of under this bank guarantee only & only if you serve upon us at -----branch at Bhubaneswar a written claim or demand on or before dt.-----.

Dated _____ Day of _____

For _____

[Indicate the name of Bank]

Witness ((Signature, names & address)

1.

2.

ANNEXURE-VII

**PROFORMA FOR COMPOSITE BANK GUARANTEE FOR SECURITY DEPOSIT
PAYMENT AND PERFORMANCE**

This Guarantee Bond is executed this _____ day
of _____ 2015 by us the _____ Bank
at _____

P.O. _____ P.S. _____

District _____ State _____

1. WHEREAS the ODISHA POWER TRANSMISSION CORPORATION LTD., a body corporate constituted under the Electricity Act, 2003 [hereinafter called "the OPTCL" which shall include its successors and assigns has placed orders No. _____ Date _____ [hereinafter called "The Agreement"] on M/s. _____

[hereinafter called "The Supplier"] which shall include its successors & assigns for supply of materials.

AND WHERE AS the supplier has agreed to supply materials to the OPTCL in terms of the said agreement AND

WHEREAS the OPTCL has agreed [1] to exempt the supplier from making payment of Security [2] to release 100% payment of the cost of materials as per the said agreement and [3] to exempt from performance guarantee on furnishing by the Supplier to the OPTCL, a Composite bank Guarantee of the value of 10 % [ten percent] of the contract price of the said agreement.

NOW THEREFORE, in consideration of the OPTCL having agreed [1] to exempt the Supplier from making payment of Security [2] releasing 100% payment to the Supplier and [3] to exempt from furnishing performance guarantee in terms of the said agreement as aforesaid, we, the _____ [Bank][hereinafter referred to as 'the Bank'] do hereby undertake to pay to the OPTCL an amount not exceeding Rs. _____ [Rupees _____] against any loss or damage caused to or suffered by or would be caused to or suffered by the

OPTCL by reason of any breach by the said Supplier [s] of any of the terms or conditions contained, in the said agreement.

2. We the (_____ Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on demand from the OPTCL stating that the amount claimed is due by way of loss or damage caused to or suffered by the OPTCL by reason of any breach by the said Supplier [s] of any of the terms or conditions, contained in the said agreement or by reason of the supplier's failure to perform the said agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

[Rupees _____]

3. We the _____ Bank} also undertake to pay to the OPTCL any money so demanded notwithstanding any dispute or disputes raised by the supplier [s] in any suit or proceeding instituted/pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Supplier [s] shall have no claim against us for making such payment.

- 4 We, (_____ Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to do so enforceable till all the dues of the OPTCL under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Managing Director, ODISHA POWER TRANSMISSION CORPORATION LTD. certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said Supplier [s] and accordingly discharges this Guarantee.

Unless a demand or claim under this guarantee is made on us in writing on or before the [Date _____], we shall be discharged from all liability under this guarantee thereafter.

5. We,(_____ Bank) further agree that the OPTCL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Supplier [s] and we shall

not be relieved from our liability by reason of any such variations or extension being granted to the said supplier [s] or for any forbearance, act or omission on the part of the OPTCL or any indulgence by the OPTCL to the said Supplier [s] or by any such matter or thing whatsoever which under the law relating to sureties would but these provisions have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the name , style and constitution of the Bank and supplier [s].
7. We,[_____Bank] lastly undertake not to revoke this guarantee during its currency except with the previous consent of the OPTCL in writing.
8. We the _____ Bank further agree that this guarantee shall also be invocable at our place of business at ----- Branch of Bhubaneswar (indicate the name of the branch)in the state of ODISHA.

Notwithstanding any thing contained here in.

- 1) Our liability under this bank guarantee shall not exceed Rs.-----
-(Rupees-----).
- 2) The bank guarantee shall be valid up to dt.-----
- 3) We are liable to pay the guaranteed amount or any part there of under this bank guarantee only & only if you serve upon us at -----branch at Bhubaneswar a written claim or demand on or before dt.-----.

Dated _____ Day of _____

For _____
[Indicate the name of Bank]

Witness ((Signature, names & address)

1.

2.

ANNEXURE-VIII

**CHART SHOWING PARTICULARS OF EARNEST MONEY DEPOSIT
FURNISHABLE BY TENDERERS**

1.	Central and State Government Undertakings	Exempted
2.	All other inside & outside state units.	The amount of EMD as specified in the specification /Tender Notice in shape of bank guarantee /DD.

NB: - **REFUND OF E.M.D.**

- [a] In case of unsuccessful tenderers, the EMD will be refunded immediately after the tender is decided. In case of successful tenderer, this will be refunded only after furnishing of Composite Bank Guarantee referred to in clause No.19 of Section-II of this specification.

Suits, if any, arising out of EMD shall be filed in a court of law to which the jurisdiction of High Court of ODISHA extends.

- [b] Earnest Money will be forfeited if the tenderer fails to accept the letter of intent/purchase order, issued in his favour or revises the bid price[s] within the validity period of Bid.

ANNEXURE-IX

DATA ON EXPERIENCE

- [a] Name of the manufacturer.
- [b] Standing of the firm as manufacturer of equipment quoted.
- [c] Description of equipment similar to that quoted [supplied and installed during the last two years with the name of the organizations to whom supply was made].
- [d] Details as to where installed etc.
- [e] Testing facilities at manufacturer's works.
- [f] If the manufacturer is having collaboration with another firm, details regarding the same and present status.
- [g] A list of purchase orders, executed during last three years.
- [h] A list of similar equipments of specified MVA rating, voltage class, Impulse level, short circuit rating, Designed, manufactured, tested and commissioned which are in successful operation for at least two years from the date of commissioning with legible user's certificate. User's full complete postal address/fax/phone must be indicated. (Refer clause No.7 of the Part-I, Section-II of the specification).

Place:

Date:

Signature of tenderer

Name, Designation, Seal

ANNEXURE-X

SCHEDULE OF SPARE PARTS FOR FIVE YEARS OF NORMAL OPERATION & MAINTENANCE

SL. No	Particulars	Quantity	Unit delivery rate	Total price

Place:

Date:

Signature of Tenderer

Name, Designation, Seal

ANNEXURE-XI

SCHEDULE OF INSTALLATIONS.

Rated MVA	Rated Voltage	Place of installation and complete postal address	Year of commissioning

Place: -

Date

Signature of Tenderer:

Name, Designation, Seal

ANNEXURE-XII

DEVIATION SCHEDULE.

Tenderer shall enter below particulars of his alternative proposal for deviation from the specification, if any.

A) Technical

Sl.No	Clause No. of specification	Particulars of deviations.

Place: -

Date

Signature of Tenderer:

Name, Designation, Seal

B) Commercial deviations.

A) Commercial.

Sl.No	Clause No. of specification	Particulars of deviations.

Place: -Date

Signature of Tenderer:

Name, Designation, Seal

ANNEXURE – XIII

LITIGATION HISTORY

Name of the Bidder:

Bidder should provide information on any history of litigation or arbitration resulting from contracts executed in the last five years or currently under execution.

Year.	Award for or against bidder	Name of client, cause of litigation and matter in dispute	Disputed amount (current value in Rs.)

Place: -

Date

Signature of Tenderer:

Name, Designation, Seal

SECTION-V

TECHNICAL SPECIFICATION FOR SUB-STATION AUTOMATION FOR 132/33kV GSS: ANANDPUR, ARGUL, BASTA, BHAWANIPATNA, ARANJIA, KESURA, KONARK, KUCHINDA & SHAMUKA

The Substation Automation System (SAS) is proposed for 132/33kV Anandpur, Argul, Basta, Bhawanipatna, Karanjia, Kesura, Konark, Kuchinda & Shamuka Grid S/s with installation of Bay control Unit in existing control relay panels, work station, HMI, printers and remote transmission unit for Remote Network Control centre & SLDC.

The Substation Automation System (SAS) shall be installed to control and monitor all the sub-station equipment from remote control centre (RCC) as well as from local control centre.

The SAS shall contain the following main functional parts:

- i) Bay control Intelligence Electronic Devices (IED s) for control and monitoring.
- ii) Station Human Machine Interface (HMI)
- iii) Redundant managed switched Ethernet Local Area Network communication infrastructure.
- iv) Peripheral equipment like printers, display units, key boards, Mouse etc.

It shall include communication gateways, intelligent electronic devices (IED) for bay control and inter IED communication infrastructure.

The communication gateways shall facilitate the information flow to remote control centres & Load despatch Centre.. The bay level intelligent electronic devices (IED) for protection and control shall provide the direct connection to the switchgear without the need of interposing components and perform control, protection, and monitoring functions.

The present substation switchyard configurations are provided in attached Single Line diagrams. The BCU/BCPU are to be installed in the existing control relay panels. The

substations are equipped with IEC61850 compliant numerical protection relays. The protection arrangements for the 132kV & 33kV system for SAS of above GSSs should be as envisaged below.

1. 132kV Side:

i) Line bay: The line bay will have one Bay controller Unit (BCU), one distance protection, one backup over Current & earth fault relay. The existing CR panels are having IEC 61850 complied numerical distance, over current & earth fault protection relays and electro mechanical trip & auxiliary relays. The vendor has to provide IEC61850 compliant Bay Control unit & necessary auxiliary relays. The trip circuit supervision & carrier supervision function will be performed by Bay Controller Unit

ii) Each transformer bays: The line bay will have Bay controller Unit(BCU),one differential protection, and one backup over Current & earth fault relay. The existing CR panels are having IEC 61850 complied numerical distance , over current & earth fault protection relays and electro mechanical trip & auxiliary relays. The vendor has to provide IEC61850 compliant Bay Control unit & necessary auxiliary relays. The trip circuit supervision & Automatic voltage regulation function will be performed by Bay Controller Unit

iii) Bus Coupler bays: Each bay will have Bay controller Unit(BCU), backup over Current & earth fault relay. The existing CR panels are having IEC 61850 complied numerical over current & earth fault protection relays and electro mechanical trip & auxiliary relays. The vendor has to provide IEC61850 compliant Bay Control unit & necessary auxiliary relays. The trip circuit supervision & station DC regulation function will be performed by Bay Controller Unit

2. 33kV Side:

Each bay should be provided with on Bay controller & protection Unit (BCPU). The unit should be capable of protection, measurement , control & record .IEC 61850protocols should be available for full system integration. The BCPU should be capable of following feeder protection functions.

1. Current protection (50/50N,51/51N,67/67N) ,
2. Voltage protection (59,27).
3. Frequency protection (81 U,81 O,81R)

4. Power protection.

Additional Multifunction meter may provided for monitoring the measurement, if monitoring of measurement is not available in BCPU.

QUALIFYING REQUIREMENT FOR SUPPLY INSTALLATION & COMMISSIONING OF THE SUBSTATION AUTOMATION SYSTEM:

The bidder shall be Original Equipment Manufacturer (OEM). The offered equipment have to be designed, manufactured and tested as per relevant IS/IEC with latest amendments. The bidder should have installed/retrofitted & commissioned the system with trouble free operation for minimum three years in any of the power system utilities in India. Further, the bidders should fulfil the following criteria & supporting documents to the effect should be accompanied with the tender document.

- 1) The minimum requirement of manufacturing capacity of offered type, size and rating of equipment shall be FIVE times tender/ bid quantity per annum. The bidder should indicate manufacturing capacity by submitting latest updated certificate of a Chartered Engineer (CE).
- 2) The Substation Automation system shall be offered from a manufacturer who must have designed, manufactured, tested, installed and commissioned substation automation system which must be in satisfactory operation on 400/220/132/33KV system in India for at least 3 (Three) years as on the date of bid opening.
- 3) The bidder should furnish performance report of SAS system supplied installed and commissioned by them indicating the quantity and Single Value Contract executed during last FIVE (5) years, for the offered equipment. The details are to be submitted in following format,

Sl.No	Name of the Utility	Order No. & Date.	Items supplied With	Date of Completion	If completed Within	Performance of the system as on date.	Remark
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			quantity & work done.		Stipulated Period.		

4) Equipment offered shall have Type Test Certificates from accredited laboratory (accredited based on ISO/IEC Guide 25 / 17025 or EN 45001 by the National accreditation body of the country where laboratory is located), as per IEC / IS / technical specification. The type test reports shall not be older than FIVE years and shall be valid up to expiry of validity of offer.

SPECIFICATION:

I. SCOPE :

The Substation Automation System (S.A.S) for EHV substations, is to be used for the control, protection and supervision of new/existing Air insulated (AIS) 132/33KV EHV substations of OPTCL.

This specification covers technical, functional, configuration and testing requirements for a substation automation system for extra high voltage (EHV) substations with 132kV and 33kV buses respectively.

The substation automation system shall be digital and shall include control, protection, monitoring, measurement functions and tele-transmission of data and commands.

II. STANDARDS:

The substation automation solutions should be future proof & compliant to international standards IEC 61850, and simplify maintenance and enable interoperability.

The standards applicable for this automated digital control , protection system & communication protocol for the EHV sub- station are as follows.

1. IEC 61850
 - i. IEC 61850-8-1, information is exchanged as GOOSE messages.
 - ii. IEC 61850-9-2 exchange of analogue information.
2. IEC 60870 set of standards which define systems used for tele-control (supervisory control and data acquisition) in electrical engineering and power system automation.
 - i. IEC 60870-5-1 Transmission Frame Formats
 - ii. IEC 60870-5-3 General Structure of Application Data
 - iii. IEC 60870-5-4 Definition and Coding of Information Elements
 - iv. IEC 60870-5-5 Basic Application Functions
 - v. IEC 60870-5-6 Guidelines for conformance testing for the IEC 60870-5.

Also following companion standards are applicable for basic tele-control tasks, transmission of integrated totals, data exchange from protection equipment & network access of IEC101 respectively.

- IEC 60870-5-101 Transmission Protocols, companion standards especially for basic tele-control tasks
- IEC 60870-5-102 Companion standard for the transmission of integrated totals in electric power systems (this standard is not widely used)
- IEC 60870-5-103 Transmission Protocols, Companion standard for the informative interface of protection equipment
- IEC 60870-5-104 Transmission Protocols, Network access for IEC 60870-5-101 using standard transport profiles

III. CLIMATIC CONDITIONS

This automated digital control and protection system for EHV substations, shall be capable of withstanding the following climatic conditions:

- a. Ambient temperature during operation : -5 °C to +55°C

- b. Ambient temperature during storage : -5 °C to +55°C
- c. Relative humidity : 5% - 90%
- d. Altitude level:

IV. SUPPORT DOCUMENTS

This substation automation system for EHV substation shall be designed for selected AIS substation of OPTCL with the instructions contained in this technical specification and with the information provided in the following documents, which will be made available on inquiry.

- a. EHV substation single line diagram
- b. EHV substation layout drawing in which the following are depicted:
 - Location of EHV substation primary equipment
 - EHV substation's control building
 - Bay Relay & BCU kiosks will be planned as per requirement.
- c. Switchgear interlocking arrangements.
- d. List of commands to the substation equipment.
- e. List of digital event and alarm signals for this hereby substation automation system.
- f. List of analogue measurements for this thereby substation automation system
- g. List of commands received from transmission's system Remote control center (RCC) and if applicable from the distributions peripheral control center (DCC).
- h. List of events and alarms to be transmitted to the transmission's system control center and to the distribution's peripheral control center (if applicable)
- i. List of measurements received from TCC and from DCC (if required).

j. Specifications for distance relays, overcurrent / Earth fault relays, autotransformer/Power transformer differential relays, bus-bar differential relays, transformer REF relays (if required), voltage relays, Over flux & frequency relays.

V. REQUIRED FUNCTIONS OF THE SUBSTATION AUTOMATION SYSTEM.

The substation automation system shall be capable of the following functions:

1. Control and supervision of the EHV substation
2. Switchgear interlocking.
3. Synchro-check with phasing.
4. Autotransformer tap-changer control
5. Power Transformer tap-changer control
7. Measurements
8. Event recording and alarm handling
9. Protection
10. Automatic switching
11. Full remote access control (Web browser access secured through fire wall and support up to 5 web client)
12. It must support up to 100000 data points and integration of at least 250 IEDs in single ring.
13. It should support up to 4 high resolution screen

A. Control of the EHV substation

- i. The control must handle selection of control Position
 - a. Locally, via control switches located on the primary equipment
 - b. From the bay control unit, - bay level (located in relay kiosks)
 - c. From the HMI, - station level (Control building of the EHV Substation)

- d. From the transmission's system remote control center (RCC)
- e. The commands will be issued each time only from one control place excluding at the same time the other three. The priority (switching authority) of commands shall be in the order indicated above and shall be carried out either via software or hardware. Each control level shall have proper indication indicating the selected position.
 - ii. Selection of equipment and type of command for control operation (opening or closing).
 - iii. Execution or cancellation of command.
 - iv. Execution of the command when the conditions of interlocks, synchro-check or other conditions are met.
 - v. Capability of overriding of interlocks and execution of the automatic switching sequences.
 - vi. The apparatuses to be controlled are the following:
 - a. 400 KV ,220kV ,132kV & 33kV Circuit Breakers associated with transmission line bays, autotransformers, transformers ,reactor & capacitor banks.
 - b. Dis-connectors of transmission line bays, autotransformers, Transformers, Reactors & capacitor banks.
 - d. Earthing Switches of the 400KV Dis-connectors (If it is required.)
 - e. Mechanism of increase, decrease and emergency stop of the step of the tap changer (OLTC) of the autotransformers, power transformers (if it is required).
 - f. At table 1 of the attached appendix, the necessary commands from the Substation Automation System (S.A.S) to the EHV substation equipment are presented, as well as the commands that required to be received from RCC (Remote Control Centre) remote control centers.

B. The supervision of the substation shall include the following:

1. The position of each circuit breakers on a continuous basis.
2. The position of each dis-connectors (isolators) on a continuous basis.
3. The position of each earthing switch on a continuous basis.
4. Every detected change shall cause a change in the single-line diagram displayed on the operator's terminal (HMI unit) located in the ehv substation control building, notation in the event list and a print-out.
5. Alarms shall be issued, in the form of lists and print-out, in case the position changes are not caused by a command.
6. At the operator's terminal and specifically at the colour visual display, the single-line diagram of the EHV substation (including the future bays of the switching station with dotted-lines), details of the status of breakers and dis-connectors (isolators) and measurements shall be depicted.
7. The naming of the equipment shall be as indicated in the single-line diagram of the EHV substation which is provided.
8. The substation automation system for EHV substation shall also allow supervision of all EHV substation circuit breaker and motor driven (electrically operated) disconnectors and earthing switches from the transmission system's Remote control center (RCC).
9. The substation automation system shall allow supervision of the transformer bay circuit breakers and Dis-connectors & transformer Tap position.

VI. COMMUNICATION PROTOCOLS AND OTHER COMMUNICATIONS.

The following protocols are acceptable for the communications within the EHV substation and also for the communication of the substation automation system (S.A.S) with the system's control centers.

1. Between bay level control units and HMI center, the acceptable communication protocol is IEC-61850.
2. Between transmission's system (network) control center and this substation automation system the only acceptable protocol is the following:

- IEC 60870-5-101/104 with minimum transmission speed of 19,2kbits/sec and the conventional way.
 - It must (SCADA) support to integrate at least 250 IEDs in single ring.
3. Between protection relays and HMI center, the communication protocol is IEC-61850.
 4. Between bay level control units and protection relays the acceptable protocol is IEC-61850.
 5. Security of the system, because the IEC-61850 protocol is based on a Ethernet platform, sufficient security

measures, must be provided, that is beyond passwords, in order to prevent unauthorized access.

VII. PLCC

PLCC panels /end equipment of OPGW for tele-protection features are to be installed in Carrier Room near Control Room. Yards' IED should communicate with PLCC /end equipment of OPGW panels through GOOSE commands. In this project supply is not in the scope of the contract, the same will be provided by OPTCL. The integration of PLCC /end equipment in the SAS is to be carried out by the contract awardee.

VIII. SOFTWARE

Any software needed for the configuration setting, parameterizing, documentation displaying and operation of the system or of the devices which is composed of (bay control units, protection relays, bus bar differential protection relays and GPS) should be Window based with latest version of Window operating software. The same should be provided on the basis of a royalty free, non-exclusive with irrevocable license to use by OPTCL. Software for the analysis of fault data shall also be provided with the same terms as above.

IX. DETAIL SCOPE OF WORK:

The Substation Automation System is envisaged for following type of existing substation of OPTCL.

1. 132/33kV Substation. in 132kV & 33kV System.
2. 220/132/33kV Substation.
3. 400/220/132 Substation.
4. 400/220/132/33kV Substation.

Bus arrangements are in general as follows.

- i. 400kV : 1½ Breaker system.
- ii. 220kV : Two Bus system.
- iii. 220kV : Two Bus system with transfer Bus.
- iv. 132kV : Main and Reserve bus arrangement.
- v. 33kV : Main and Reserve bus arrangement.

The Remote operation and monitoring of control & protection system of above type of substation as mentioned in the Section-V is to be executed by replacement / modification of existing equipments/relays as specified in the schedule. The existing relays of substations conforming to IEC61850 standard, if found suitable will be retained.

The objective of the above work is as follows.

- a. The operation & monitoring of control & protection system is as per SLD and conforming to technical standard envisaged in CEA regulation-2010 for Technical Standard construction of Electrical Plant & Transmission line..
- b. DC & AC system LT Panel Boards for above SAS but excluding battery chargers
- c. On line capturing & monitoring of Transformer local readings & protection.
- d. All the local control & protection at the sub station for its remote operation from MCC shall be substituted by bay controller and SCADA.

- e. While Main Sub Station will be master S/S option/ provision must be available to independently run slave S/S, i.e. the proposed sub station locally.
- f. There must be provision for down loading event logger and D/R data at MCC at any time during the day.
- g. If asked, optional price shall be submitted for 7 years AMC for remote control and protection of equipment and no down time is permitted except for tripping on faults.
- h. List of optional spares for above stated scope shall be furnished separately along with prices however it will not be part of evaluation.
- i. Remote connectivity between master & slave S/S for above shall be established by bidder by providing necessary terminal equipment for existing OPGW.
- j. Master Control Centre shall also be fully automated as per the 400KV/220KV/132/33 KV proposed substation by replacement / modifications of existing equipment/ relays for localized control (if specified).
- k. Scope also includes one week training to the executives of each substation. The list of topics and on site training shall be finalized during the course of execution.
- l. Factory Acceptance test has to be performed before dispatching equipment in the presence of representative of OPTCL and the test report should be approved by OPTCL.
- m. Relay settings and coordination is part of scope. The setting will be as per the approved philosophy adopted by OPTCL
- n. Local existing DC and AC system at Main Sub Station can be used, but it is bidder's responsibility to verify before bidding.
- o. Any other local input requirement at Main Sub Station must be clearly specified by bidder.
- p. It is the bidders' responsibility for complete engineering/supply of necessary equipment at both the end, installation, testing & successfully commissioning of entire system as stated above including putting it to commercial operation.

X. GENERAL SYSTEM DESIGN.

- The systems shall be of the state-of-the art suitable for operation under electrical environment present in Extra High Voltage substations.
- The system shall incorporate the control, monitoring, metering, communication and protection functions specified, event recording and evaluation of disturbance records.
- The Bay level unit comprising Bay Control Unit (BCU) are to be fitted in existing relay and protection panels installed in the control room.
- PLCC panels are to be located in PLCC room near Control Room.
- The station HMI & DR Work station should be located in Control Room building connecting bay level unit through optical cables /Ethernet cable for overall optimization in respect of cabling and control room building.
- Remote control and monitoring of the substation shall be from Main Sub Station i. e. Master Control Centre through OPGW communication link unless specified otherwise. Required equipment for controlling the sub-station remotely from MCC as well as transmitting all necessary RTU data to SLDC should also be considered.
- Maintenance, modification or extension of components may not cause a shutdown of the whole substation automation system. Self-monitoring of components, modules and communication shall be incorporated to increase the availability and the reliability of the equipment and minimize maintenance.
- Adopt the latest engineering technology, and ensure long-term compatibility requirements.
- The system shall be designed such that personnel without any background knowledge in Microprocessor-based technology are able to operate the system. The operator interface shall be intuitive such that operating personnel shall be able to operate the system easily after having received some basic training.
- The Substation Automation System (SAS) shall be suitable for operation and monitoring of the complete substation including future extensions. Interoperability with third party IEC 61850 compatible IEDs to be incorporated in future with offered SAS shall be ensured and necessary data/information shall be provided in this regard.

- The offered SAS shall support remote control and monitoring from Master Control Center via gateway.

XI. System architecture

The Substation Automation System (SAS) shall be based on a decentralized architecture and on a concept of bay- oriented, distributed intelligence. The Bay Control Unit (BCU), Bay Control Protection Unit (BCPU), protective relays etc. shall be connected to Ethernet Fiber Switch EFS through fiber optic /Ethernet cable with PRP (Parallel Redundancy Protocol) configuration.

The main process information of the station shall be stored in distributed databases. The typical SAS architecture shall be structured in two levels, i.e. in a station and a bay level. At bay level, IEC 61850 compatible BCU shall be provided for 400kV, 220kV & 132kV system for all bay level functions regarding control, monitoring and I/O processing and IEC 61850 compatible Protective Relays shall be provided for different system as per specifications enumerated in the relevant section. The BCU / protection IEDs shall be connected to the switchgear through TB without any need for additional transducers. The IEC 61850 Bay Control & Protection Unit (BCPU) shall be provided for control, monitoring, I/O processing and protection.

Each bay controller & IED shall be independent from each other and its functioning shall not be affected by any fault occurring in any of the other bay control units of the station.

Separate BCU / RTU for station auxiliaries shall be provided.

Substation LAN data exchange is to be realized using IEC 61850 standard having minimum speed of 100 mbps with a redundant managed switched Ethernet communication infrastructure having priority tagging. Each component/module of SAS including entire communication link shall be provided with built-in supervision and self-diagnostic features and any failures shall be alarmed to the operator.

Data exchange is to be realized using IEC 61850 protocol with a redundant managed switched Ethernet communication infrastructure.

The communication shall be made in 1+1 mode, excluding the links between individual bay IEDs to switch, such that failure of one set of fiber/Ethernet link shall not affect the normal operation of the SAS. However it shall be alarmed in SAS.

At station level, the entire station shall be controlled and supervised from the station HMI. It shall also be possible to control and monitor the bay from the bay level equipment at all times.

The control priorities as described in the section (V: Sub section- A. Control of the EHV substation) shall prevent operation of a single switch at the same time from more than one of the various control levels, i.e. MCC, station HMI, bay level or apparatus level. The priority shall always be on the lowest enabled control level.

The GPS time synchronizing signal for the synchronization of the entire system shall be provided. GPS system should be compatible with SCADA protocol IEC 61850. A time accuracy of 1ms shall be achieved for all the devices within SAS.

The PLCC panels' status, Inter-tripping signals exchange between BCU and PLCC panel BCU should work on IEC 61850 protocols through GOOSE concept.

XII. Functional Requirements:

The Substation elements shall be operated from different locations such as:

- **Remote control centers.**
- **Station HMI.**
- **Local Bay Controller.**

But the operation shall be possible by only one operator at a time. Further, the operation shall depend on the conditions of other functions, such as interlocking, synchro check, etc. see description in 'Bay level control functions').

1. Select-before-execute:

For security reasons the command is always to be given in two stages:

Selection of the object and command for operation under all mode of operation except emergency operation. Final execution shall take place only when selection and command are actuated.

2. Command supervision:

Bay/station interlocking and blocking:

Software Interlocking is to be provided to ensure that inadvertent incorrect operation of switchgear causing damage and accidents in case of false operation does not take place.

In addition to software interlocking hardwired interlocking are to be provided for:

- i. Bus Earth switch Interlocking.
- ii. Transfer Bus Interlocking.

It shall be a simple layout, easy to test and simple to handle when upgrading the station with future bays. For software interlocking the bidder shall describe the scenario while an IED of another bay is switched off or fails.

A software interlock override function shall be provided which can be enabled to bypass the interlocking function.

3. Run Time Command cancellation:

Command execution timer (configurable) must be available for each control level connection. If the control action is not completed within a specified time, the command should get cancelled.

4. Self-supervision:

Continuous self-supervision function with self-diagnostic feature shall be included.

5. User configuration:

The monitoring, controlling and configuration of all input and output logical signals and binary inputs and relay outputs for all built-in functions and signals shall be possible both locally and remotely.

6. Functions:

The Functional requirement shall be divided into following levels:

Bay Level Functions & System Level Functions

A. Bay level functions:

In a decentralized architecture the functionality shall be as close to the process as possible. In this respect, the following functions can be allocated at bay level:

- Bay control functions including data collection functionality.
- Bay protection function.
 1. Bay control functions:
 - a. Control mode selection
 - b. Select-before-execute principle
 - c. Command supervision:
 - i. Interlocking and blocking
 - ii. Double command
 - d. Synchrocheck, voltage selection
 - e. Run Time Command cancellation
 - f. Transformer tap changer control (for power transformer bays)
 - g. Operation counters for circuit breakers and pumps
 - h. Hydraulic pump/ Air compressor control and runtime supervision
 - i. Operating pressure supervision
 - j. Display of interlocking and blocking
 - k. Breaker position indication per phase
 - l. Alarm annunciation
 - m. Measurement display
 - n. Local HMI (local guided, emergency mode)

- o. Interface to the station HMI.
- p. Data storage for at least 200 events
- q. Extension possibilities with additional I/O's inside the unit or via fiber-optic

Communication and process bus.

2. Transformer tap-changer control:

Raise and lower operation of OLTC taps of transformer shall be facilitated through Bay controller IED.

3. Bay protection functions:

The protection functions are independent of bay control function. The protection shall be provided by separate protection IEDs (numerical relays) and other protection devices as per section Relay & Protection. However, for 33kV system the bay control & protection function may be provided in one unit (BCPU).

IEDs, shall be connected to the communication infrastructure for data sharing and meet the real-time communication requirements for automatic functions. The data presentation and the configuration of the various IEDs shall be compatible with the overall system communication and data exchange requirements.

Event and disturbance recording function.

Each IED should contain an event recorder capable of storing at least 200 time-tagged events. This shall give alarm if 70% memory is full. The disturbance recorder function shall be as per protective relays. All disturbances can be viewed at Master Control Centre.

B. System level functions:

i. Status supervision

The position of each switchgear, e.g. circuit breaker, isolator, earthing switch, transformer tap changer etc., shall be supervised continuously. Every detected change of position shall be immediately displayed in the single-line diagram on the station HMI screen, recorded in the event list and a hard copy printout shall be produced. Alarms shall be initiated in the case of spontaneous position changes.

The switchgear positions shall be indicated by two auxiliary switches, normally closed (NC) and normally open (NO), which shall give ambivalent signals. An alarm shall be initiated if these position indications are inconsistent or if the time required for operating mechanism to change position exceeds a predefined limit.

The SAS shall also monitor the status of sub-station auxiliaries. The status and control of auxiliaries shall be done through separate one or more IED and all alarm and analogue values shall be monitored and recorded through this IED.

ii. Measurements

Analogue inputs for voltage and current measurements shall be connected directly to the voltage transformers (VT) and the current transformers (CT) without intermediate transducers. The values of active power (W), reactive power (VAR), frequency (Hz), and the rms values for voltage (U) and current (I) shall be calculated.

The measured values shall be displayed locally on the station HMI and in the control centre. The abnormal values must be discarded. The analogue values shall be updated every 2 seconds. Threshold limit values shall be selectable for alarm indications.

iii. Event and alarm handling

Events and alarms are generated either by the switchgear, by the control IEDs, or by the station level unit. They shall be recorded in an event list in the station HMI. Alarms shall be recorded in a separate alarm list and appear on the screen. All, or a freely selectable group of events and alarms shall also be printed out on an event printer. The alarms and events shall be time-tagged with a time resolution of 1 ms.

iv. Substation HMI:

1. Operation:

On the HMI the object has to be selected first. In case of a blocking or interlocking conditions are not met, the selection shall not be possible and an appropriate alarm annunciation shall occur. If a selection is valid the position indication will show the possible direction, and the appropriate control execution button shall be pressed in order to close or open the corresponding object.

Control operation from other places (e.g. REMOTE) shall not be possible in this operating mode. The operator station HMI shall be a redundant with hot standby and shall provide basic functions for supervision and control of the substation. The operator shall give commands to the switchgear on the screen via mouse clicks or keyboard commands. The HMI shall give the operator access to alarms and events displayed on the screen. Aside from these lists on the screen, there shall be a printout of alarms or events in an event log.

An acoustic alarm shall indicate abnormalities, and all unacknowledged alarms shall be accessible from any screen selected by the operator.

The following standard pictures shall be available from the HMI:

- a. Single-line diagram showing the switchgear status and measured values.
 - b. Control dialogues with interlocking and blocking details. This control dialogue shall tell the operator whether the device operation is permitted or blocked.
 - c. Measurement dialogues
 - d. Alarm list, station / bay-oriented
 - e. Event list, station / bay-oriented
 - f. System status
2. HMI design principles

Consistent design principles shall be adopted with the HMI concerning labels, colours, dialogues and fonts. Non-valid selections shall be dimmed out.

The object status shall be indicated using different status colours for:

- a. Selected object under command
- b. Selected on the screen
- c. Not updated, obsolete values, not in use or not sampled
- d. Alarm or faulty state

- e. Warning or blocked
- f. Update blocked or manually updated
- g. Control blocked
- h. Normal state

Process status displays and command procedures

The process status of the substation in terms of actual values of currents, voltages, frequency, active and reactive powers as well as the positions of circuit breakers, isolators and transformer tap-changers shall be displayed in the station single-line diagram.

In order to ensure a high degree of security against undesired operation, a "select-before-execute" command procedure shall be provided. After the "selection" of a switch, the operator shall be able to recognize the selected device on the screen, and all other switchgear shall be blocked. As communication between control centre and device to be controlled is established, the operator shall be prompted to confirm the control action and only then final execute command shall be accepted. After the "execution" of the command the operated switching symbol shall flash until the switch has reached its new position.

The operator shall be in a position to execute a command only, if the switch is not blocked and if no interlocking condition is going to be violated. The interlocking statements shall be checked by the interlocking scheme implemented at bay and station level.

After command execution the operator shall receive a confirmation that the new switching position has been reached or an indication that the switching procedure was unsuccessful with the indication of the reason for non-functioning.

3. System supervision & display

The SAS system shall be comprehensively self-monitored such that faults are immediately indicated to the operator, possibly before they develop into serious situations. Such faults are recorded as a faulty status in a system supervision display. This display shall cover the status of the entire substation including all switchgear,

IEDs, communication infrastructure and remote communication links, and printers at the station level, etc.

4. Event list

The event list shall contain events that are important for the control and monitoring of the substation. The event and associated time (with 1 ms resolution) of its occurrence has to be displayed for each event.

The operator shall be able to call up the chronological event list on the monitor at any time for the whole substation or sections of it.

A printout of each display shall be possible on the hard copy printer.

The events shall be registered in a chronological event list in which the type of event and its time of occurrence are specified. It shall be possible to store all events in the computer for at least one month. The information shall be obtainable also from a printed event log.

The chronological event list shall contain:

- a. Position changes of circuit breakers, isolators and earthing devices
- b. Indication of protective relay operations
- c. Fault signals from the switchgear
- d. Indication when analogue measured values exceed upper and lower limits. Suitable provision shall be made in the system to define two level of alarm on either side of the value or which shall be user defined for each measurand.
- e. Loss of communication.

Filters for selection of a certain type or group of events shall be available. The filters shall be designed to enable viewing of events grouped per:

- f. Date & time.
- g. Bay
- h. Device

- i. Function e.g. trips, protection operations etc.
 - j. Alarm class
5. Alarm list

Faults and errors occurring in the substation shall be listed in an alarm list and shall be immediately transmitted to the control centre. The alarm list shall substitute conventional alarm tableau, and shall constitute an evaluation of all station alarms. It shall contain unacknowledged alarms and persisting faults. The date and time of occurrence shall be indicated.

The alarm list shall consist of a summary display of the present alarm situation. Each alarm shall be reported on one line that contains:

- a. The date and time of the alarm.
- b. The name of the alarming object.
- c. A descriptive text.
- d. The acknowledgement state.

Whenever an alarm condition occurs, the alarm condition must be shown on the alarm list and must be displayed in a flashing state along with an audible alarm. After acknowledgement of the alarm, it should appear in a steady (i.e. not flashing) state and the audible alarm shall stop. The alarm should disappear only if the alarm condition has physically cleared and the operator has reset the alarm with a reset command. The state of the alarms shall be shown in the alarm list (Unacknowledged and persistent, unacknowledged and cleared, Acknowledged and persistent).

Filters for selection of a certain type or group of alarms shall be available as for events.

6. Object picture

When selecting an object such as a circuit breaker or isolator in the single-line diagram, the associated bay picture shall be presented first. In the selected object picture, all attributes like:

- a. Type of blocking.
- b. Authority.

- c. Local / remote control.
 - d. RCC / SAS control.
 - e. Errors etc. shall be displayed.
7. Control dialogues.

The operator shall give commands to the system by means of mouse click located on the single-line diagram. It shall also be possible to use the keyboard for command activation. Data entry is performed with the keyboard. Dedicated control dialogues for controlling at least the following devices shall be available:

- a. Breaker and disconnectors
 - b. Transformer tap-changer
8. User-authority levels

It shall be possible to restrict activation of the process pictures of each object (bays, apparatus...) within a certain user authorization group. Each user shall then be given access rights to each group of objects, e.g.:

Display only.

Normal operation (e.g. open/close of switchgear)

Restricted operation (e.g. by-passed interlocking)

System administrator

For maintenance and engineering purposes of the station HMI, the following authorization levels shall be available:

No engineering allowed

Engineering/configuration allowed

Entire system management allowed

The access rights shall be defined by passwords assigned during the login procedure. Only the system administrator shall be able to add/remove users and change access rights.

9. Reports

The reports shall provide time-related follow-ups of measured and calculated values. The data displayed shall comprise:

- a. Trend reports:
 - Day (mean, peak)
 - Month (mean, peak)
 - Semi-annual (mean, peak)
 - Year (mean, peak)
- b. Historical reports of selected analogue Values:
 - Day (at 15 minutes interval)
 - Week
 - Month
 - Year

. It shall be possible to select displayed values from the database in the process display on-line. Scrolling between e.g. days shall be possible. Unsure values shall be indicated. It shall be possible to select the time period for which the specific data are kept in the memory

Following printouts shall be available from the printer and shall be printed on demand:

- o Daily voltage and frequency curves depicting time on X-axis and the appropriate parameters on the Y-axis. The time duration of the curve is 24 hours.
- o Weekly trend curves for real and derived analogue values.

- o Printouts of the maximum and minimum values and frequency of occurrence and duration of maximum and minimum values for each analogue parameter for each circuit in 24 hr period.
- o Provision shall be made for logging information about breaker status like number of operation with date and time indications.
- o Equipment operation details shift wise and during 24 hours.
- o Printout on adjustable time period as well as on demand for MW, MVAR, Current, Voltage on each feeder and transformer as well as Tap Positions, temperature and status of pumps and fans for transformers.
- o Printout on adjustable time period as well as on demand system frequency and average frequency.
- o Reports in specified formats which shall be handed over to successful bidder.
- c. Trend display (historical data)

It shall be possible to illustrate all types of process data as trends –input and output data, binary and analogue data. The trends shall be displayed in graphical form as column or curve diagrams with a maximum of 10 trends per screen. Adjustable time span and scaling ranges must be provided.

It shall be possible to change the type of value logging (direct, mean, sum, or difference) on-line in the window. It shall also be possible to change the update intervals on-line in the picture as well as the selection of threshold values for alarming purposes.

- d. Automatic disturbance file transfer

All recorded data from the IEDs with integrated disturbance recorder as well as dedicated disturbance recording systems shall be automatically uploaded (event triggered or once per day) to a dedicated computer and be stored on the hard disc.

- e. Disturbance analysis

The PC-based work station shall have necessary software to evaluate all the required information for proper fault analysis.

f. IED parameter setting

It shall be possible to access all protection and control IEDs for reading the parameters (settings) from the station HMI or from a dedicated monitoring computer. The setting of parameters or the activation of parameter sets shall only be allowed after entering a password.

g. Automatic sequences

The available automatic sequences in the system should be listed and described, (e.g. sequences related to the bus transfer). It must be possible to initiate pre-defined automatic sequences by the operator and also define new automatic sequences.

XIII. Gateway

Gateway offered shall be of reputed make with modular structure & high availability. The Gateway provided for the above system shall be rack mounted. LED indications should be provided on the front of the cards to know the status of communication by looking at the front of the communication card. The Gateway shall also support PLC programming for future controls at the sub-station. Technical parameters to be complied are stipulated hereunder.

A. Technical Parameters of Gateway

1. Power supply: 230 V + / - 10 V , 50 Hz AC
2. Processor Type : Intel Pentium D 820 Processor, 2.8 GHz or
Higher Standard L2 2MB, 800 MHz front side bus Intel R1208GZ4GC, 1U
3. Chipset : Intel Core DUO ,INDUSTRIAL PUPOSE @ 3.1 GHz, or higher
4. Memory Type: 8 GB DDR3, 32 GB max.
5. Standard memory : 4 GB
6. Memory slots: 2 DIMM
7. Hardware monitoring : System Monitor (fan ,temp., Voltage)
8. Memory upgrade : Expandable

9. Internal hard disk drive : 500 GB, 3.5-in. SATA HDD
10. Hard disk drive speed : 7200 rpm
11. Protocols capabilities : IEC 61850, IEC 69870-5-101/104, Modbus
12. Optical drives : 16X DVD-ROM (Combo)
13. Mounting : Rack mountable 4 U height
14. Chassis type : 19" 4 U Industrial Rack mount BP chassis
15. Fans, Air filter, cables : One 12cm & one 8 cm cooling fans with removable filter and lockable front door. ON/OFF, HDD, FDD, RESET with all power & Inter connecting cables.
16. Video adapter, bus : PCI Express TMX16
17. Expansion slots : Two full –height PCI 2.3 slots, one full height PCI Express x1 slot and one full–height PCI x16 slot.
18. Audio : Integrated Audio with External speakers & Microphone.
19. Modem : Integrated 56K PCI Modem
20. Network Interface : Integrated 10/100/1000 Gigabit Fast Ethernet-WOL, Dual RJ-45 with Two LED indicators.
21. External I/O ports : 1xParallel port, 2xSerial port, Selectable RS-232/422/485x 1,6xUSB 2.0 ports , 4xRJ- 45
22. Operating system installed: Gateway software
23. Warranty : 3 year of on-site comprehensive
24. UPS : 1000 VA or higher With 30 Minutes Backup
25. Operating Temp : 0 - 55 °C
26. Relative Humidity : 5 to 95 %(Non-condensing at 40 °C).

27. Antivirus s/w : Registered standard latest Anti-virus software

B. Communication Interface

The Substation Automation System shall have the capability to support independent remote master station. The Substation Automation System shall have communication ports as follows:

- (a) Two ports for Remote Control Centre.
- (b) Two ports for RTU data communication to SLDC.

The communication interface to the SAS shall allow scanning and control of defined points within the substation automation system independently for control centre. The substation automation system shall simultaneously respond to independent scans and commands from employer's control centers. The substation automation system shall support the use of a different communication data exchange rate (bits per second), scanning cycle, and/or communication protocol to each remote control centre. Also, each control center's data scan and control commands may be different for different data points within the substation automation system's database.

The SAS shall also allow all necessary RTU data transfer to SLDC main RTU system. There may require typical protocol converter depending upon SLDC RTU system. Communication media may be leased line, PLCC, Radio or any other means.

C. Master Control Centre Communication (NET WORK CONTROL CENTER) Interface

Communication channels between the Substation Automation System and the master control centre (Net Work Control Centre) will consist either of OPGW, power line carrier, microwave, optical fiber, VSAT or leased line, as the case may be, as specified.

D. Interface equipment:

The Contractor shall provide interface equipment for communicating between Substation Automation system and Remote control centre (RCC).

In case of PLCC communication any modem supplied shall not require manual equalization and shall include self-test features such as manual mark/space keying, analogue loop-back, and digital loop-back. The modems shall provide for convenient adjustment of output level and receive sensitivity. The modem should be stand alone

complete in all respects including power supply to interface the SAS with communication channel. The configuration of tones and speed shall be programmable and maintained in non-volatile memory in the modem. All necessary hardware and software shall also be in the scope of bidder except the communication link along with communication equipment between substation control room and Remote Control Centre.

E. Communication Protocol

The communication protocol for gateway to control centre must be open protocol and shall support IEC 60870-5-104 and IEC 61850 for all levels of communication for substation automation such as Gateway to remote station and Bay to station HMI, etc. respectively.

XIV. System hardware:

A. SCADA Equipment:

The contractor shall provide redundant station HMI in hot standby mode.

It shall be capable to perform all functions for entire substation including future requirements as indicated in the SLD. It shall use industrial grade components.

Processor and RAM shall be selected in such a manner that during normal operation not more than 30% capacity of processing and memory are used. Supplier shall demonstrate these features.

The capacity of hard disk shall be selected such that the following requirement should occupy less than 50% of disk space:

1. Storage of all analogue data (at 15 Minutes interval) and digital data including alarm, event and trend data for thirty(30) days.
2. Storage of all necessary software,
3. 100 GB space for OWNER'S use.

Supplier shall demonstrate that the capacity of hard disk is sufficient to meet the above requirement.

B. HMI (Human Machine Interface)

The VDU shall show overview diagrams (Single Line Diagrams) and complete details of the switchgear with a colour display. All event and alarm annunciation shall be selectable in the form of lists. Operation shall be by a user friendly function keyboard and a cursor positioning device. The user interface shall be based on WINDOWS concepts with graphics & facility for panning, scrolling, zooming, decluttering etc.

C. Mass Storage Unit

The mass storage unit shall be built-in to the Station HMI. All operational measured values and indications shall be stored in a mass-storage unit of CD-ROM / DVD-ROM with 700 MB or more capacity. The unit should support at least Read (48X), Write (24X), and Re-Write (10X) operations, with Multi-Session capability. It should support ISO9660, Rockridge and Joliet File systems. It should support formatting and use under the operating system provided for Station HMI. The monthly back up of data shall be taken on disc. The facility of back up of data shall be inherent in the software.

D. Visual Display Units/TFT's (Thin Film Technology)

The contractor shall provide three display units, one for station HMI, one for redundant HMI and one for DR work station. These shall have high resolution and reflection protected picture screen. High stability of the picture geometry shall be ensured. The screen shall be at least 21" diagonally in size and capable of colour graphic displays.

The display shall accommodate resolution of 2560 X 1440 pixels. The HMI shall be able to switch the key board and cursor positioning device, as unit among all the monitors at a console with push button or other controls.

E. Printers

It shall be laser jet color printer & the printing operation shall be quiet with a noise level of less than 55 dB suitable for location in the control room. Printer shall accept and print all ASCII characters via master control computer unit interface.

The printer shall have in built testing facility. Failure of the printer shall be indicated in the Station HMI. The printer shall have an off line mode selector switch to enable safe maintenance. The maintenance should be simple with provisions for ease of change of print head, ribbon changing, paper insertion etc.

F. Switched Ethernet Communication Infrastructure:

The bidder shall provide the redundant switched optical Ethernet communication infrastructure for SAS. The bidder shall keep provision of 100% spare capacity for employer use. One switch shall be provided to connect all IEDs housed in respective kiosk.

G. Bay level unit (BCU)

a) Location:

The bay control units will be located inside the relay kiosks, which are located throughout the ehv substation's.

b) Interfacing:

All bay control units shall contain an optical-fiber serial interface for connection to the HMI center and a RS 232 serial interface for connection to a PC.

All optical-fiber cables will be part of the supply as well.

c) Interfacing with the equipment of the switchyard:

The bay control units shall be capable of interfacing with the equipment of the switchyard. All digital and analog input signals from the equipment of the switchyard and out-going carrying command and control signals to the various equipment will interface with the bay control units through terminal blocks located inside the relay kiosks. These incoming and out-going signals will be wired by PPC with conventional control cables of cross section of 2.5 mm² (that is from the terminal blocks to and from the switchyard equipment) except for the VTs and CTs circuits, which utilize cables of 4mm² in cross section

d) Isolation from the switchyard equipment:

The bay control units shall provide isolation from the switchyard equipment via heavy duty relay contacts or by other means.

e) Parameterization and control:

Parameterization and control for the bay control units shall be performed via an integrated graphic display and keypad and also via PC.

f) Analog inputs signals:

Analog input signals can be input to the bay control units either via analog transducers or by direct connection to CTs and VTs. If transducers are required, the supplier will supply these transducers.

g) Mounting:

The bay control units shall be suitable for panel flash mounting or ½ flash panel mounting.

The bay unit shall use industrial grade components. The bay level unit, based on microprocessor technology, shall use numerical techniques for the calculation and evaluation of externally input analogue signals. They shall incorporate select-before-operate control principles as safety measures for operation via the HMI. They shall perform all bay related functions, such as control commands, bay interlocking, data acquisition, data storage, event recording and shall provide inputs for status indication and outputs for commands. They shall be directly connected to the switchgear via TBs. Connections from BCU to switchgear should not be terminated directly on I/O boards but should be routed through Terminal Boards (TB). The bay unit shall acquire and process all data for the bay (Equipment status, fault indications, measured values, alarms etc.) and transmit these to the other devices in sub-station automation system. In addition, this shall receive the operation commands from station HMI and control centre. The bay unit shall have the capability to store all the data for at least 24 hours. One No. Bay level unit shall be provided for supervision and control of each 400, 220 and 132 KV bay (a bay comprises of one circuit breaker and associated disconnectors, earth switches, instrument transformers etc). The Bay level unit shall be equipped with analogue and binary inputs/outputs for handling the control, status monitoring and analogue measurement functions. All bay level interlocks are to be incorporated in the Bay level unit so as to permit control from the Bay level unit/ local bay mimic panel, with all bay interlocks in place, during maintenance and commissioning or in case of contingencies when the Station HMI is out of service. The Bay level unit shall meet the

requirements for withstanding electromagnetic interference according to relevant parts of IEC 61850. Failure of any single component within the equipment shall neither cause unwanted operation nor lead to a complete system breakdown.

Surface-mount technology (SMT) should be used for printed circuit boards (PCB) of BCU. Further a conformal coating should be applied to the PCB for ensuring optimum performance under the toughest environment conditions.

i. Input/Output (I/O) modules

The I/O modules shall form a part of the bay level unit and shall provide coupling to the substation equipment. The I/O modules shall acquire all switchgear information (i.e. data coming directly from the switchgear or from switchgear interlocking devices) and transmit commands for operation of the switchgear. The measured values of voltage and current shall be from the secondary of instrument transformers. The digital inputs shall be acquired by exception with 1 ms resolution. Contact bouncing in digital inputs shall not be assumed as change of state. Connections from BCU to switchgear should not be terminated directly on I/O boards but should be routed through Terminal Boards (TB).

ii. Technical Parameters of BCU

1. Power supply : 220 VDC, + 20%, Power consumption: < 50W Ripple (peak to peak): < 12%.

2. Protocol Capabilities : The BCU should have ethernet module to connect to the communication buses (like the station bus) that use the IEC 61850-8-1 protocol.

The module should have one or two optical ports with ST/LC connectors & Ethernet electrical RJ 45 connector.

IEC 61850-8-1 communication protocol-100BASE-FX,

Transmission rate-1000Mbit, Ethernet Electrical –RJ45, Test Volt-500V AC against ground. Distance Max. 20meter.

Ethernet Optical- LC/ST connector , Wavelength- 1300nm, Distance-Max. 1.5km.

3. IED Communication: : 1. IEC 60870-5-103 (T103)

2. Modbus

3. DNP3

4. IEC 60870-5-101 (T101)

All these networks use a serial link to communicate with IEDs.

5. Time synchronisation : External Time Synchronization from IRIG B BNC plug, Amplitude modulated/ Ethernet SNTP Time Server (<1ms accuracy)

4 Binary Input processing : Hardwired Digital Input should be acquired via digital boards or IED connected by a serial link. Software Digital Input coming from configurable relays & other devices with 1 ms time tagging support GOOSE mode digital boards or IED connected by a serial link. Software Digital Input coming from configurable relays & other devices with 1 ms time tagging. Support GOOSE mode.

No of Binary Input : 32 Nos. for 132kV & 220kV System and 48 Nos. for 400kV System.

Operating Volt: 220V DC. (Max.300V)

5 Analogue Input processing:a. Four Voltage Inputs :

Nominal AC voltage (Vn) range :110V,110V/ $\sqrt{3}$

Frequency operating range: 50 Hz \pm 10%

VT load rating: 10 seconds with no destruction 880 V r m s

b. Four Current Input:

Nominal AC current (In) :1 A r m s Minimum measurable current with same accuracy :0.2 A r m s Maximum measurable current 4 A r m s (4*In) Frequency 50 Hz \pm 10%.

c. Analogue Transducers input :

8 insulated transducer input (-20mA to +20mA) values on 8 independent galvanic-isolated channels. This means that there is no common point of contact between two

analogue inputs. Each analogue input can be configured in the current range or voltage range.

Overload Capacity :100mA

Sampling period 100 ms

Accuracy 0,1% full scale for each range at 25°C

AD conversion 16 bits (15 bits+sign bit).

6 Measured value acquisition :Monitoring of calculated four CT & four PT/CVT

direct primary measures.

7 Derived values : From the direct primary measures:

RMS currents & voltages, network frequency, active power, reactive power, apparent power, Power factor, Phase angles.

8 Digital Outputs : DO used for switching device in field or inside

C/R via digital boards, should also configurable & contain security, interlocks etc.

No. of out put relays : 16 Nos. for 132kV System.

24 Nos. for 220kV and 32Nos. for 400kV system.

Nominal operating voltage :220VDC (Max.300V)

Make: 5A

Carry: 5A continuously

30A for 500 mseconds.

Break DC: 50 W resistive, 15 W inductive (L/R = 40 ms).

9 Sub-station/bay : Should use logical equation and pre defined Inter-locking rules & sub-station topology for operation.

: Should use logical equation and pre defined Inter-locking rules & sub-station topology for operation.

10 Trip Circuit Supervision :Supervise trip circuits for both the conditions of Breaker.

11 Event Logging : Storage of events up to 2000 in ROM.

:Storage of events up to 2000 in ROM.

12 Disturbance files & wave forms :Five records of waveforms and disturbance record of wave forms files stored and accessible by HMI/DR work Station.

13 Gateway support :Should interface with Gateway for Remote Control facility

14 Local control, Operation :Local control & Operation should be possible and Display using backlit LCD Display and keypad of BCU.

15 Self- monitoring :Power ON and continuous cyclic self-monitoring

tests. Abnormality result should be displayed.

16 I/O processing : As per our required I/O list with 20% extra for Capacities each bay.

17 Internal Ethernet :4 X 10/100 Base T (RJ-45) ports+2X10/100 Base Switches Fx (optical) ports for redundant Ethernet network.

18 Additional ports :1 X RS232 and 3 X RS485 can support IEC 103

Modbus, should be s/w configurable.

19 Environmental conditions : :Operating temperature: -5°C to + 70 °C

Storage temperature: -5°C to + 70 °C

: 0°C to + 70 °C Humidity: 5 to 95 % (Non-condensing).

20 Mounting & design :19" Rack fitting with modular design.

21 Warranty .:3 year of on-site comprehensive.

XV. Inverters of UPS

Redundant ,SCADA Compatible, Output: 230 V Stabilized AC with 30 X 12V, 26 AH battery set ,Capable of handling all SCADA equipment containing HMI PCs, DR Work station, Gateways, modems, all Printers, etc. installed in C/R. One battery set will be common for both the inverters. An arrangement should be made such that it should be always connected with the inverter which provides load to SCADA equipment.

INPUT SPECIFICATIONS Voltages 230 VAC

Voltage Range -20% to +15%

Frequency 50 Hz

Protection Input circuit breaker provided protection to the unit, load and personnel. Input Circuit Breaker will be higher interruption rated.

Input Current Sinusoidal, .95 PF under all line/load conditions

Number of Wires 2 Wires Plus Ground

OUTPUT SPECIFICATION

Available Output Ratings (KVA or KW to be specified) 3 KVA / 2.1 KW

Output Voltages

230 VAC

Voltage Regulations $\pm 3\%$ No Load to Full Load, High Line to Low Line

Frequency 50 Hz +/- 0.5 HZ (when on inverter)

Output Wave Form Sine Wave

Harmonic Distortion <5 % THD; <3% Single Harmonic

Crest Factor 3 to 1

Overload 125% for Ten (10) Minutes; 150% Surge for 10 seconds

Protection Internal electronic overload protection. Circuit breaker provides inherent overload protection.

Efficiency 90% typical

Isolation Complete from line. Output neutral bonded to ground

Noise Isolation 120 dB Common-Mode: -60 dB Transverse- Mode

Power Connections Hard Wired (Terminal Block) Optional Output Receptacle Panels w/

NEMA Type Receptacles and Overcurrent Protection

Number of Wires 2 Wires Plus Ground

BATTERY SPECIFICATIONS Run Time 5 minutes – up to 6 hrs available

Optional Run Time Select 15 min, 30 min, 45 min, 60 min, 90 min, 120 min, 180 min or 240 min.

Battery Type Sealed, Maintenance-Free (AGM) battery, (Optional Long Life Battery)

Expected Life 10 Years

Charger Ampacity < 10 times discharge

Float Voltage 2.25 Volts per Cell

Protection Fuses, DC Disconnect or Circuit Breaker

XVI. Extendibility in future

Offered substation automation system shall be suitable for extension in future for additional bays. During such requirement, all the drawings and configurations, alarm/event list etc. displayed shall be designed in such a manner that its extension shall be easily performed by the employer. During such event, normal operation of the

existing substation shall be unaffected and system shall not require a shutdown. The contractor shall provide all necessary software tools along with source codes to perform addition of bays in future and complete integration with SAS by the user. These software tools shall be able to configure IED, add additional analogue variable, alarm list, event list, modify interlocking logics etc. for additional bays/equipment which shall be added in future. HMI h/w & s/w should also support extreme extendibility as per future layout.

XVII. Software structure.

The software package shall be structured according to the SAS architecture and strictly divided in various levels. Necessary firewall shall be provided at suitable points in software to protect the system. An extension of the station shall be possible with lowest possible efforts. Maintenance, modification or an extension of components of any feeder may not force a shut-down of the parts of the system which are not affected by the system adaptation.

1. Station level software:

a. Human-machine interface (HMI)

The base HMI software package for the operator station shall include the main SAS functions and it shall be independent of project specific hardware version and operating system. It shall further include tools for picture editing, engineering and system configuration. The system shall be easy to use, to maintain, and to adapt according to specific user requirements.

Systems shall contain a library with standard functions and applications.

b. System software

The system software shall be structured in various levels. This software shall be placed in a non-volatile memory. The lowest level shall assure system performance and contain basic functions, which shall not be accessible by the application and maintenance engineer for modifications. The system shall support the generation of typical control macros and a process database for user specific data storage. In case of restoration of links after failure, the software along with hardware shall be capable of automatically synchronizing with the remaining system without any manual interface. This shall be demonstrated by contractor during integrated system test.

c. Gateways Software

i. Gateway (RCC)

Software of Gateway should be suitable for controlling s/s remotely.

ii. Gateway (RTU)

Software of Gateway should be suitable for sending RTU data to SLDC existing RTU scheme by using protocol converter or any means.

d. Application software

In order to ensure robust quality and reliable software functions, the main part of the application software shall consist of standard software modules built as functional block elements. The functional blocks shall be documented and thoroughly tested. They form part of a library. The application software within the control/protection devices shall be programmed in a functional block language.

e. Network Management System for D.R. Work Station:

The contractor shall provide network management system software for following management functions:

i. Configuration Management

ii. Fault Management

iii. Performance Monitoring.

This system shall be used for management of communication devices and other IEDs in the system. This NMS can be loaded in DR work-station and shall be easy to use, user friendly and menu based. The NMS shall monitor all the devices in the SAS and report if there is any fault in the monitored devices. The NMS shall ;

i. Maintain performance, resource usage, and error statistics for all managed links and devices and present this information via displays, periodic reports and on demand reports.

ii. Maintain a graphical display of SAS connectivity and device status.

- iii. Issue alarms when error conditions occur.
- iv. Provide facility to add and delete addresses and links.
- f. The contractor shall provide each software in two copies in CD to load into the system in case of any problem related with Hardware/Communication etc.

XVIII. TESTS

The bidder shall submit the complete type test reports as stated hereunder for the offered item along with the offer otherwise the offer shall be liable to be rejected. These tests must have been conducted in the NABL approved laboratory as per IEC 60255, IEC 60068, IEC 61000, IEC 60529, IEC 61010-1 & IEC 61850 within last 5 years prior to date of validation of the offer. Complete type test reports containing test procedure, drawings, oscillograms etc. shall be submitted.

The substation automation system offered by the bidder shall be subjected to following tests to establish compliance with IEC 61850 for EHV substation equipment installed in sheltered area in the outdoor switchyard and specified ambient conditions:

A. Type Tests:

1. Control IEDs and Communication Equipment:

- a. Performance tests
 - i. Accuracy requirements
 - ii. Limits of operating range of auxiliary energizing inputs and auxiliary Voltage dependence.
 - iii. Limits of frequency range and frequency dependence
 - iv. Rated burden
 - v. Mechanical Endurance test
 - vi. Characteristic and Functional test
- b. Thermal requirements
 - i. Maximum allowable temperature

- ii. Limits of short time thermal withstand value of input energizing quantities
- iii. Limiting dynamic value
- c. Insulation Tests:
 - i. Dielectric Tests
 - ii. Impulse Voltage withstand Test
 - iii. Insulation resistance measurement
- d. Influencing Quantities:
 - i. Permissible ripples
 - ii. Interruption of input voltage
- e. Electromagnetic Compatibility Test:
 - i. 1 MHZ burst disturbance test
 - ii. Electrostatic Discharge Test
 - iii. Radiated Electromagnetic Field Disturbance Test
 - iv. Electrical Fast transient Disturbance Test
 - v. Conducted Disturbances Tests induced by Radio Frequency Field
 - vi. Magnetic Field Test
 - vii. Emission (Conducted and Radiated) Test.
 - viii. Surge Immunity Test
- f. Contact performance Test
 - i. Contact making/Breaking capacity test
 - ii. Continuous capacity
 - iii.
- g. Environmental tests:

- i. Cold Temperature
- ii. Dry Heat
- iii. Storage temperature test
- iv. Humidity (Damp heat Cycle)
- h. Mechanical Tests:
 - i. Vibration response & Vibration endurance test
 - ii. Bump test
 - iii. Shock response test
 - iv. Seismic test
- i. Enclosure Test:
 - i. Degree of Protection test – IP51
- j. Safety Test:
 - i. Single fault condition assessment
 - ii. Earth bonding impedance test
 - iii. Mechanical resistance to shock and impact
 - iv. Protection against electrical shock
 - v. Protection against the spread of fire
- k. IEC 61850 Compatibility tests

B. Factory Acceptance Tests:

The supplier shall submit a test specification for factory acceptance test (FAT) and commissioning tests of the station automation system for approval. For the individual bay level IED's applicable type test certificates shall be submitted. The manufacturing phase of the SAS shall be concluded by the factory acceptance test (FAT). The purpose is to ensure that the Contractor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general Page 84 of 116

philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. If the FAT comprises only a certain portion of the system for practical reason, it has to be assured that this test configuration contains at least one unit of each and every type of equipment incorporated in the delivered system. If the complete system consists of parts from various suppliers or some parts are already installed on site, the FAT shall be limited to sub-system tests. In such a case, the complete system test shall be performed on site together with the site acceptance test (SAT).

C. Integrated Testing:

The integrated system tests shall be performed as detailed in subsequent clauses as per following configuration:

Redundant Station HMI, DR work station, two switches (i.e. for two diameters) along with all IEDs for the Dia. and printers.

All other switches for complete sub-station as detailed in section project shall be simulated as needed.

D. Hardware Integration Tests:

The hardware integration test shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system. The equipment expansion capability shall also be verified during the hardware integration tests.

E. Integrated System Tests:

Integrated system tests shall verify the stability of the hardware and the software. During the tests all functions shall run concurrently and all equipment shall operate a continuous 100 Hours period. The integrated system test shall ensure the SAS is free of improper interactions between software and hardware while the system is operating as a whole.

F. Field Tests:

The field tests shall completely verify all the features of SAS hardware and software.

G. System Performance:

It shall be the responsibility of the bidder to predict and indicate in the bid, the worst case loading condition and design the system accordingly to meet the same. The worst case loading condition shall include following

- All analogue inputs scanning and processing in progress and all data is being transmitted over the system bus every one second.
- A burst of 100 alarms is generated over a period of 10 seconds.
- An operator control is generated every 10 seconds.
- Data collection for logs/reports is in progress.
- Data collection for historical storage and trend function in progress.
- Data collection of fault record is in progress.
- All health monitoring functions/diagnostics in progress.
- All output devices are in operation with rated performance/speed.
- All data are transferred to the control centre.

The updating time on the operator station under normal and calm/worst conditions in the station shall be:

Function	Response Time
----------	---------------

From Selection of object to picture colour change form object	< 1 Sec.
---	----------

Command Execute < 1 Sec.

Display of binary change < 0.5 Sec.

Display of Analog Value Change <1 Sec.

System Display with 100 variables	Max. 3 Sec.
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Times taken to report the last of 50 simultaneous alarms Max. 5 Sec.

Updating Database < 1 Sec.

H. Duty cycle time

- a. Under worst loading condition processor shall have
 - 1. 40 % free time when measured over any two second period
 - 2. 60% free time when measured over any one minute period
- b. Substation network spare time

50 % spare time when measured over any two second period during worst case loading conditions.

Bidder shall furnish necessary data to fully satisfy employer that processor spare duty cycle figures quoted by the bidder are realistic and based on configuration and computational capability of the offered system and these shall be actually implemented system as commissioned at project site.

XIX. System Operation

1. Substation Operation

a. Normal Operation

Operation of the system by the operator from the MCC or at the substation shall take place via industry standard HMI (Human Machine interface) subsystem consisting of graphic colour VDU, a standard keyboard and a cursor positioning device (mouse).

The coloured screen shall be divided into 3 fields:

- i) Message field with display of present time and date
- ii) Display field for single line diagrams
- iii) Navigation bar with alarm/condition indication

For display of alarm annunciation, lists of events etc a separate HMI View node shall be provided.

All operations shall be performed with mouse and/or a minimum number of function keys and cursor keys. The function keys shall have different meanings depending on the operation. The operator shall see the relevant meanings as function tests displayed in the command field (i.e. operator prompting). For control actions, the switchgear (i.e. circuit breaker etc.) requested shall be selectable on the display by means of the cursor keys.

The switching element selected shall then appear on the background that shall be flashing in a different color. The operator prompting shall distinguish between:

Prompting of indications e.g. fault indications in the switchgear, and prompting of operational sequences e.g. execution of switching operations.

The summary information displayed in the message field shall give a rapid display of alarm/message of the system in which a fault has occurred and alarm annunciation lists in which the fault is described more fully.

Each operational sequence shall be divided into single operation steps which are initiated by means of the function keys/WINDOW command by mouse. Operator prompting shall be designed in such a manner that only the permissible keys are available in the command field related to the specific operation step. Only those switching elements shall be accessed for which control actions are possible. If the operation step is rejected by the system, the operator prompting shall be supported by additional comments in the message field. The operation status shall be reset to the corresponding preceding step in the operation sequence by pressing one of the function keys. All operations shall be verified. Incorrect operations shall be indicated by comments in the message field and must not be executed.

The offer shall include a comprehensive description of the system. The above operation shall also be possible via WINDOWS based system by mouse.

XX. Power Supply

Power for the substation automation system shall be derived UPS. Inverter of suitable capacity shall be provided for station HMIs, DR work station, Gateways and its peripheral devices e.g. printers etc. There must be redundant Inverter to feed power in case of one inverter fails. In case of failure of one Inverter supply should automatically

switched over to second one. In the event of total Power failure, necessary safeguard software shall be built for proper shutdown and restart.

XXII. Documentation

The following documents shall be submitted for employer's approval during detailed engineering:

- (a) System Architecture Drawing
- (b) Hardware Specification
- (c) Sizing Calculations of various components
- (d) Response Time Calculation
- (e) Functional Design Document

The following documentation to be provided for the system in the course of the project shall be consistent, CAD supported.

- List of Drawings.
- Substation automation system architecture.
- Block Diagram.
- Guaranteed technical parameters, Functional Design Specification and guaranteed availability and reliability.
- Calculation for power supply dimensioning.
- I/O Signal lists.
- Schematic diagrams.
- List of Apparatus.
- List of Labels.
- Logic Diagram (hardware & software).
- Kiosk layout drawing.

- GA of kiosk and GTP.
- Control Room Lay-out.
- Test Specification for Factory Acceptance Test (FAT).
- Product Manuals.
- Assembly Drawing.
- Operator's Manual.
- Complete documentation of implemented protocols between various elements.
- Listing of software and loadable in CD ROM.

Other documents as may be required during detailed engineering.

Two sets of hard copy and four sets of CD ROM containing all the as built documents/drawings shall be provided.

XXII. GUARNTTEE.

The availability for the complete SAS shall be guaranteed by the Contractor. Bidder shall include in their offer the detailed calculation for the availability. The contractor shall demonstrate their availability guaranteed by conducting the availability test on the total sub-station automation system as a whole after commissioning of total Sub-station Automation system. The test shall verify the reliability and integrity of all sub-systems. Under these conditions the test shall establish an overall availability of 99.98%. After the lapse of 1000 Hours of cumulative test time, test records shall be examined to determine the conformance with availability criterion. In case of any outage during the availability test, the contractor shall rectify the problem and after rectification, the 1000 Hours period start after such rectification. If test object has not been met the test shall continue until the specified availability is achieved.

The contractor has to establish the availability in a maximum period of three months from the date of commencement of the availability test.

After the satisfactory conclusion of test both contractor and employer shall mutually agree to the test results and if these results satisfy the availability criterion, the test is

considered to be completed successfully. After that the system shall be taken over by the employer and then the guarantee period shall start.

The SAS supplied under this specification shall be designed and constructed to meet all specification requirements for 15 years. Further the bidder should support for hardware and software for 15 (fifteen) years to guard against obsolescence. SAS equipment or components that cannot meet this life expectancy or specified design and operational requirement or likely to become obsolete during entire service life shall be identified and their expected failure rate/obsolescence period with corrective action shall be indicated by the bidder in his proposal. Otherwise SAS shall be deemed to be suitable for above requirements. All requirements/devices not listed under recommended spares shall have a normal expectancy exceeding the specified expected life of SAS

XXIII. TRAINING, SUPPORT SERVICES, MAINTENANCE AND SPARES

A. TRAINING

The contractor shall impart training for two batches of engineers of OPTCL on the topics of SAS as listed below .

1. SAS Computer System Hardware Course

A SAS computer system hardware course shall be offered, but at the system level only. The training course shall be designed to give Employer hardware personnel sufficient knowledge of the overall design and operation of the system so that they can correct obvious problems, configure the hardware, perform preventive maintenance, run diagnostic programs, and communicate with contract maintenance personnel. The following subjects shall be covered:

- a. System Hardware Overview: Configuration of the system hardware.
- b. Equipment Maintenance: Basic theory of operation, maintenance techniques and diagnostic procedures for each element of the computer system, e.g., processors, auxiliary memories, LANs, routers and printers. Configuration of all the hardware equipments.
- c. System Expansion: Techniques and procedures to expand and add equipment such as loggers, monitors, and communication channels.

- d. System Maintenance: Theory of operation and maintenance of the redundant hardware configuration, failover hardware, configuration control panels, and failover switches. Maintenance of protective devices and power supplies.
- e. Subsystem Maintenance: Theory of design and operation, maintenance techniques and practices, diagnostic procedures, and (where applicable) expansion techniques and procedures. Classes shall include hands-on training for the specific subsystems that are part of Employer's equipment or part of similarly designed and configured subsystems. All interfaces to the computing equipment shall be taught in detail.
- f. Operational Training: Practical training on preventive and corrective maintenance of all equipment, including use of special tools and instruments. This training shall be provided on Employer equipment, or on similarly configured systems.

2. SAS Computer System Software Course

The Contractor shall provide a computer system software course that covers the following subjects:

- a. System Programming: Including all applicable programming languages and all stand-alone service and utility packages provided with the system. An introduction to software architecture, Effect of tuning parameters (OS software, Network software, database software etc.) on the performance of the system.
- b. Operating System: Including the user aspects of the operating system, such as program loading and integrating procedures; scheduling, management, service, and utility functions; and system expansion techniques and procedures.
- c. System Initialization and Failover: Including design, theory of operation, and practice
- d. Diagnostics: Including the execution of diagnostic procedures and the interpretation of diagnostic outputs,
- e. Software Documentation: Orientation in the organization and use of system software documentation.

f. Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary.

3. SAS Application Software Course:

The Contractor shall provide a comprehensive application software courses covering all applications including the database and display building course. The training shall include:

a. Overview: Block diagrams of the application software and data flows. Programming standards and program interface conventions.

b. Application Functions: Functional capabilities, design, and major algorithms. Associated maintenance and expansion techniques.

c. Software Development: Techniques and conventions to be used for the preparation and integration of new software functions.

d. Software Generation: Generation of application software from source code and associated software configuration control procedures.

e. Software Documentation: Orientation in the organization and use of functional and detailed design documentation and of programmer and user manuals.

f. Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary.

B. MAINTENANCE

Maintenance Responsibility during the Guaranteed Availability Period. During guaranteed Availability Period, the Contractor shall take continual actions to ensure the guaranteed availability and shall make available all the necessary resources such as specialist personnel, spare parts, tools, test devices etc. for replacement or repair of all defective parts and shall have prime responsibility for keeping the system operational.

C. Reliability and availability.

The SAS shall be designed so that the failure of any single component, processor, or device shall not render the system unavailable. Each component and equipment offered by the bidder shall be of established reliability. The minimum target reliability of each piece or equipment like each electronic module/card Power supply, Peripherals etc. shall be established by bidder considering its failure rates/mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of complete system is assured. The guaranteed annual system availability shall not be less than 99.9%. This shall be supported by detailed calculation according to availability calculations specified in IEEE standard –1046 or equivalent. This shall be submitted by bidder along with offer. The SAS shall be designed to satisfy the very high demands for reliability and availability concerning:

- i. Mechanical and electrical design
- ii. Security against electrical interference (EMI)
- iii. High quality components and boards
- iv. Modular, well-tested hardware
- v. Thoroughly developed and tested modular software
- vi. Easy-to-understand programming language for application programming
- vii. Detailed graphical documentation and application software
- viii. Built-in supervision and diagnostic functions
- ix. Security
- x. Experience of security requirements
- xi. Process know-how
- xii. Select before execute at operation
- xiii. Process status representation as double indications
- xiv. Distributed solution
- xv. Independent units connected to the local area network

- xvi. Back-up functions
- xvii. Panel design appropriate to the harsh electrical environment and ambient
- xviii. conditions
- xix. Panel grounding immune against transient ground potential rise

Outage terms

i. Outage: The state in which substation automation system or a unit of SAS is unavailable for Normal Operation due to an event directly related to the SAS or unit of SAS. In the event, the owner has taken any equipment/ systems other than Sub-station Automation System for schedule/forced maintenance, the consequent outage to SAS shall not be considered as outage for the purpose of availability.

ii. Actual outage duration (AOD)

The time elapsed in hours between the start and the end of an outage. The time shall be counted to the nearest 1/4th of an hour. Time less than 1/4th of an hour shall be counted as having duration of 1/4th of an hour.

iii. Period Hours (PH)

The number of hours in the reporting period. In a full year the period hour are 8760h (8784h for a leap year).

iv. Actual Outage hours (AOH)

The sum of actual outage duration within the reporting period $AOH = \sum AOD$

v. Availability:

Each SAS shall have a total availability of 99.98 % i.e. the ratio of total time duration minus the actual outage duration to total time duration.

D. SPARES:

The contractor shall make a list of spares which may be required for ensuring the guaranteed availability of the system. The contractor should keep the same at site for free replacement during the guaranteed period. Further, the contractor shall make a list of spares for running the system with guaranteed availability beyond the guaranteed period. The said spares list shall form the part of scope of supply and accordingly the price thereof shall be quoted by the bidder and shall be considered.

All consumables such as paper, cartridges shall be supplied by the contractor till the SAS is taken over by the owner.

XXIV. ADDITIONAL REQUIRED DESIGN CHARACTERISTICS OF THE

SUBSTATION AUTOMATION SYSTEM FOR THE EHV SUBSTATION

1. All wording appearing on the VDU with regard the single line diagrams of the ehv substation shall be in English language.
2. Care shall be taken so that the system can be expanded in the future, if needed.
3. The database, after it has been created, will be delivered on CD-ROMs.
4. Due to IEC-61850 communication protocol implementation, the following should be applied:
 - 4.1 For all “functions” within the substation, an object oriented data model will be provided grouping the data into the smallest possible independent functions named Logical Nodes (LN). Entire functionality of S.A.S split into LNs.

The LNs and all data attributes contained therein will be named according to standardised “semantic”. The Substation Configuration Language used to configure the S.A.S and individual IEDs is the SCL language.

- 4.2 Complete S.A.S will be formally documented within SCL especially through SCD (Substation Configuration Description) files.

The SCD files will ensure that all system engineering work has been recorded for re-use in future adaptations, extensions and refurbishment of the S.A.S. The SCD files is part of the documentation that PPC will receive with the delivery of the System.

XXV. COMMISSIONING

The commissioning of the system shall be carried out by the supplier of the system, therefore the cost of the commissioning of the system must be included in the economic offer.