OFFICE OF CHIEF LOAD DESPATCHER, SLDC ODISHA
POWER TRANSMISSION CORPORATION LTDTENDER
SPECIFICATION NO. SLDC-03/2023-24

SURVEY, DESIGN, DEVELOPMENT, SUPPLY, INSTALLATION, TESTING, COMMISSIONING & ANNUAL MAINTENANCE CONTRACT OF PMU BASED WIDE AREA MEASUREMENT SYSTEM IN SLDC, OPTCL NETWORK.

(e-Tendering mode only)

PART-I

SECTION-I: INSTRUCTION TO BIDDERS

SECTION-II: GENERAL TERMS AND CONDITIONS OF CONTRACT

SECTION-III: LIST OF ANNEXURES

SECTION IV: SCOPE OF WORK

SECTION-V: TECHNICAL SPECIFICATION.

SECTION-VI: ANNUAL MAINTENANCE CONTRACT

PART-II

SECTION-VII: PRICE BID

Table 1 Schedule of Dates

1	Request for online tender documents	From Date 15.12.2023 (10.00 Hrs) To Date 16.01.2024 (12.30 Hrs)
2	Pre-Bid Meeting	Date: 27.12.2023 (11.00 Hrs)
3	Last date of submission of online tender	Date: 16.01.2024 (16.30 Hrs)
4	Date of opening of Tender	Date: 17.01.2024 (11.00 Hrs)

NOTICE INVITING TENDER
OFFICE OF CHIEF LOAD DESPATCHER, SLDC
ODISHA POWER TRANSMISSION CORPORATION LTD
TENDER SPECIFICATION NO. SLDC-03/2023-24

For and on behalf of the STATE LOAD DESPATCH CENTER, OPTCL, the undersigned invites bids from firms for **"SURVEY, DESIGN, DEVELOPMENT, SUPPLY, INSTALLATION, TESTING, COMMISSIONING & ANNUAL MAINTENANCE CONTRACT OF PMU BASED WIDE AREA MEASUREMENT SYSTEM IN SLDC, OPTCL NETWORK"** in e- tendering mode only as per the following details.

Table 2 Tender Details

Sl. No	Tender Specification No.	Description of work	Quantity /Unit	EMD (₹)	Cost of Tender document(₹)	Tender Processing Fee (₹)	Last date of receipt & opening of tender
1.	SLDC-03/2023-24	**SURVEY, DESIGN, DEVELOPMENT, SUPPLY, INSTALLATION, TESTING, COMMISSIONING & ANNUAL MAINTENANCE CONTRACT OF PMU BASED WIDE AREA MEASUREMENT SYSTEM IN SLDC, OPTCL NETWORK.**	1 Lot	21,10,000	25,000/-+ GST @18% =29500	5000/-+ GST @18%= 5900/-	Dated 16.01.2024 (16.30 Hrs) **&** Dated 17.01.2024 (11.00 Hrs)

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

TENDER COST:
The bidders who want to submit bids will have to pay non-refundable amount Rs. 29,500/- (Rupees Twenty-nine thousand Five hundred) only including GST @ 18%) towards the tender cost, in the form of Demand draft/Pay order, drawn in favour of the Power System OPTC Ltd, Bhubaneswar or payment through NEFT / RTGS to account no. 588901110050000 IFSC code UBIN0558893 . They have to also submit notarized hard copy of GST registration certificate on or before the date & time of opening of techno-commercial bid (Part-I).

TENDER PROCESSING FEE:

The bidders will have to submit non-refundable amount of Rs.5, 900/- (Rupees Five thousand nine hundred) only including GST @ 18% 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 down load the bid proposal sheets & bid document in electronic mode.

EMD:

The Bidder must submit the EMD as per Clause No.10 of Part-I (ITB)

SUBMISSION OF TENDER COST, TENDER PROCESSING FEE & EMD:

The bidder will deposit the tender cost, tender processing fee & EMD in shape of DD drawn in favour of the Power System OPTC Ltd, Bhubaneswar or payment through NEFT / RTGS to account no. 588901110050000, IFSC code UBIN055889 or BG prior to last date & time for opening of techno-commercial bid (Part-I) as notified in tender notice.

The demand draft/pay order for tender cost, copy of proof of e –payment of processing fees are to be Submitted along with the DD.BG towards EMD at the office of the undersigned on or before the last date & time of opening of technical bid (Part-I).

The bidders will scan the Demand Draft/Pay order/ Bank guarantee, towards cost of EMD and upload the same in the prescribed form in .gif or .jpg format in addition to sending the original as stated above.

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 tender can be had from the undersigned during office hours.

Minimum qualification criteria of bidders: AS STIPULATED IN CLAUSE NO 41.0 SECTION-II, PART-I (G.T.C.C) OF THE TENDER SPECIFICATION.

N.B:-All subsequent addendums / corrigendum to the tender will be hosted in www.tenderwizard.com/ OPTCL only. Interested Bidders are requested to visit e-tender portal for update information of tender (Corrigendum/addendum etc.).

CHIEF LOAD DESPATCHER, SLDC,

BHUBANESWAR

TENDER SPECIFICATION:

PART – I

SECTION – I: INSTRUCTION TO BIDDERS

SECTION – II: GENERAL TERMS AND CONDITIONS OF CONTRACT (G.T.C.C.) (COMMERCIAL)

SECTION – III: LIST OF ANNEXURES (COMMERCIAL)

SECTION – IV: SCOPE OF WORK

SECTION – V: TECHNICAL SPECIFICATION

SECTION – VI: SPECIFICATION FOR AMC OF PMU BASED WAMS SOFTWARE & HARDWARE INFRASTRUCTURE

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PART I

SECTION I: Instruction to Bidders

Submission of Bids

The bidder will 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 SLDC, OPTCL to collect the Bids in physical form will be entertained by the SLDC, OPTCL.

The SLDC, 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 GST Laws.

I. For all the users it is mandatory to procure the Digital Signatures of Class-III.

II. Bidders /Suppliers are requested to follow the below steps for Registration:

   i. Click “Register”, fill the online registration form.

   ii. Pay the amount of Rs.2360/- through e-payment in favor of K S E D C Ltd Payable at Bangalore.

   iii. Send the acknowledgment copy for verification.

   iv. As soon as the verification is being done the e-tender user id will be enabled.

III. 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.

IV. If any Bidder wants to participate in the tender, he will have to follow the instructions given below:

   i. 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).

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

   iii. Go to Start > Programs > Internet Explorer.

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

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

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

vii. Select the Certificate and enter DSC Password.

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

V. To make a request for Tender Document Bidders will have to follow below mentioned steps.

i. Click "Un Applied" to view / apply for new tenders.

ii. Click on Request icon for online request.

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

i. Click to view the tender documents which are received by the user.

ii. Tender document screen appears.

iii. Click "Click here to download" to download the documents.

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

i. Prior to submission, verify whether all the required documents have been attached and uploaded to the particular tender or not.

ii. Note down / take a print of bid control number once it displayed on the screen

VIII. Tender Opening event can be viewed online.

IX. Competitors bid sheets are available in the website for all.

X. For any e-tendering assistant contact help desk number mentioned below.

Bangalore – 080- 40482000.

The participants to the tender should be registered under GST Laws.

1. DIVISION OF SPECIFICATION/BID

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

Part-I Consists of Technical & Commercial Part

- Section-I Instruction to Bidders.
- Section-II General Terms & conditions of contract.
- Section-III List of Annexures
- Section IV Scope of Work

- Section-V Technical Specification.
- Section-VI Specification for AMC

Part-II Consist of Price Part

Section-VII**:** Schedule of prices as per Annexure-V

2. PRE-BID MEETING

A pre-bid conference shall be held as per the following program. The interested bidders may raise the queries, if any, in writing for the works, 03 days prior to the pre-bid conference, which shall be clarified during the pre-bid conference along with other issues raised in the pre-bid conference. All the clarifications / amendments to the bidding document shall be uploaded in OPTCL's website/e-Tender Portal of OPTCL. Queries after the pre-bid conference will not be entertained. The SLDC, OPTCL shall not be under any obligation to entertain/respond to suggestions made or to incorporate modifications sought for by the prospective bidders during the pre-bid meeting or thereafter.

Table 3 Pre-bid conference venue

Sl No	Date and time of Pre-bid conference	Venue
1	**As indicated in the e-NIT underTable-1**	Conference hall of SLDC,1st Floor, Mancheswar, GRIDCO Colony, OPTCL, Bhubaneswar

i. The bidder or its authorized representative is invited to attend pre-bid meeting to be held on the date, time and location specified at Table-1 at above in BPS. The purpose of the meeting will be to clarify the exact scope of work, and any issues regarding the bidding documents and the technical specifications for its clarification, if raised at that stage by the bidders. The Purchaser shall not be under any obligation to entertain /respond to suggestions made or to incorporate modifications sought for by the prospective bidders.

ii. Any modification/amendment of the bidding documents shall be made by the Purchaser exclusively through the issue of an amendment pursuant to clause 4

iii. Non-attendance at the pre-bid meeting will not be a cause for disqualification of bidders but at the same time shall not entitle them to raise any query at a later date.

iv. Any essential requirement not included in the Price Schedules but required for successful commissioning and operation of Works as per scope of Contract shall be indicated by the bidders in the price bid and any additional information shall be submitted before the pre-bid meeting by the date specified in the document.

v. The Purchaser shall make related modifications/amendments as may be considered necessary based on this form in the bidding documents as per provisions mentioned in this clause-4

vi. Bidders shall not be permit to Bid to indicate any additional requirements in the bid for any reason whatsoever after the Purchaser has considered such amendments.

vii. All queries and communications related to this tender should be made through the following mail id. : **wams@sldcorissa.org.in**

3. AMENDMENT OF BIDDING DOCUMENTS

i. At any time after pre-bid meeting, but not later than ten (10) days prior to the deadline for submission of bids, the Purchaser may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issue of an addendum/amendment

ii. The addendum/amendment will be uploaded in the e-tendering portal and all such amendments/addendums will be binding upon them. SLDC, OPTCL shall assume that the information contained therein will have been taken into account by the bidder in its bid. SLDC, OPTCL will bear no responsibility or liability arising out of non-compliance of the same in time or otherwise by the bidder.

iii. In order to afford prospective bidders reasonable time in which to take the addendum/amendment into account in preparing their bids, SLDC, OPTCL may, at its discretion, extend the deadline for the submission of bids.

iv. In order to afford prospective bidders reasonable time in which to take the addendum/amendment into account in preparing their bids, SLDC, OPTCL may, at its discretion, extend the deadline for the submission of bids.

v. For the information of bidders, the addendum/ amendments shall be uploaded on the e- tendering portal. The bidders may visit the website from time to time in their own interest.

4. OPENING OF BIDS

i. The Part-I (Techno Commercial)will be opened on the date and time fixed by the SLDC, 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 optremain present. After scrutiny of the technical particulars and other commercial terms, clarifications, if required, will be sought for from the bidders. The Tenderers will be allowed 15 days' time for such activity.

ii. On receipt of technical clarification, the bids will be reviewed, evaluated and those not

in conformity with the technical Specification / qualifying experience, will be rejected. If any of the technical proposals requires modification to make them comparable, discussion will be held with the participating bidders.

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

iv. 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, will 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.

v. 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 will include details of bidder's experience, its financial, managerial and technical capabilities.

vi. The bidders are also required to furnish details of availability of appropriate technical staff and capability to perform after sales services. The above information will be considered during scrutiny and evaluation of bids and any bid which does not satisfactorily meet these requirements, will not be considered for price bid evaluation.

vii. The price bids of the technically and otherwise acceptable bids will only be evaluated as per the norms applicable in terms of this Specification.

5. PURCHASER'S RIGHT REGARDING ALTERATION OF QUANTITIES TENDERED

i. Deviation to the revised scope of works is not permissible under the contract. However, at any time during the execution of the contract, SLDC, OPTCL reserve the right to vary the quantity of any item with reference to the BOQ to any extent within the limit of ±25% of the BOQ of the LOA at the same unit rate and terms conditions contained in the LOA. However, any increase in the BOQ quantity of an item beyond 25% of the BOQ of the LOA shall be lower of price available in BOQ (i.e. in LOA) or Rate Contract or Cost Data.

ii. In case a new item(s) are required during the execution of the contract for which unit rates are not available in BOQ, the same shall be the least of the available Rate Contract Price or Cost Data Price or Average unit rate of the same items from works awarded during last one year as available with SLDC, OPTCL.

iii. The increase in quantity w.r.t items in BOQ or inclusion of new item(s), however, shall always be subject to the prior approval of the competent authority.

iv. Accordingly, the Contract price shall be adjusted based on the approved unit rates for the variation in quantities as above.

6. PROCEDURE AND OPENING TIME OF TENDERS

Tenders will be opened in the office of the Chief of Load dispatch Centre. OPTCL 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 Developers, 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]. Such deviations may be accepted if purchaser is fully convinced and satisfied or else bidder's proposal will be rejected. Acceptance of this deviation is purely under the discretion of the purchaser.

8. 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 SLDC, OPTCL, under the existing circumstances. [Read with clause-10, Section-II of the specification].

9. MODE OF SUBMISSION OF TENDERS

i. Tender will be submitted in electronic mode only. (www.tenderwizard.com/OPTCL)

ii. Telegraphic **or FAX tenders** will not be accepted under any circumstances.

10. EARNEST MONEY DEPOSIT

The tender will be accompanied by Earnest Money deposit of value specified in the notice inviting tenders against bid. Tenders without the required EMD in shape of BG as indicated at **Annexure-VIII** will be rejected out rightly.

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

(i) Bank Draft / Pay Order: -To be drawn in favor of Power System, OPTC Ltd, Bhubaneswar. In case of demand draft / Pay order to be drawn in favor of Odisha Power Transmission Corporation Limited, Payable at Bhubaneswar.

(ii) Bank Guarantee: 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 to be accompanied by the confirmation letter of the issuing Bank Branch along with conformation through SFMS.

NOTE:

i. The validity of the EMD in the form of Bank Guarantee will 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 will be paid on the Earnest Money Deposit.

iii. The Earnest Money Deposit shall be furnished in any one of the forms indicated above (i.e., Through Bank Draft, Bank Guarantee).

iv. No adjustment towards EMD will be permitted against any outstanding amount with the SLDC/OPTCL.

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 a clause-19 of Section-II.

vii. Suits, if any, arising out of this clause will be filed in a Court of law to which the jurisdiction of High Court of ODISHA extends.

viii. EMD will be forfeited if the tenderer fails to accept the letter of intent and/or purchase order issued in his favor or to execute the order, placed on them.

Tenders not accompanied by Earnest Money will be disqualified.

11. 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.

12. PRICE

a. Tenderers are requested to quote- 'FIRM' Price. No deviation from FIRM PRICE will be entertained irrespective of deviation as in clause No.9 of section -II Part- I.

b. The price quoted by the bidder for AMC shall not be less than 10% of the Project cost.

13. REVISION OF TENDER PRICE BY BIDDERS

i. 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 will stand rejected and the EMD deposited will be forfeited.

ii. 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.

iii. However, the tender is 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.

14. 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 submitted their tenders. In case of doubt regarding the meaning of any clause, the tenderer may seek clarification in writing from the Chief Load Despatcher, SLDC. This, however, does not entitle the Tenderer to ask for time beyond due date, fixed for receipt of tender.

15. DOCUMENTS TO ACCOMPANY BIDS

Tenderers are required to submit tenders in the following manner:

i. Declaration Form. [As per Annexure-I]

ii. Earnest Money. [As per Annexure-VIII], Tender Cost.

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. Documentary proof in support of Original Manufacturer of Phasor Measurement Unit (PMU), based on industry recognized standards.(Submit with QR Bid)

v. Photostat copies of type test certificates of software modules, Hardware materials/equipment offered as stipulated in the Technical Specification.

vi. Abstract of Terms & conditions in prescribed proforma as per Annexure-XVII.

vii. General Terms & Conditions of supply offer as per Section-II, Part-I of the Specification.

viii. List of orders executed for similar software modules, hardware materials/equipment during preceding 5(five) years indicating the customer's name, Purchase Order No. & Date, date of supply and date of commissioning etc.

ix. Client performance certificate in support of developed, commissioned and running at least one project in which installation of PMU, installation of control center hardware, data received and handled at control center PDC with data archiving and visualization software for system operator/utility successfully

x. Client performance certificate in support of there shall be at least one SCADA/WAMS system developed by bidder or its parent company which handles the data from RTU/PMU with visualization should be in service for minimum one year from the date of technical bid opening.

xi. List of Employee with Qualification, Experience of all partners and associates.

xii. Documentary proof in support of should have full-fledged set-up in India with necessary infrastructure, resources and capacity of approximately 30 (Thirty) trained Technical persons to deliver the project and sales service thereafter

xiii. The support paper to demonstrate this qualifying requirement must be furnished with bid.

xiv. Data on experience as per [As per Annexure IX] and Clause-7 of Section-II of the Specification.

xv. GST Compliance Rating. The GST Identification Number (GSTIN) under GST Laws and permanent account number [PAN] of the firm under Income tax Act are required.

xvi. Audited Balance sheet & profit loss accounts of the bidder, for past (3) three years.

xvii. Schedule of quantity and delivery in the prescribed Proforma vide Annexure, as appended.

xviii. List of Orders in hand to be executed.

xix. Deviation schedule.

xx. The bidder should not have any pending litigation or arbitration with SLDC/ OPTCL/GRIDCO 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/notary.

16. INSTRUCTIONS BEFORE SUBMITTING YOUR BID

i. All the drawings, i.e. Architecture of the solution and scheme of the field and any other bidder require to furnish, in Auto CAD DXF format and manuals in PDF format, for offered item shall be submitted by successful bidder. Also the hard copies as per specification shall be submitted.

ii. The bidder shall submit Quality Assurance Plan (QAP) & Field Quality Plan (FQP) with the technical bid.

iii. The bidder must fill up all the point of GTP for offered item/s.

iv. All the points other than GTP, which are asked to confirm in technical specifications must be submitted separately with the bid.

v. Please note that the evaluation will be carried out on the strength of content of bid only. No further correspondence will be made.

vi. The bidder shall bring out all the technical deviation/s only at the specified annexure.

vii. Bar chart with completion period of 24 months in MS Project shall be submitted.

17. DOCUMENTS/PAPERS TO ACCOMPANY IN PART-II BID

Part-II, Section –VII of the tender will consist of the schedule of prices in the prescribed proforma.

18. CONDITIONAL OFFER

Conditional offer will not be accepted.

19. GENERAL

i. In the event of discrepancy or arithmetical error in the schedule of price, the decision of the purchaser will be final and binding on the Tenderer.

ii. For evaluation, the price mentioned in words will be taken if there is any difference in figures and words in the price bid.

iii. Notice inviting tender will form part of this specification.

iv. The price bids of the technically and otherwise acceptable bids will only be evaluated. The EMD of others, if any, will be returned to the bidders.

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

20. EXPENSES AGAINST FAT

Expenses of SLDC, OPTCL's representative for witnessing the inspection & testing of the offered Software module, Hardware equipment/ materials during inspection and testing at developer's/ manufacturer's work place.

The testing and inspection of the equipment/ materials / software at Developer's/ manufacturer works are in the scope of work of the Supplier/bidder.

SLDC, OPTCL inspecting officer, / authorized representative by SLDC, OPTCL on receipt of offer for inspection from the bidder/supplier, proceeds to the manufacturer works/premises 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 / software, are hereby supplemented with following additional terms and conditions.

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

a. Hotel Accommodation:

Single room accommodation in 4-star hotel for the SLDC, OPTCL/ authorized representative by SLDC, OPTCL inspecting officer of the rank of Assistant General Manager (Grade E-6) and above.

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

N.B.: It is the responsibility of the supplier 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, Developer supplier/manufacturer will 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 Developer supplier/manufacturer will suggest alternative suitable arrangement at the time of offer for inspection, which is subjected to acceptability of SLDC, OPTCL inspecting officer.

b. Journey of the inspecting officer / authorized representative by SLDC, OPTCL:

i. To and from travel expenditure from the Head Quarters of the inspecting officer to the place of inspection/testing will be borne by the bidder supplier/ manufacturer. Journey from the Head Quarters of the inspecting officer to the

nearest Air Port by train (Ist/IInd 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/IInd A.C) & A/C taxi to the place of inspection/testing will be arranged by the bidder supplier/manufacturer.

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

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

iv. Moreover, if during the journey there is an unavoidable necessity for intermediate travel by road/ waterway/sea-route, the bidder/supplier will provide suitable conveyance to the inspecting officer for travel this stretch of journey or bear the cost towards this. Any such possibilities will be duly intimated to SLDC, 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 will be provided by the bidder/ supplier/ manufacturer.

d. Following points are also to be considered:

All the above expenses will be deemed to be included in the bidder's quoted price for that

i Supplier/bidder/manufacturer may assume that only in 40% of the inspection and testing offer cases, SLDC, OPTCL inspecting officer, not below the rank of Assistant General Manager will do the due inspection.

ii Bidder/supplier/manufacturer will judiciously plan the inspection/testing schedule and place of inspection/testing, so that optimum number of inspection/testing and minimum time will be required to cover all the equipment/materials of the relevant contract package.

iii It will be the responsibility of the Bidder/Supplier to organize the above tour related matters of SLDC, OPTCL inspecting officer including the matters related to overseas inspection/testing, if any.

21. EVENTS OF DEFAULT

Each of the following events or occurrences shall constitute an event of default ("Event of Default") under the Contract:

Contractor fails or refuses to deliver materials/equipment or to execute work conforming to the technical specifications or otherwise or fails to execute the works assigned to them within the period specified in LOA or any extension thereof.

a. Contractor becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or theContractor's creditors file any petition relating to bankruptcy of Contractor;

b. Contractor otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Contractor of notice of such failure from SLDC, OPTCL.

c. Contractor fails or refuses to pay any amount due under the Contracts.

22. TERMINATION OF CONTRACT ON SLDC, OPTCL'S INITIATIVE

a. The SLDC, OPTCL reserves the right to terminate the Contract either in part or in full due to reasons other than those mentioned under clause entitled 'Contractor's Default'. The SLDC, OPTCL shall in such an event give fifteen (15) days' notice in writing to the Contractor of his decision to do so.

b. The Contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and Contracts to the extent they are related to the work terminated and terms satisfactory to SLDC,OPTCL, stop all further sub-contracting or purchasing activity related to the work terminated, and assist SLDC,OPTCL in maintenance, protection, anddisposition of the works acquired under the Contract by SLDC,OPTCL.

c. In the event of such a termination the Contractor shall be paid compensation, equitable and reasonable, dictated by the circumstances prevalent at the time of termination.

23. CONTRACTOR'S DEFAULT

If the Contractor shall neglect to execute the works with due diligence and expedition or shall refuse or neglect to comply with any reasonable order given to him, in writing by the Engineer-In-Charge in connection with the works or shall contravene the provisions of the Contract, SLDC, OPTCL may give notice in writing to the Contractor to make good the failure, negligence or contravention complained of. Should the Contractor fail to comply with the notice within thirty (30) days from the date of serving the notice, then and in such case SLDC ,OPTCL shall be at liberty to employ other workmen and forthwith execute such part of the works as the Contractor may have neglected to do or if SLDC, OPTCL shall think fit, without prejudice to any other right he may have under the Contract to take the work wholly

or in part out of the Contractor's hands and re-Contract with any other person or persons to complete the works or any part thereof and in that event SLDC ,OPTCL shall have free use of all Contractors equipment that may have been at the time on the site in connection with the works without being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same, and SLDC ,OPTCL shall be entitled to retain and apply any balance which may otherwise be due on the Contract by him to the Contractor, or such part thereof as may be necessary, to the payment of the cost of executing the said part of the works or of completing the works as the case may be. If the cost of completing of works or executing part thereof as aforesaid shall exceed the balance due to the Contractor, the Contractor shall pay such excess. Such payment of excess amount shall be independent of the price reduction schedule for delay, which the Contractor shall have to pay if the completion of works is delayed.

In addition, such action by SLDC, OPTCL as aforesaid shall not relieve the Contractor of his liability to price reduction schedule for delay in completion of works as defined in this Section.

Such action by SLDC, OPTCL as aforesaid under this clause shall not entitle the Contractor to reduce the value of the Contract performance Guarantee nor the time thereof. The Contract Performance Guarantee shall be valid for the full value and for the full period of the Contract including guarantee period.

24. SUSPENSION OF WORK

a. The SLDC, OPTCL reserves the right to suspend and reinstate execution of the whole orany part of the works without invalidating the provisions of the Contract. Orders for suspension or reinstatement of the works will be issued by the Engineer-In-Charge to theContractor in writing. The time for completion of the works will be extended for a periodequal to duration of the suspension.

b. Any necessary and demonstrable cost incurred by the Contractor as a result of such suspension of the works will be paid by SLDC, OPTCL, provided such costs are substantiated to the satisfaction of the Engineer-In-Charge. The SLDC, OPTCL shall notbe responsible for any liabilities if suspension or delay is due to some default on the partof the contractor or his sub-contractor.

25. LITIGATION/ARBITRATION

a. 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 historyof

litigation by or against the bidder may result in rejection of bid.

b. The bidder should not have any pending litigation or arbitration with SLDC, 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 or notary. Bid furnished by the bidder will not be eligible for consideration if it is not accompanied by the affidavit. Further, the bid/LOA/LOI will liable for outright rejection/cancellation at any stage if any information contrary to the affidavit/declaration is detected.

26. SHORT CLOSURE CONDITIONS

Closing conditions shall be implemented in case both the owner and Software Provider have conditions that must be met or waived, and may also include joint conditions. Conditions may include any of the following:

a. Closing certificates that state representations and warranties have been satisfied by both parties.
b. Each party's representations and warranties are valid as of the closing and/or signing date.
c. Provision of fully executed ancillary documents by both parties.
d. Deal specific conditions by the buyer that specific issues are addressed, such as pending liabilities.
e. Joint condition that no pending litigation would prevent the deal from closing.
f. Joint condition that the transaction is legal by law.

Failure to meet any of the obligations gives either party the right to terminate the transaction.

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PART-I

SECTION-II

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

PART-I

SECTION-II: GENERAL TERMS AND CONDITIONS OF CONTRACT [G.T.C.C.]

1.0 SCOPE OF WAMS PROJECT

i. The scope of work under project is to include **Survey, Planning, Design, Engineering, Documentation, Integration, Supply, Delivery to site, Unloading, Insurance, Storing, Handling, transportation to final locations, Installation, Commissioning, Termination, Testing, Demonstration for acceptance, and Commissioning** of all the Hardware/equipment specified under the accompanying Technical Specifications. It will include among others as specified therein the following:

a. Detailed design, Engineering with Technical specification and plan for Total Solution.
b. Complete integrated solution for WAMS Project, Maintenance of complete solution for five years after one-year warranty period.
c. The broad scope of Total solution is described below but detail scope of work is specified in Technical Specification of individual item and Special terms and condition of contract.

1. Providing, Testing and commissioning of PMUs with GPS complete with all necessary accessories Switch/Router, Panels, Cables, Patch Cable, FO/Ethernet Cables, Converter (Fiber to Ethernet) etc. at the Substations and Power plants.
2. Phasor Data Concentrator (PDCs) along with user interface to the extent identified in BOQ.
3. Historian System for storing PMU data.
4. Associated computer system hardware and software, networking hardware & software along with associated items at location & Control Centres as per BOQ.
5. Integration of Existing PMUs (URTDSM) with PDC at SLDC-OPTCL.
6. Project management, project scheduling, including periodic project reports documenting progress during the contract period.
7. Mandatory Spares as identified in the BOQ.
8. All cabling, wiring, terminations and interconnections to the equipment including necessary dressing of cable, surfacing also between communication equipment and power supply.
9. Communication required within the substation including communication cable as well as the interface equipment requirement like modem, converter etc.
10. Maintenance of the system as per the specification for six years period including one year warranty period.
11. Engineering and technical assistance during the contract warranty and maintenance period.
12. Integration of all the supplied equipment with existing system.
13. Data exchange with existing SCADA/EMS System.
14. Factory and site testing of all hardware and software provided.

15. Conduct Type test and provide Type Test report as per specification.
16. Testing of PMU & PDC as per IEEE C37.118.2011-1, C37.118.1a-2014, C37.118.2011-2 with all amendments.
17. Testing of all PMU data of all location including URTDSM PMUs with new PDC at control Centre.
18. Design and configuration of entire WAMS system supplied shall be compliant to the Cyber Security requirements mentioned in detail technical specification.
19. Provide all additional equipment and services for successful completion of project.
20. All documentation and drawings as specified.
21. All software/database backup of PMUs installed at all locations.
22. On- site Training of personnel.
23. To maintain systems availability as per term & condition.
24. Providing prototype during Technical scrutiny stage against SLDC mentioning complete solution offered with all respect. Failing to which commercial offer will not be considered.
25. Any other work, which is not defined in the specification but is required for integrated solution of this project within intent of successful implementation of Total solution shall also be in the scope of the bidder.
26. BOQ & GTP is given at APPENDIX-I, PART-A & B.
27. This is being an EPC project therefore any item, accessories, work etc. required for completion and successful operation of entire project shall be considered in the scope.
28. Contractor has to provide all engineering drawings, data calculations etc. for owner's approval.

ii. An analysis of the functional and performance requirements of this specifications and site surveys, design and engineering may lead the bidder to conclude that additional items and services are required that are not mentioned in this specifications. The bidder shall be responsible for providing at no added cost to the purchaser, all such additional items and services such that a viable and fully functional system is implemented that meets or exceeds the capacity, and performance requirement specified. Such materials and services shall be considered to be within the scope of the contract to the extent possible, bidder shall identify and include all such additional items (hardware/software) and services in their proposal.

iii. AMC for six years with one support engineer at Control Center including one year warranty for complete solution.

iv. Providing Training to SLDC/OPTCL Executives as per Training clause in Technical specification.

This specification covers the detailing Survey, Planning, Design, Engineering, Documentation, Integration, Supply, Delivery to site, Unloading, Insurance, Storing, Handling, transportation to final locations, Installation, Commissioning, Termination, Testing, Demonstration for acceptance for Development of Wide Area Measurement Systems Project.

2.0 DEFINITION OF TERMS

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

i. "The Bidder" means any eligible FIRM or COMPANY registered under Company act 1956 (Amended in 2013) or Limited Liability Partnership (LLP) registered under the LLP Act, 2008 and should have been in operation in India, whose primary business is software development and implementation and must have relevant experience in Data Centre Hardware and software installation as on the date of bid opening and will have their registered offices in India.

ii. "The Purchaser" will mean the CHIEF LOAD DESPATCHER for and on behalf of SLDC, OPTCL, and Bhubaneswar.

iii. "The Engineer" shall mean the Engineer appointed by the Purchaser for the purpose of this contract.

iv. "Limited Liability Partnership (LLP)" shall mean an alternative corporate business firm that gives the benefits of limited liabilities of a company and the flexibility of a partnership

v. "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.

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

vii. "Software / Equipment" shall mean and include all IT / OT services, machinery, apparatus, materials, and articles to be provided under the contract by the suppliers.

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

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

x. "The Specification" shall mean both the technical as well as commercial parts of the specification annexed to or issued with GTCC and will include the schedules and drawings, attached there to as well as all samples and pattern, if any.

xi. "Month" shall mean "Calendar month".

xii. Writing" shall include any manuscript, type written, printed or other statement reproduction in any visible form and whether under seal or under hand.

xiii. "Basic Price (Taxable value for Goods & Services) at the point of destination" shall mean the price quoted by the bidder for equipment, material, services at the consignee's store/site & including AMC service. The cost is inclusive of packing, forwarding, freight, insurance

and all expensesand taxes & duties at the end of the supplier excluding Goods & Service Tax. The Goods & Service Tax will be shown in a separate column item wise alongside the Basic Price quoted at the applicable rate in the Tax Invoice. The applicable rate of GST will refer to the HSN/SAC code of the material/service supplied/provided. The Basic Price and GST thereon willbe the "FOR Destination Price" as quoted by the bidder.

xiv. 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.

xv. 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 Odisha General Clauses Act.

3.0 MANNER OF EXECUTION

All software modules and hardware equipment supplied under the contract will be Designed, developed /manufactured/procured in the manner, set out in the specification, or where not set out, to the reasonable satisfaction of the Purchaser / Purchaser's representative.

4.0 INSPECTION AND TESTING

i. The purchaser's representative will be entitled at all reasonable times during development / manufacture to inspect, examine and test at the supplier's premises, the software / development environment /materials and workmanship of all software module /equipment/materials to be supplied under this contract and if part of the said software module /equipment/material is being manufactured in other premises, the supplier will obtain for the purchaser's representative permission to inspect, examine and test as if the software module /equipment/material were being developed/manufactured in the supplier's premises. Such inspection, examination and testing will not relieve the supplier from his obligations under the contract.

ii. The supplier will 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 will also furnish the Test Certificate, and certification document, from Govt. approved agency with authenticity letter 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 will also be furnished.

iii. Where the contract provides for test at the Premises of the supplier or any of his sub-suppliers, the supplier will 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 routine test Certificate, 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 agency

must be furnished to the purchaser along with the offer for inspection.

iv. After completion of the tests, the Purchaser's representative will forward the test results to the Purchaser. If the test results conform to the specific standard and specification, the Purchaser will approve the test results and communicate the same to the supplier in writing. The supplier will 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 will have to bear all expenses towards repetition of inspection and testing of the total offered quantity or part thereof.

5.0 TRAINING FACILITIES

The supplier will provide all possible facilities for training of Purchaser's Technical personnel, when deputed by the Purchaser for acquiring firsthand knowledge in software and hardware, its erection, commissioning and for its proper operation & maintenance in service, wherein it is thought necessary by the purchaser. The training will be imparted as per the plan detailed in technical specifications Section- V

6.0 REJECTION OF ANALYTICS SOFTWARE MODULES/ HARDWARE MATERIALS

In the event any of the software/ equipment /material / services supplied / provided by the developer/manufacturer is found non-compliant / defective due to faulty development, design, bad workmanship, bad materials used or otherwise not in conformity with the requirements of the Specification, the Purchaser will either reject the Software module, /equipment/material or ask the developer/supplier in writing to rectify or replace the defective Software module/ equipment/material free of cost to the purchaser. The Supplier/Developer on receipt of such notification will either rectify or replace the non-compliant /defective software/ 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:

i. At its option replace or rectify such non-compliant/defective Software module /equipment/materials and recover the extra costs so involved from the bidder/supplier plus fifteen percent and/or.

ii. Terminate the contract for balance work/supplies, with enforcement of penalty Clause asper contract for the un-delivered goods and with forfeiture of Performance Guarantee/ Composite Bank guarantee.

iii. Acquire the non-compliant/defective software/hardware equipment/materials at reduced price, considered equitable under the circumstances.

7.0 EXPERIENCE OF BIDDERS

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

i. Name of the software Developer/Equipment manufacturer:

ii. The supplier/ bidder will procure the hardware from the OEM of reputed firms, with availability of service Centre in India.

iii. Standing of the firm and experience in software development, manufacture of equipment/ material quoted:

iv. Description of software /equipment/material similar to that quoted, supplied and installed during the last five years with the name(s) of the Organization's to whom supplies were made, wherein necessary certificate will be from SLDC/RLDC/NLDC/RPC/Grid India.

v. Details as to where installed etc.

vi. Testing facilities at Developers/manufacturer's Premises/works.

vii. A list of work orders of identical Software/material/equipment offered as per technical specification executed during the last five years along with user's certificate. User's certificate will be legible and must indicate, user's name, address, designation, place of use, and satisfactory performance of the Software/equipment/materials for at least one year from the date of go-live.

viii. The qualifying criteria for the tender is detailed under subsequent section and will be the guidelines for the selection of bidders. Bids will not be considered if the past software Development/ manufacturing experience is found to be un-satisfactory and bids not accompanying user's performance certificate will be rejected.

8.0 LANGUAGE AND MEASURES

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

9.0 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 will be enclosed with the tender. Unless deviations in scope, technical and

commercial stipulations are specifically mentioned in the list of deviations, it will be presumed that the tenderer has accepted all the conditions, stipulated in the tender specification, not-withstanding any exemptions mentioned therein.

10.0 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. The purchaser has exclusive right to alter the quantities of Software/ hardware materials/ equipment / services / AMC at the time of placing final purchase order. After placing of the order, the purchaser may defer the delivery of the Software development/ materials. It may be clearly understood by the Tenderer that the purchaser need not assign any reason for any of the above action [s].

11.0 SUPPLIER TO INFORM HIMSELF FULLY

The supplier will 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 will 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 will 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.

12.0 PATENT RIGHTS ETC.

The supplier will 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 will also cover any use of the equipment, other than for the purpose indicated by or reasonably to be inferred from the specification.

Intellectual Property Rights & Royalties

i. Royalties and fees for patents covering Software / Equipment/Materials, articles, apparatus, devices or processes used in the Works will be deemed to have been included in the Contract Price. The Supplier will satisfy all demands that may be made at any time for such royalties or fees and he alone will be liable for any damages or claims for patent infringements and will keep the Purchaser indemnified in that regard.

ii. The Supplier will, subject to the Purchaser‘s compliance with (iii) indemnify and hold harmless the Purchaser, his successors or assignees, its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney‘s fees and expenses, which the Purchaser may suffer as a result of any infringement or alleged infringement of any

patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of :

a. The installation of the Works by the Supplier or the use of the Works in the country where the Site is located; and

b. The sale of the products produced by the Works in any country. Such indemnity will not cover any use of the Works or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the Works or any part thereof, or any products produced thereby in association or combination with any other Equipment/ Materials not supplied by the Supplier, pursuant to the Contract Agreement.

iii. If any proceedings are brought or any claim is made against the Purchaser arising out of the matters referred to in (ii), the Purchaser will promptly give the Supplier a notice thereof, and the Supplier may at its own expense and in the Purchaser‘s name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. If the Supplier fails to notify the Purchaser within thirty (30) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Purchaser will be free to conduct the same on its own behalf. Unless the Supplier has so failed to notify the Purchaser within the thirty (30) days.

iv. The Purchaser will, at the Supplier ‘s request, afford all available assistance to the Supplier in conducting such proceedings or claim, and will be reimbursed by the Supplier for all reasonable expenses incurred in so doing

v. Advertising: Any advertising stating the subject of this Contract by the Supplier in India or in foreign countries will be subject to approval of the Purchaser prior to the publication. Publication of approved articles, photographs and other similar materials will carry acknowledgment to the Purchaser.

13.0 DELIVERY

i. Time being the essence of the contract; the software/ equipment will 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 will be reckoned from the date of placing the Letter of Intent/Purchase order, as may be specified in LOI/Purchase order.

ii. The expected completion of the project is estimated as twenty four (24) months from the date of awarding the LOA

iii. The desired delivery period shall be as indicated at ANNEXURE-XIV

iv. The bidder shall supply and install the software modules and hardware materials in sync with

each other so that SAT and go-live can be executed seamlessly.

14.0 DISPATCH INSTRUCTIONS

i. The hardware materials shall be securely packed and dispatched directly to the specified site at supplier's risk.

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 will have no responsibility on this account.

iii. All design document drawings and software source code submitted by the Supplier will be the property of Purchaser. The Purchaser reserves the right to use the same in its future project without any further reference and additional charges to the Supplier for such use. The Purchaser's Design Document, Software Source Code, Drawings, Specification and other information submitted by the Purchaser to the Supplier will remain the property of the Purchaser. They will not, without the consent of the Purchaser, be used, copied or communicated to a third party by the Supplier unless necessary for the purposes of the Contract. Any error in any such Design Document, Source Code drawing/Specification etc. will not absolve the Supplier of his responsibility.

iv. The contractor has to keep all materials in safe custody and transport to the respective sites and will be fully responsible for any damage to or loss of all materials at any stage during transportation or erection till successfully commissioning and performing SAT.

v. The Contractor has to open site store and ensure for safe custody of all the stored materials at his own cost.

vi. The Contractor shall have total responsibility for the entire materials stored, loose, semi assembled and/or erected by him at site in his custody. The Contractor shall make suitable security arrangements at his own cost to ensure the protection of all materials, equipment and works from theft, fire pilferage and any other damages and loss. It shall be the responsibility of the contractor to arrange for security till the works are finally taken over by the SLDC,OPTCL

15.0 SUPPLIER'S DEFAULT LIABILITY

i. The Purchaser may, upon written notice of default to the supplier, terminate the contract in circumstances detailed here under.

a. If in the judgment of the Purchaser, the supplier fails to make delivery of Software/hardware 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.

iii. 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 software/equipment/material similar to that terminated and the supplier will be liable to the Purchaser for any additional costs for such similar Software/ 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.

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

16.0 FORCE MAJEURE

The supplier will 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 will within Ten (10) days from the beginning of delay on such account notify the purchaser in writing of the cause of delay. The purchaser will verify the facts and grant such extension, if facts justify.

17.0 EXTENSION OF TIME

If the delivery of Software/ equipment/material /services is delayed due to reasons beyond the control of the supplier, the supplier will 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.

18.0 GUARANTEE & LIABILITY

i. The Contractor shall warrant that the whole project, in accordance with the Contract documents and free from defects in material/equipment and workmanship for a period of Twelve (12) calendar months commencing immediately upon the satisfactory commissioning of the project and issuance of Site Acceptance Test & Taking overCertificate (TOC). The Contractor's liability shall be limited to the replacement of any defective parts in the equipment of his own manufacture or those of his Sub-Contractors under normal use and arising solely from faulty design, materials and/or workmanship provided always that such defective parts are repairable at

the site and are not in meantime essential in the commercial use of the equipment. Such replaced/defective parts shall be returned to the Contractor unless otherwise arranged. No repairs or replacement shall normally be carried out by the Engineer when the equipment is under the supervision of the Contractor's Supervisory Engineer. Whole setup should work smoothly & carry out desired functions without any changes during the warranty period.

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

iii. If it becomes necessary for the Contractor to replace or renew any defective portions of the works the provision of this clause shall apply to portion of the works so replaced or renewed until the expiry of twelve (12) months from the date of such replacement or renewal. If any defects are not remedied within a reasonable time, the Engineer may proceed to do the work at the Contractor's risk and cost but without prejudice to any other rights which the Owner may have against the Contractor in respect of such defects.

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

v. The cost of any special or general overhaul rendered necessary during the maintenance period due to defects in the equipment or defective work carried out by the Contractor, the same shall be borne by the Contractor.

vi. The acceptance of the equipment by the Engineer shall in no way relieve the Contractor of his obligations under this clause.

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

viii. During Guarantee and AMC period it will be responsibility of bidder that Total solution working smoothly and secure with user friendly and bidder is responsible for maintainingit and correct it if required. No additional charges will be paid for the same.

ix. At the end of the guarantee period, the Contractor's liability continues till AMC period of 5 year for all defects as per guarantee clause. In respect of goods supplied by Sub- Contractors to the Contractor where a longer guarantee is provided by such Sub- Contractor, the Owner shall be entitled to the benefits of such longer guarantee.

x. The provisions contained in this clause will not be applicable: a) If the Owner has notused the equipment according to generally approved industrial practice and in accordance with the conditions of operations specified and in accordance with operating manuals, if any. In cases of normal wear and tear of the parts to be specifically mentioned by the Contractor in the offer.

19.0 B.G. TOWARDS SECURITY DEPOSIT, 100% PAYMENT AND PERFORMANCE GUARANTEE

The successful bidder shall have to submit the performance guarantee in the form of Bank Guarantee worth 10% of the total contract value (end cost) including AMC cost. The Performance Bank Guarantee will be return ONLY on successful commissioning & issuance of TOC including material reconciliation, and after completion of warranty period of one year and AMC period of 05 years. The Performance Bank Guarantee will be retained till completion of the warranty period + AMC period + one month i.e. One year plus five years plus one month.

These Bank Guarantees shall be applicable for all the bidders irrespective whetherthey are SSI/NSIC units."

The above performance guarantee, to be submitted by successful tenderer, towards execution period, is for the satisfactory execution of the contract.

If the full Performance Guarantee amount / BG is not paid / submitted within 15 (Fifteen) days after the receipt of the order , then the order will be out rightly cancelled at the risk & cost of the Tenderer (at the discretion of the Corporation) and without entering into any correspondences and this will be binding on the Tenderer.

i. No interest is payable on any kind of Bank Guarantee.

ii. In case of non-fulfillment of contractual obligation, as required in the detailed purchase order/Specification, the composite Bank guarantee will be forfeited.

iii. These Bank Guarantees shall be applicable for all the bidders irrespective whether they are SSI/NSIC units."

20.0 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.

21.0 PAYMENT TERMS AND CONDITIONS

The payments will be as per PSDF terms and conditions, since it is a PSDF funded project.

A. Being an IT hardware infrastructure and software development works contract under GST Laws, the on-account payments will be made as below.

Table 4 Payment terms

Sl.No.	Deliverables	Payment	Remark
1	Completion of Supply of Hardware at Sub Station	70% (Seventy) taxable value of Substation Hardware Cost.	On receipt of material and subsequent joint verification report by the concerned site Engineering in charge.
2	Completion of supply of Hardware at Control Centre.	70% (Seventy) taxable value of Control Centre Hardware Cost.	On receipt of material and subsequent joint verification report by the concerned site Engineering in charge.
3	Completion of Installation, Commissioning & Testing of Hardware at Sub Station.	20% pro-rata of completion	On receipt of joint verification report by the concerned officer in charge. **20%** (Twenty) taxable value of Substation Hardware Cost will be paid on progressive basis depending on the actual work done i.e. on completion of installation, testing and commissioning of the respective items and on certification of the same by the Engineering in charge and verification by the respective substation Engineering in charge.
4	Completion of Installation, Commissioning & Testing of Hardware at Control Centre.	20% pro-rata of completion	On receipt of joint verification report by the concerned officer in charge. **20%** (Twenty) taxable value of Substation Hardware Cost will be paid on progressive basis depending on the actual work done i.e. on completion of installation, testing and commissioning of the respective items and on certification of the same by the Engineering in charge and verification by the Control Centre Engineering in charge.
5	Software Cost	90% pro-rata on installation of software module-wise.	On receipt of joint verification report by the concerned officer in charge. Payment will be released after successful UAT and due certification of the Engineering in charge.
6	At system taking over	10% of overall remaining cost	On receipt of joint verification report by the nodal officer.
7	**FOR AMC** Bills for 25% of every year AMC value out of 5 years shall be raised on completion of each quarter.		The bills shall be produced along with the satisfactory working report of Engineer in Charge, SLDC along with necessary deduction if any as per terms and condition of contract.

Payment shall be made after submission of the following:

i. Contract cum Performance Bank Guarantee at the rate of 10% (Ten per cent) of Total Taxable Value of contract plus GST thereon

ii. Guarantee certificate

iii. TDS / Cess under GST and other Laws will be deducted, as applicable.

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

v. Test certificate by the Purchaser. The software developed by the firm must satisfy all the requirements stipulated in technical specifications.

vi. The payment will be made after due certification and verification thereof by the engineering in charge /Nodal officer.

vii. The terms of payment for AMC of WAMS will be paid quarterly after due approval of engineering in charge.

B. The supplier will furnish contract cum performance Bank Guarantee of appropriate amount for Comprehensive AMC to SLDC, OPTCL as indicated in Clause-19 above, within 30 (Thirty) days from the date of issue of the purchase order.

22.0 PRICE REDUCTION SCHEDULE FOR DELAY IN COMPLETION OF SUPPLY UNDER PURCHASE ORDER/CONTRACT

i. If the Supplier fails to deliver the Software/ materials/equipment /complete Development/ installation & commissioning within the delivery schedule, specified in the Purchase Order/Contract including delivery time extension, if any, granted with waiver of Price Reduction Schedule, the Purchaser will recover from the Supplier, Price Reduction Schedule for a sum of half per cent (0.5 per cent) of the Taxable Value of the un-delivered software/ equipment /materials for each calendar week of delay or part thereof. For this purpose, the date of receipted challan will be reckoned as the date of delivery. The total amount of Price Reduction Schedule will not exceed five per cent (5%) of the Taxable Value of the un-delivered software equipment/materials/service. Equipment will be deemed to have been delivered only when all its components, accessories and spares as per technical Specification are also delivered. If certain components, accessories, and spares are not delivered in time, the equipment/materials will be considered delayed until such time as the missing components, accessories and spares are delivered.

ii. During the guarantee period, if the Supplier fails to rectify/replace the equipment/material / install within 15 days from the date of intimation of defect by the purchaser, then the Price Reduction Schedule at the rate of half percent (0.5%) of the Total Taxable Value for each calendar week of delay or part thereof will be recovered by the purchaser. For this purpose, Price Reduction Schedule will be reckoned from the 30th day from the date of issue of letter on defectiveness of equipment/material. The total amount of Price Reduction Schedule in this case will not exceed 10% (TEN PERCENT) of the Purchase Order/Contract amount except GST (i.e. Total Taxable Value). If the defects, so intimated are not rectified or equipment/materials not replaced by the supplier within the guarantee period, then whole of the C.P.B.G. will be forfeitedby the purchaser, without any intimation to the supplier.

iii. **Price reduction Schedule for Comprehensive AMC for WAMS**: As per clause-2.2, Section-VI, PART-I (Specification for AMC of WAMS)

23.0 INSURANCE

The Supplier will 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 must be settled by the supplier. The Supplier will 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 waiting for the settlement of their claims with the carriers and underwriters.

24.0 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 SLDC or OPTCL.

25.0 RATING UNDER GOODS AND SERVICES TAX AND BALANCE SHEET AND PROFIT & LOSS ACCOUNT

The following documents are to be submitted at the time of Tender Submission:

i. Compliance rating under Goods and Services Tax for immediately preceding financial year.
ii. Audited Balance Sheet and Profit & Loss Account of the bidder for the previous three years to assess the financial soundness of the bidder(s).

iii. GST registration certificate and PAN Card Copy.
iv. Tax holiday/exemption certificate under GST or any other Act.
v. TDS exemption certificate under the Income Tax Act or any other act.

26.0 CERTIFICATE OF EXEMPTION FROM GOODS AND SERVICES TAX

Offers with exemption from Goods and Services Tax will be accompanied with authenticated attested Photostat copy of exemption certificate. Any claim towards Goods and Services Tax will be paid on actual basis subject to payment of GST by the supplier. In case Outward supply details of the supplier of Goods in GSTR-1 do not match with GSTR -2 of SLDC, OPTCL on GSTN portal, the same will be adjusted through debit/credit advice issued by SLDC, OPTCL under intimation to the supplier after allowing cooling period of 3 months after the date of supply.

27.0 SUPPLIER'S RESPONSIBILITY

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

28.0 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 will be rejected.

29.0 EVALUATION

i. Evaluation of price bids will be on the basis of the TOTAL FOR DESTINATION PRICE including Goods and Services Tax & other levies as may be applicable. The FORD PRICE willconsist of the following components:
   a. Goods and Services Tax
   b. Cost of materials
   c. Other levies, if any.

ii. Comprehensive AMC charges for 5 years.

iii. Any other items, as deemed proper for evaluation by the purchaser.

iv. Loading will be made for items not quoted by the bidder at the highest rate quoted by other biddersunless particular item is included in other items.

v. Any imposition of new tax or revision of tax will be considered between due date of submissionof bids and the date of price bid opening.

30.0 EVALUATION PROCEDURES OF TECHNICAL & PRICE BID

30.1 EVALUATION OF TECHNICAL PART OF BID

i. The bids shall be independently evaluated. Prior to detailed Bid evaluation, SLDC, OPTCL will determine the substantial responsiveness of each Bid with respect to the Qualifying Requirement, Bid Capacity & other Bid Document requirements based on attachments uploaded (in .pdf formats) and Keyed in Schedules (in .XLS formats)contained in the official e-tender portal of, OPTCL and any other documents

required to be furnished as per the clarifications sought for by SLDC, OPTCL. A substantially responsive Bid is one, which conforms to the terms, condition and specification of the Bid Documents including e-tendering provisions without material deviation. A material deviation is one which affects or is likely to affect in a substantial way the scope of work,

ii. quality or performance of the works, or which limits in any substantial way, inconsistent with the Bidding Documents and formats/schedules mentioned in e-tendering provision, SLDC,OPTCL's rights or the Bidders' obligations as envisaged in the Bidding Documents and would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids. Further examination of only such Bids as are determined to be substantially responsive shall be taken up, unless otherwise determined by SLDC,OPTCL may waive any minor informality or non-conformity or irregularity in a bid, which does not constitute a material deviation, provided such waiver, does not prejudice or affect the relative ranking of any Bidder.

iii. The complete scope of supplies and work/services has been defined in the Bidding Documents. Only those Bidders who take complete responsibility and who Bid for the complete scope of supplies and work/services as contained in the Bidding Document shallbe considered for further evaluation.

iv. A bidder may be technically eligible based on the Qualifying Requirement mentioned above except Bid Capacity Qualification.

v. Thereafter, the price bid of the eligible bidder(s) shall be opened based on the available bid capacity.

30.2 EVALUATION OF PRICE BID

a. **Opening of Price Part of Bid:** Price Bid of those Bidders, whose Bids are considered technically responsive and meeting the available Bid Capacity Qualification Criteria shall be opened separately.

b. **Evaluation of Price Bid:** The Bid Price quoted under the different component of the Price Schedule i.e. (i) Develop/Supply, (ii) Erection & Commissioning as quoted by bidder shall be evaluated separately in the following manner.

c. **Arithmetical Correction:**

i. The price of all such items(s) against which bidder has not quoted rates/amount (viz. items left blank or against which "nil"/ "-" / "0" is indicated) in the schedule will be deemed to have been quoted free of cost or included in other item(s) and covered in the total quoted bid price.

ii. The Bidder should ensure that the unit prices for the same item furnished in various price schedules are consistent with each other. In case of any inconsistency

in the Unit prices furnished in the price proposal of the bidder, the same shall be identified by SLDC, OPTCL and SLDC, OPTCL shall consider the highest unit price of the bidder for the purpose of evaluation. However, the contract shall be awarded at the lowest unit price of the bidder. The prices quoted by the Bidders shall be checked for arithmetic correction, if any, based on rate and amount filled by the Bidder in the respective price schedule.

iii. If there is a discrepancy between unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and total price shall be corrected. If there is a discrepancy in the quantity mentioned by the bidder from the quantity mentioned in the tender, the tendered quantity will prevail.

d. **To arrive at the total evaluated prices following methodology shall be applied.**

i. Price evaluation shall be made considering the total evaluated price inclusive of CGST plus OGST or IGST as the case may be, at applicable rate.

ii. Price evaluation shall be made considering the Bill of Quantity (BOQ) specified in the Tender Document. In case of any deviation to the BOQ by the bidder, the BOQ specified in the Tender document shall be final and binding on the bidder.

e. Prices received in the price bid sheet (.XLS Format) shall be used for Tabulation / Price Bid Comparison. The soft form of price bid Keyed in to the .XLS format shall be final and binding on the Contractor.

f. The total evaluated prices of all the Bidders, shall be compared to determine the lowest evaluated price.

30.3 E-REVERSE AUCTION PROCEDURE SHALL BE RESORTED TO AS FOLLOWS

Table 5 E-Reverse Auction

STRATEGY FOR E-REVERSE AUCTION	
1	Bidders are required to go through the guide lines given below and submit their acceptance to the same.
2	e-Reverse Auction (RA) will be conducted in e-tender portal of OPTCL on specified date and time, while bidders shall quote from their own offices/places of their choice. Internet connectivity shall be ensured by the respective agencies/bidders themselves.
3	KEONICS shall arrange for demonstration/ training (if not trained earlier) of bidder's nominated person(s), to explain all the rules related to e-Reverse Auction/ Business Rule document to be adopted.
4	The strategy to be used for reverse auction shall be "DYNAMIC TEMPLATE BIDDING"
Procedure for electronic Reverse Auctioning (e-RA):	

5	a. The e-RA shall be conducted on www.tenderwizard.com/OPTCL only. b. Bidder has to submit letter towards agreement to the Process related Terms & Conditions for e-Reverse Auction, as per (Reverse Auction Process Compliance Form at Annexure-XIX). In non-receipt of the same, vendors will not be allowed to participate in e-RA. c. e-RA shall be carried out after opening of Price bids and completion of Price bid evaluation, which will be intimated only to the techno-commercially qualified bidders by OPTCL as perprocedure given below. d. d. OPTCL reserves the right to conduct e-RA and it is obligatory on part of bidder(s) invitedto participate in e-RA process once they have responded to the techno-commercial bid.
6	Prior intimation/ Notice for RA invitation will be given to techno-commercially qualified bidders regarding the date & time of opening of the e-RA. The start bid price (SBP) for e-Reverse Auction of each bidder under a particular package shall be the L1 evaluated price for the subject package including Taxes & Duties for the totalscope for subject Package. Taking the above discovered L1 price as the upper limit e-RA willbe conducted to determine the lowest possible price. Reverse Auction will be conducted amongst first 50% of the technically qualified bidders arranged in order of prices from lowest to highest, as L1, L2, L3 ---------- Ln, and L1 price Will be discovered. Minimum of 3 bidders shall be eligible for e RA. (E.g. If 4 bidders are financially evaluated then the L1, L2 and L3 bidders shall be eligible for e-RA). Number of bidders eligible for participating in RA would be rounded off to next higher integer value if number of technically qualified bidders is odd (e.g., if 7 bids are technically qualified, then RA will be conducted amongst L1 to L4). However, in case only two bidders are found to be responsive, e-RA would be carried out with both the parties without any elimination. However, OPTCL reserves the right to invite the evaluated L1 bidder for negotiation without conducting the e-RA. In case of price submitted by any bidder is found to be abnormal, OPTCL reserves the right to reject the bid of the bidder(s). Rank of bidders would be displayed as per the total cost to OPTCL, i.e. including Taxes and Duties payable by OPTCL as per the provisions of the biding document & after e-RA processis over.

7	Names of bidders/ vendors shall not be disclosed during the e-RA process. Names of bidders/ vendors shall be anonymously masked in the e-RA process. i. In case of RA, start/ reference price and step value of decrement shall be indicated to the bidders at the start of the auction. Any participating bidder can bid one or multiple step decrement lower than the prevailing lowest bid at that time. The Bidder shall be able to viewBid Start Price, Bid Decrement Value, Prevailing Lowest Bid value, last Bid Placed by him and time left for bidding. ii. The step value of decrement in a package to be offered by bidder (the minimum amount of reduction in the total bid price including all taxes & duties during auction), shall be kept at 0.15% of L1 bidder's final evaluated price (or) at approved amount as decided by OPTCL. iii. Bidders can only quote any value lower than their previous quoted price. However, at no stage, increase in Price will be permissible. iv. At any point during Reverse Auction, bidding Price field (Total price) shall remain enabled for the bidders. The total reverse auction period shall be unlimited and the initial auction period (1st slot) will be of thirty (30) minutes with provision of auto extension by (10) ten minutes from the schedule/ extended closing time. If any fresh lower bid is received in last ten (10) minutes of auction period or extended auction period, the reverse auction processshall get extended automatically for another ten(10) minutes. In case, there is no bid receivedduring schedule/extended slot, Auction shall get closed automatically without further extension. v. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the period of e-reverse auction to avoid complication related with internet connectivity, network problem, system crash down, power failure etc.
8	i. After conclusion of e-Reverse Auction i.e. (Closing Price in Reverse Auction will be taken as offered price by the L1 bidder), decrease in price of individual head of the template shall be considered proportionately on all individual line items of the respective head of the price schedule of the successful L1 bidder. ii. Any bid received at the tender wizard server end subsequent to closure of the e-RA shall be summarily rejected and shall not be considered as a valid bid under whatsoever circumstances. For this purpose, tender wizard server log shall prevail. iii. The bidder shall not involve himself or any of his representatives in price manipulation of any kind directly or indirectly by communicating with other bidders. iv. During Reverse Auction, If no bid is received within the specified time, OPTCL, at its discretion, may decide to close the reverse auction process/ proceed with conventional mode of tendering [Evaluation of Part-II (price bid) submitted by bidders earlier].

9	Consequent upon completion of e-Reverse Auction, OPTCL's decision on award of contract shall be final and binding on the bidders. OPTCL shall be at liberty to call the L1 bidder for further process/ negotiation and also at liberty to cancel the e-reverse auction process/ re-tender at any time, without assigning any reason thereof. OPTCL can decide to reschedule or cancel any reverse auction: the bidders shall be informed accordingly. OPTCL/ Service Provider shall not have any liability to bidders for any interruption or delayin access to the e-Tender site/ Reverse Auction link irrespective of the cause.

31.0 FINANCIAL REQUIREMENTS

31.1 MINIMUM AVERAGE ANNUAL TURNOVER (MAAT)

The minimum average annual turnover (MAAT) of the last three years (FY 20-21, FY21-22, FY22-23) for the Bidder will be INR 15.80 Crores. The Minimum Average Annual Turnover (MAAT) requirement of the bidder (The Average of Last Three Financial Years preceding to the year of NIT) as indicated in the following Table-Fin-1 shall not be less than the **above mentioned amount.** In case the Bidder is in existence for less than three financial years, the average annual turnover shall be sum of turnover in the completed no of financial years divided by three for the purpose of meeting the above criteria. Turnover of the bidding company on standalone basis only (excluding its associate companies on Standalone Basis) shall be considered for arriving at Annual Turnover.

Table-Fin-1
MAAT Schedule
(Name of Bidder)

Sl. No	Financial Year	Last Three Years Annual Turnover (excluding associate companies) on Standalone Basis of the Bidder (in INR Crores)
1		
2		
3		
A. Total		
B. Average = (A/3)		

Note:

1. The bidder has to furnish the certificate from the Chartered Accountant (CA) certifying the Last Three Years Annual Turnover in similar projects of the company only (excluding its Associated Companies) on Standalone Basis based on audited accounts of the last three Financial Years. In case the bidder has executed any project in Joint Venture/ Consortium, the Last Three Years Annual Turnover in similar projects certified by the Chartered Accountant (CA) should reflect his share of the turnover only.

31.2 LIQUID ASSETS AND ACCESS TO CREDIT FACILITY

Bidder shall be financially sound and stable. The liquid assets (Cash at Bank & Fixed Deposit) and Un-Utilized credit facility (both Fund & Non Fund based) available from bank(s) duly certified by the Bank(s) - **(Annexure-VII)** within one Month prior to the date of Tender opening, as indicated in the following format should not be less than **Rs. 3.20 Crore** [**15% (Fifteen Percent) of estimated cost of the package(s)/works]**.

Note: Liquid Assets and Credit facilities (Un-Utilized) are applicable independently for each package irrespective of the no. of packages in which bidder has participated.

Table-Fin – 2
(Name of Bidder)

Liquid Assets and Un-Utilised Credit Facility Schedule

Package/ Work Quotedfor	Estimated Cost of the Package/ Work (Rs. in Lakh)	Liquid Assets as on …..		Un-Utilised Credit Facility ason ….	
		Description	(Rs. in Cr)	Description	(Rs. in Cr)
		Cash in Hand		Cash Credit	
		Cash at Bank		LC and BG	
		Fixed Deposits		Others (Pl Specify)	
		Total Liquid Assets		Total Un-Utilised Credit Facility	

Grand Total: Total Liquid Assets + Total Un-Utilised Credit Facility.

Note:

i. The above Table – FIN-2 of the Bidder to be certified by Chartered Accountant (CA).
ii. The date of position of Liquid Assets and Un-Utilized Credit Facility Schedule Certified by Bank and CA should be same.

31.3 NET WORTH

Net worth of bidder as per the audited financial results shall be positive on the last day of the preceding financial year.

Net Worth means the sum total of the paid-up share capital and free reserves (excluding reserves created out of the revaluation of assets, write back of depreciation provisions and amalgamation & Capital Reserve) net of P&L A/C (Dr. balance) and miscellaneous expenses to the extent not adjusted or written off.

Table: Fin-3
(Name of Bidder)
Net Worth Schedule as on Dt…..

Sl. No.	Particulars	Amount (In Rs. Crore)
01	Paid-up share capital	
02	Free Reserves excluding the reserves created out of the following; i. Revaluation of assets. ii. Write Back of depreciation Provisions. iii. Amalgamation. iv. Capital Reserve v. P&L A/C (Cr. balance)	
03	Less, P&L A/C (Dr. balance)	
04	Less, Miscellaneous expenses to the extent not written off.	
05	Total: (5=1+2-3-4)	

Note:
The above (Table Fin – 3) of the Bidder(s) to be certified by Chartered Accountant (CA).

31.4 BID CAPACITY QUALIFICATION

A bidder shall meet the following bid capacity Qualification Criteria along with other Technical Qualifying requirement before his bid is considered for opening of the price bid.

i	Bidder's Bid Capacity	The bid capacity of the bidder shall be considered as 300% of Implementation of WAMS project's annual turnover (excluding that of Associated Companies) on Standalone Basis in any financial year during the last 3 financial years reckonedfrom the year of NIT, which shall be evaluated by SLDC, OPTCL based on the information furnished by the bidder as per the format **FIN No. 4 & FIN No. 5**.
ii	Bidder's Participation in the bid	A bidder may participate in the bidding of any of the package(s)/works irrespective of bidder's bid capacity.
iii	Bidder's Technical Eligibility	Bidder shall be Technically eligible based on the qualifying requirement mentioned under Clause- 4 (Qualifying Requirements (QRs) of Bidder) except Bidders Bid Capacity.
iv	Bidder's Price Bid Opening Eligibility based on the Bidder's Bid Capacity Qualification.	The bidder shall be eligible for opening of the Price Bidbased on the available bid capacity defined as under; **Available bid capacity:** =[(3 x A) –(0.5 x B) – C)], should be equal to or more than the tendered estimated price where , **A**= Highest of Implementation of WAMS project's Annual Turnover of the Bidder (excluding it's Associated Companies on Standalone Basis) in any financial year during last three financial yearsas per FIN-4. **B**= Total order Value of ongoing Work Orders/LOAs placed by OPTCL and Other Organizations on the Bidder on the date of opening of the Technical bid excluding those which have been commissioned as per FIN-5. **C**= Package(s)/Works finalized but yet to be awarded in favour of the Bidder by OPTCL (to be computed byOPTCL based on available information).
v	Opening of the Price Bid	The price bid of tender of the Technically eligible bidder(s) shall be on the date and time as decided by the SLDC, OPTCL and communicated to the eligible bidder through tender portal. The price bid of the bidder shall be opened subject to meeting the available bid capacity limit considering Para-iv above. If the evaluated price of the bidder becomes (L-I) which exceeds the available bid capacity, the price bid of the bidder shall not be rejected on bid capacity ground.
vi	Award for the Contract	After opening of the price bids of all the tender under this e-NIT, the price bids of the responsive bidder(s) shall be evaluated adopting the price evaluation methodology to derive the lowest evaluated bidder(s).

Table (FIN-4):
(Name of Bidder)

Bidder's Bid Capacity Schedule (Highest of Implementation of WAMS project's Annual Turn Over)

Sl. No	Financial Year	Bid Capacity
		Highest of Implementation of WAMS project's Annual Turnover of the company only (excluding its Associated Companies) on Standalone Basis of any year during last 03 FY (In Rs.Cr.)
01	FY 2020-21	
02	FY 2021-22	
03	FY 2022-23	

Note:

The bidder has to furnish the highest Annual Turnover Certificate from the Chartered Accountant (CA) based on Audited Account related to implementation of PMU based WAMS project. In case the bidder has executed any project in Joint Venture/ Consortium, the certificate of the Chartered Accountant (CA) should reflect his share of the PMU based WAMS project related turnover only.

Table- (FIN-5):
(Name of Bidder)

Total Order Value of Ongoing Work Orders/LOAs placed by OPTCL and Other Organizations

Sl No	Name of Organization	Description of work	Contract no & date	Total order Value of ongoingWorks placed by OPTCL & Other Organizations (in INR)
1				
2				
3				
			Total, i.e. 'B'=	

Note:
The bidder has to furnish the information in Fin No. 5 duly certified by the Chartered Accountant (CA) based on LOAs/Works Orders/NOA excluding those which have been commissioned.

32.0 CONFLICT OF INTEREST

The bidder will not have a conflict of interest. Any Bidder found to be having a conflict of interest will be disqualified. The bidder will be considered to have conflict of interest with one or more parties in this bidding process, if:

a. They have a controlling partner in common.

b. They have a relationship with each other, directly or through common thirdparties, that puts them in position to have access to information about or influence on the bid of another Bidder.

c. A bidder submits more than one bid in the bidding process.

33.0 THIRD PARTY AUDIT (TPA)

a. If OPTCL desires, the project including all software modules and hardware's shall be validated and certified with respect to tender specification and SLDC requirement, by Third Party Agency engaged by SLDC of its own cost.

b. The Third-Party agency shall conduct yearly audit of the WAMS Project during AMCperiod.

c. The supplier shall comply the observations (if any) of the TPA during AMC period based on which AMC charges shall be released.

34.0 CYBER SECURITY (VAPT) TEST

The bidder shall clear all vulnerabilities detected in the VAPT conducted by a CERT-IN empaneled audit agency before commissioning of the project as per CEA guidelines. VAPT test shall be conducted twice a year by audit agency to ensure its stability and reliability till end of AMC period. Bidder will include the cost of such tests in their offer.

35.0 GO-LIVE ACTIVITIES

After the issue of the User's Acceptance Certificates for all applications and after Cyber security conformance testing such as VAPT, the Supplier will commence Go-Live Acceptance Test (after functionality & performance tests for all applications) to ensure that the WAMS Project is rolled out in totality and all integration requirements are complied with, in accordance with the timelines specified in the Tender Document and LOA.

36.0 GO-LIVE ACCEPTANCE

a. The Supplier shall give a notice to the SLDC requesting the issue of the Go-LiveAcceptance.

b. Certificate along with all the necessary documents to justify Supplier's claim of Readiness for Go-Live.

c. After receipt of the Supplier 's notice, the SLDC shall Issue a Go-Live AcceptanceCertificate;

or

d. Notify the Supplier in writing of any defect or deficiencies or other reason for the failure of the Go-Live Acceptance Tests.

37.0 FALL BACK

If the System or Subsystem fails to pass the SAT or Go-Live even after 3 unsuccessful attempts, then SLDC reserves the right to terminate the Contract and if the Contract is terminated, the Performance Security Deposit will be forfeited. The remaining work shall be carried out by SLDC through any other supplier at the risk and cost of the Bidder.

38.0 THE BACKUP & RESTORATION

The Backup & Restoration of all data of WAMS application shall be done as per the decided bythe SLDC, OPTCL.

39.0 SUB-CONTRACTING

Sub-Contracting both software development and hardware supply is not allowed under this contract.

40.0 MINIMUM QUALIFICATION CRITERIA OF BIDDERS

Bidders would be evaluated on the following criteria as per the guide lines given below by the SLDC, OPTCL Odisha.

The bidder should submit the bid on its own. The bidder‘s experience as sub-supplier/sub-contracting in any contract will not be taken into account in determining the bidder's experience for meeting the mandatory Technical and FinancialQualification Criteria and Technical Evaluation Criteria.

The Bidder **MUST MEET ALL** the following qualification criteria and will submit the relevant documentary evidences as indicated below:

40.1 GENERAL INFORMATION

i. “The Bidder” means any eligible FIRM or COMPANY registered under Company act 1956 (Amended in 2013) or Limited Liability Partnership (LLP) registered under the LLP Act, 2008 and should have been in operation in India, whose primary business is software development and implementation and must have relevant experience in Data Centre Hardware and software installation as on the date of bid opening and will have their registered offices in India.

ii. Bidders to furnish Self-attested copies of work orders with successful completion certificate from the user to prove the following in full shape.

The Bidder or its parent company shall have developed commissioned and running of at least two projects in RLDC / NLDC / Grid India / RPC / STU /CTU/ SLDC with minimum cumulative project cost INR 10 Cr (with GST) in India in which installation of PMU,

installation of control Centre hardware, data received and handled at Control Centre PDC with data archiving and visualization software for system operator/utility successfully in the last five (5) years ending the date of submission of bid and handled at Control Centre PDC with data archiving and visualization software for system operator/utility successfully.

iii. The Bidders should have CMMI – Level III maturity at the time of participation in the tender and the appraisal document and certificate will be enclosed with the bid.

iv. Bidders shall have a valid ISO 9001:2000 or above and ISO 27001.

v. Bidders must provide third party Safety Certification ("S" mark) Scheme of electronic sector promoted by STQC certification services, Standardization Testing and Quality Certification directorate, Ministry ofElectronics and Information Technology, Govt. of India.

40.1.1 CODES, STANDARDS & REGULATIONS

The design, manufacture, erection and testing of the equipment and material to be supplied shall comply with latest revisions of relevant Indian Standards or equivalent IEC, IEEE standards.

In addition, the Indian Electricity Rules, Electricity Act 2003,Statutory requirements of Central Govt., GERC and State Government of Odisha (applicable codes), shall also be complied with. Any complications arising out of it will be set right by the bidder without any implication to Corporate.
The bidder shall submit his offer as per information given in submission of

tender.Drawings, Data and Documents

The bidder shall furnish following documents/ information along with offer in spiral bound volumes.
General description of equipment offered specifying the important features make, technical parameters, materials etc. to enable SLDC/OPTCL to have proper understanding of the material offered and its operation.

The following drawings and documents shall be furnished to SLDC by the successful bidder for approval of SLDC, within the period stipulated in the draft contract/mutually agreed terms at the time of placement of order, the bidder shall submit a list of all such drawings and documents he proposes to submit. The list will be approved by SLDC and may be modified, if necessary. Each drawing /document in the list shall be identified with a serial number, description and scheduled date of submission. This should be submitted in a spiral bound volumes.

40.1.2 MAJOR DOCUMENTS & DRAWINGS REQUIRED FOR APPROVAL

i. Architecture of the proposed system showing each item as per BOQ and detail working of each by the bidder

ii. Specification of PMUs and PDC, Control Centre Hardware.
iii. Hardware proposed for Communication between PMU and Communication panel.
iv. Data dictionary for all process.
v. Detail of Technical help extend to software developer (decided by SLDC).
vi. Detail layout with PMU drawing of all substation.
vii. Detailed process specification.
viii. Detailed specification of Hardware used.
ix. Drawing of all product used in project.
x. Detail of Data Archiving Software.
xi. Detail scheme of storage proposed and retrieve method.
xii. Detail of scheme/schematic for Visualization at Control Centre of PMU data on OPTCL Power Map
xiii. The complete design, detailed engineering are to be done by the successfulbidder.
xiv. All the drawings are to be submitted by the successful bidder and got approved from SLDC before execution.
xv. Detailed Engineering BOQ to be submitted by the successful bidder and got approved after due scrutiny considering actual requirement, standard clearances (CLD) etc.

40.1.3 FOR REFERENCE

OEM's Complete and comprehensive instruction manuals with drawings for operation and maintenance of the equipment's supplied by the bidder. This shall also include the following:

i. Inter panel wiring of all CT/PT/Digital Status.
ii. Inter panel wiring and terminal block arrangement.
iii. External connection diagram, panel wise and scheme wise.

40.1.4 AS- BUILT DRAWINGS

On completion of installation, testing and commissioning, the bidder shall incorporate revisions/ modification if any, in the reproducible and submit 'as built' drawing for OPTCL's record in spiral bound volumes and soft copy. The drawings shall be in AutoCAD DXF format.

40.1.5 FUNCTIONAL AND COMPOSITE TESTING

The bidder has to perform functional testing on each site with PMU data and development and testing for relation for different type of visualization must be performed.
The bidder also required to perform composite testing on total developed solution with PMUs data. Representative of SLDC must be presence during above testing and all testing procedure must be duly signed by them. These reports will be necessary for SAT.

Following test shall be conducted on equipment after completion of erection in the presence of Engineer -in-charge from point of view of completeness in the presence of SLDC, OPTCLs Authorized Representative.

a. Visual inspection of total system.
b. Checking of continuity of power and control cables.
c. Checking of insulation by secondary injection or by primary injection.
d. Checking of nameplate data of complete system.
e. Checking of cable terminations and laying, dressing etc. in the equipmentkiosk and control panels.
f. Checking of safe accessibility of components.

All the equipment and materials shall be passed through checks and test as per approved Field Quality Plan.

40.1.6 BAR CHARTS

The Bidder shall furnish along with the bid, the bar charts in M.S. Project and project schedules indicating starting and completion dates of each activity, such as preparation & approval of drawings, manufacturing/supply/ delivery, civil works, erection, testing, pre commissioning and commissioning etc.

40.2 TECHNICAL REQUIREMENTS

i. The bidder or its parent company shall be an Original Manufacturer of Phasor Measurement Unit (PMU), based on industry-recognized standards.
ii. The bidder or its parent company shall have developed commissioned and running of at least one project in which installation of PMU, installation of control centre hardware, data received and handled at control centre PDC with data archiving and visualization software for system operator/utility successfully.
iii. There shall be at least one SCADA/WAMS system developed by bidder or its parent company which handles the data from RTU/PMU with visualization should be in service for minimum one year from the date of technical bid opening.
iv. The bidder should have full-fledged set-up in India with necessary infrastructure, resources and capacity of approximately 30 (Thirty) trained technical persons to deliver the Project and sales service thereafter the support paper to demonstrate this qualifying requirement must be furnished with bid.

40.3 FINANCIAL

i. The firm should have sufficient financial capacity for the execution of the project within OPTCL's desired project implementation schedule. The minimum average annual turnover (MAAT) of the last three years (FY2020-21, FY 2021-22, FY2022-23) for the Bidder will be INR 15.80 Crores.

ii. The Bidder will furnish scanned attested copies of the turnover along with audited profit and loss account and balance sheet for the last three financial years on year wise basis. Financial statements audited by a practicing Chartered Accountant will only be accepted. CA certificate stating the overall turnover details and turnover from PMU based WAMS projects for the last three years (FY2020-21, FY 2021-22, FY2022-23) with name, seal and registration number of CA. In addition to the financial statements, Turnover/Net worth Certificate duly certified by the practicing Chartered Accountant to be furnished. Since Unique Documents Identification Number (UDIN) is mandatory for issuing certificate by practicing Chartered Accountants, the UDIN will be clearly specified in the above certificate. An undertaking in the prescribed form will be submitted by the bidder. Stringent action including the black listing of the firm from participating tenders of OPTCL may be taken for furnishing forged documents.

iii. Financial statements of the bidders in the case of limited Companies will be verified

iv. The Bidder will have positive net worth as on 31/03/2023

v. The bidder must have INR 3.2 crore liquid asset in hand.

vi. Bid capacity must be equal to or more than 15.80 Crores.

vii. Minimum Annual Turnover (MAT) shall be more than the estimated cost of this tender in any three years individually out of last five financial years.

41.0 DEPLOYMENT OF EXPERTS

41.1 PERSONNEL CAPABILITY

The bidder needs to submit work plan and manpower deployment plan in the technical proposal. The bidder may change the resources with the required technical skill sets as statedabove as per the project requirement. During the Pre-commissioning phase/SAT phase/AMC Phase, in addition to the offsite support, one Software Developer would need to be deployed on full-time basis onsite to ensure:

i. Addressing/fixing any production issues or defects

ii. Ensuring 24x7 operation of WAMS stack running on server at SLDC.

iii. Coordination and resolving integration issues with other systems

iv. Maintenance of DC server.

v. Modifications in reports as required by management for monitoring purpose

vi. Coordination and resolving integration issues with other systems

vii. Bidder must comply all other routine activities viz. Back up, event analysis restoration etc. required by SLDC.

42.0 PERFORMANCE BENCHMARK

a. All software modules shall adhere to the performance benchmark as specified in Section V.
b. All hardware components shall adhere to the specifications mentioned in Section V.

43.0 CHANGE REQUEST AND CONTROL PROCEDURE (AFTER GO-LIVE)

a. Impact on Price:

Bidder shall calculate the necessary price impact and discuss with SLDC before proceeding for change request

b. Change Request Process

Change request approval process:

i. Change request complying above qualification criteria shall be initiated.
ii. A change request form is filled up. (A format shown below will be supplied to bidder aspart of the contract agreement, ref-Annexure-XV)
iii. Initiator (SLDC, OPTCL or Bidder's Project Manager) fills up items number 3,4, 5 inthe form.
iv. The bidder's project manager fills up item's numbers 1, 2, 6, 7 and 8.
v. Project Manager from SLDC fills up 9, 10, and 11.
vi. On approval by SLDC, the project manager of bidder proceeds with implementation. In all respect, the decision of SLDC, OPTCL's is final and no appeals are permitted against it.

44.0 JURISDICTION OF THE HIGH COURT OF ODISHA

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

45.0 CORRESPONDENCES

i. Any notice to the supplier under the terms of the contract will be served by RegisteredPost or by hand at the Supplier's Principal Place of Business.
ii. Any notice to the Purchaser will be served at the Purchaser's Principal Office in thesame manner.

46.0 OFFICIAL ADDRESS OF THE PARTIES TO THE CONTRACT

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

i. **Purchaser**: CHIEF LOAD DESPATHER
STATE LOAD DESPATCH CENTER,
Bhubaneswar-751022, Odisha.

ii. **Supplier:** Address
Telephone No.
Mail ID Fax No.

47.0 OUTRIGHT REJECTION OF TENDERS

Tenders will be out rightly rejected if the followings are not complied with.

i. The tenderer will submit the bid in electronic mode only and will submit the tender cost on or before the date and time of opening of technical bid (part-I).

ii. The tenderer will submit the bid in electronic mode only.

iii. The Tender will not be submitted telegraphically or by FAX.

iv. The prescribed EMD will be submitted on or before the date and time of opening of technical bid (Part-I).

v. The Tender will be kept valid for a minimum period of 180 days from the date of openingof tender.

vi. The Tender will be submitted in single stage two part as specified.

vii. The schedule of prices should be filled up fully to indicate the break-up of the prices includingtaxes and duties. Incomplete submission of this schedule will make the tender liable for rejection.

viii. 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.

ix. Guaranteed Technical particulars & Abstract of terms and Conditions should be filled in completely.

x. Detailed information on any litigation or arbitration arising out of contract completed or underexecution by it over the last five years. A consistent history of litigation by or against the bidder may result in rejection of bid.

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

48.0 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.

The Purchaser and the Supplier shall keep confidential and shall not, without the written consentof

the other party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract.

The obligation of a party under above, however, shall not apply to that information which

a. Now or hereafter enters the public domain through no fault of that party
b. Can be proven to have been possessed by that party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other party hereto
c. Otherwise lawfully becomes available to that party from a third party that has no obligation ofconfidentiality

The above provisions of this shall not in any way modify any undertaking of confidentiality givenby either of the parties hereto prior to the date of the Contract in respect of the Works or any part thereof

The provisions of this shall survive termination, for whatever reason, of the Contract.

49.0 SCHEME/PROJECTS

The Software/Hardware/materials/equipment covered in this specification will come under capital works of SLDC with financial support of "PSDF ".

50.0 EFFECTIVE DATE OF CONTRACT

The effective date of contract shall be reckoned from the date of issuance of Letter of Award.

51.0 ENGINEER-IN-CHARGE'S DECISION

i. In respect of all matters which are left to the decision of the Engineer-In-Charge including the granting or with-holding of the certificates, the Engineer-In-Charge shall, if required to do so give in writing a decision thereon.

ii. If, in the opinion of the Contractor, a decision made by the Engineer-In-Charge is not in accordance with the meaning and intent of the Contract, the Contractor may file with the Engineer-In-Charge, within fifteen (15) days after receipt of the decision, a written objection to the decision. Failure to file an objection within the allotted time will be considered as an acceptance of the Engineer-In-Charge's decision and the decision shall become final and binding.

iii. The Engineer-In-Charges' decision and the filing of the written objection thereto shall be a condition precedent to the right to request arbitration. It is the intent of the Contract that there shall be no delay in the execution of the works and the decision of the Engineer-In-Charge as rendered shall be promptly observed.

52.0 CO-OPERATION OTHER CONTRACTORS & TPIA

The Contractor shall cooperate with OPTCL's other Contractors, PMC & Third Party Inspecting Agency (TPIA) and freely exchange with them such technical/commercial information as may be necessary for smooth execution of the project in an efficient and timely manner to avoid unnecessary duplication of efforts.

53.0 PROGRESS REPORT ON SUPPLY AND UTILIZATION OF MATERIALS/ EQUIPMENT

During the various stages of the work in pursuance of the Contract, the Contractor shall at his own cost submit Monthly Progress Reports of Software development, hardware's /equipment supplied, Utilization of Materials/equipment and status of the materials/equipment in pipeline as may be reasonably required by the Engineer-In-Charge with photographs, test certificates, etc. Such progress reports shall be in the form and size as may be required by the Engineer-In-Chargeand

54.0 LIMITATION OF LIABILITIES

The final payment by SLDC, OPTCL in pursuance of the Contract shall mean the release of the Contractor from all his liabilities under the Contract except for liabilities under Guarantee period. Such contractual liabilities and responsibilities of the Contractor shall prevail till expiry of the Latent Defect Warranty period even after the final payment is released.

Notwithstanding anything to the contrary mentioned herein and to the extent permitted by law, the aggregate liability of Contractor to SLDC, OPTCL, whether in contract, tort or otherwise, will be limited to 100% of the contract value.

55.0 STANDARDS

The Software developed / Materials supplied and works executed under this Contract shallconform to the IEC/IS, and, when no applicable standard is available, to the authoritative standard appropriate to the software/materials/works and such standards shall be the latest issued by the concerned institution.

56.0 DELIVERY MILESTONES OF HARDWARE AND SOFTWARE

Software module and Hardware materials shall be delivered as per the table given below.

To- Date of Issue of LoA

Table 6 Delivery Milestones

Sl.No	Activities	Hardware	Software

1	Submission of design, over all architecture, prepared design documentation and software requirement specification including field's survey for implementation of completeWAMS project.	T0+6 months	
2	Hardware supply at PMU locations	T0+11 months	
3	Hard supply at Control Centre	T0+11 months	
4	Installation of Hardware at PMU locations and at Control Centre.	T0+16 months	
5	Software design and development		T0+19 months
6	Software installation		T0+20 months
7	Integrated system Site Acceptance Test (SAT) of hardware and all software module.	T0+22 months	
8	Training and system taking over	T0+23 months	

57.0 WORK COMPLETION SCHEDULE

i. The Bidder shall include in his proposal of program for software developing, supplying and erecting the Materials/equipment covered under this Works in the form of Work Completion Schedule (Bar Chart / PERT) identifying key activities of total work, such as Software development, Supply of Materials/Equipment, erection, Installation, Testing &Commissioning of all works within the contract completion period. The work completion schedule shall be reckoned from the date of issue of Letter of Award.

ii. The Contractor shall submit Work Completion Schedule conforming to the delivery/erection dates for review and approval of OPTCL.

iii. The approved Work Completion Schedule submitted by the contractor shall form part of the contract agreement.

iv. The work completion schedule shall be revised if the reason of delay in completion of works is not attributable to the Contractor.

v. The zero date of the work completion schedule shall be considered the date of LOA.

PART I

SECTION III

LIST OF ANNEXURES

SECTION – III: LIST OF ANNEXURES

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

1	Declaration form	ANNEXURE-I
2	Black listing	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 (Technical)	ANNEXURE-XII(A)
13	Schedule of deviations (Commercial)	ANNEXURE-XII(B)
14	Litigation /Arbitration	ANNEXURE-XIII
15	Delivery Schedule	ANNEXURE-XIV
16	Change Request Format	ANNEXURE-XV
17	Pro forma for Bank Balance, Fixed Deposits and availability of Credit Facilities	ANNEXURE- XVI
18	Abstract of GTCC	ANNEXURE- XVII
19	Reverse Auction Process Compliance Form	ANNEXURE-XVIII

ANNEXURE-I: DECLARATION FORM

DECLARATION FORM

To

The CLD, SLDC,
Bhubaneswar

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/equipment 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/equipment 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.

Bid Security Declaration

*I/We further declare that, we will not modify/withdraw the bid after opening of techno-commercial bid (i.e. part-I bid) during its validity period and in such an event we agree that OPTCL would be free to debar us from participating in the tenders floated by OPTCL for a period of three years.

Signed this day of 2023

Yours faithfully

Signature of the Bidder with seal of the company

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

* (Strikeout whichever is not applicable)

Enclosure:

A. Soft Form of Documents (Scanned Copy)

Sl. No.	Description	.Pdf file reference
1	Declaration form (ANNEXURE-I)	Attach 1.pdf
2	Black listing (ANNEXURE-II)	Attach 2.pdf
3	Schedule of Quantity and Delivery (ANNEXURE-III)	Attach 3.pdf
4	Abstract of price component [to accompany Part-II of this specification] (ANNEXURE-IV)	Attach 4.pdf
5	Schedule of prices to accompany Part-II (ANNEXURE-V)	Attach 5.pdf
6	Bank Guarantee form for earnest money deposit (ANNEXURE-VI)	Attach 6.pdf
7	Composite Bank Guarantee form for security deposit, payment, and performance (ANNEXURE-VII)	Attach 7.pdf
8	Chart showing particulars of E.M.D. (ANNEXURE-VIII)	Attach 8.pdf
9	Data on Experience. (ANNEXURE-IX)	Attach 9.pdf
10	Schedule of spare parts. (ANNEXURE-X)	Attach 10.pdf
11	Schedule of Installations. (ANNEXURE-XI)	Attach 11.pdf
12	Schedule of deviations (Technical) (ANNEXURE-XII-A)	Attach 12.pdf
13	Schedule of deviations (Commercial) (ANNEXURE-XII-B)	Attach 13.pdf
14	Litigation /Arbitration (ANNEXURE-XIII)	Attach 14.pdf
15	Delivery Schedule (ANNEXURE-XIV)	Attach 15.pdf
16	Change request format (ANNEXURE-XV)	Attach 16.pdf
17	Bank Certificate (ANNEXURE-XVI)	Attach 17.pdf
18	Abstract of GTCC (ANNEXURE-XVII)	Attach 18.pdf
19	Reverse Auction Process Compliance Form (ANNEXURE-XVIII)	Attach 19.pdf

B. Schedules (XLS format) in the e-Tender Portal of OPTCL:

Sl. No.	Particulars	Schedules in XLS format
1	Bidders' information	Schedule-I
2	Acceptance of Important Condition of the Contract	Schedule-II
3	Check List	Schedule-III
4	Documents to Qualifying requirement	Schedule-IV
5	Financial qualification	Schedule-V
6	Outright Rejection Criteria	Schedule-VI
7	Documents to Accompany Bids	Schedule- VII

ANNEXURE-II: PROFORMA OF SELF DECLARATION-BLACK LISTING/ DEBARRING ACTION

(To be filled in non-judicial stamp paper of worth Rs.100/- and to be Notarized)

Name of the Bidder: ----------

e-Tender Notice No: ----------

Sir,

I. I/We, the undersigned do hereby declare that, I/We have never been blacklisted and / or there were no debarring actions against us for any default in executing the Turnkey Contract or in the performance of the contract entrusted to us in any of the Electricity Transmission Utilities of India.

II. In the event of any such information pertaining to the aforesaid matter found at any given point of time either during the course of the contract or at the bidding stage, my bid / contract shall be liable for rejection/ cancellation / termination without any notice at the sole discretion of OPTCL.

Yours faithfully,

Place-

Date-

Signature of the bidder

With seal

Note: The bidder shall also disclose, if he was debarred/black listed by any utility in the past and if the debar/blacklisting order was subsequently withdrawn by the utility suo-moto or set aside by any court order.

(This form shall be duly filled-up, signed by the bidder & uploaded as an attachment)

ANNEXURE-II: ABSTRACT OF GTCC

ABSTRACT OF GENERAL TERMS AND CONDITIONS OF CONTRACT [COMMERCIAL] TO ACCOMPANY PART-I:
(To be filled up by the tenderer as indicated in the excel sheet for "Abstract of price component & other commercial terms")

ANNEXURE-III: SCHEDULE OF QUANTITY & DELIVERY

SCHEDULE OF QUANTITY AND DELIVERY ALONG WITH INSTALLATION & COMMISSIONING

SCHEDULE OF QUANTITY & DELIVERY

Table 7 Schedule of quantity

Sl.No.	Name of the item	Unit	Total Quantity
A	**SOFTWARE**		
1	**Software for Real Time PDC & Analytical Applications**		
(a)	Super PDC Software	Lot	1
(b)	Analytical Applications - Oscillation Monitoring System (OMS)	Lot	1
(c)	Programming Development System (PDS) Software	Lot	1
(d)	Software for Remote Consoles	Lot	4
2	**Software for Historian & Data Archiving**		
	Data archiving		
(a)	Data Historian Software	Lot	1
(b)	Software for NAS	Lot	1
3	**Software for Infrastructure Management**		
(a)	Network Management System & Centralized Management System	Lot	1
(b)	Patch Management Software	Lot	1
(c)	Identity Server Software	Lot	1
(d)	Antivirus Software for all machines in the Control center	Lot	1
B	**HARDWARE**		
4	**Hardware for Real Time PDC & Analytical Applications**	**Set**	**2**
(a)	Super PDC **		
(b)	Time System (GPS receiver)		
(c)	Analytical Application Server		
(d)	Any other Hardware required for Real Time PDC & Analytical Applications		
(e)	Programming Development System (PDS) Server		
5	**Hardware for Historian & Data Archiving**		
(a)	Storage Area Network (SAN) based Storage or any other specialised Storage Solution of Minimum 50TB data storage capacity of RAID 10 or better configuration for storing PMU datafor One year	No.	1
(b)	Data Historian Server	No.	2

(c)	Network Attached Storage (NAS) System of Minimum 6TB of RAID 10 or better configuration	Set	1
(d)	Any other Hardware required for Historian & Data Archiving	Lot	1
6	**Hardware for Infrastructure Management**	**Set**	**2**
(a)	NMS Server cum Centralised Management Console		
(b)	Patch management Server		
(c)	Identity Server		
(d)	Any other Hardware required for Infrastructure Management		
7	**Workstation Consoles**		
(a)	Workstation Console integrated with dual Touch-screen Monitors for PDC Application	No.	3
(b)	Workstation Console integrated with dual Touch-screen Monitors for Programming Development System	No.	1
8	**Remote Consoles**		
(a)	Remote Consoles, equivalent to Work station console mentioned at Item No.7 above	No.	4
9	**Networking Hardware**		
(a)	Firewall with NIPS with Minimum 8 x 10Gbps Fiber optic ports and 2 x 1Gbps Ethernet ports	No.	2
(b)	WAN routers with Minimum 4 x10Gbps Fiber Optic ports & 8 x 1Gbps Ethernet ports		
i	For communications with PMUs	No.	2
ii	For communications with PDC under URTDSM	No.	2
iii	For communications with Remote Consoles at Substations.	No.	2
(e)	LAN Switch (Layer 3) with minimum 8x10 Gbps Fiber Optic Ports and 8 x 1 Gbps Ethernet Ports for the following LANs		
i	PDC LAN	No.	2
ii	Historian LAN	No.	2
iii	Infrastructure Management LAN	No.	2
iv	LAN for Remote Consoles	No.	2
v	Analytical Applications LAN	No.	2
10	Color Laser Printer	No.	1
11	Any additional item (Hardware and software) required to meet the specification requirement.	Lot	1
D	**SERVICES**		
1	Integration of WAMS System of SLDC with following units/applications:		
(a)	Integration with existing SCADA/EMS System of Main & backup SLDC.	No.	1
(b)	Integration of WAMS System with the existing Video Projection System (VPS).	Lot	1

(c)	Cyber Security Audit by Cert-IN certified Auditors during FAT.	Lot	1
(d)	Cyber Security Audit by Cert-IN certified Auditors during SAT.	Lot	1
E	**TRAINING**		
1	Training for SLDC - Man days @15 Days x 24 persons in each Region	Man-days	360
F	**ANNUAL MAINTENANCE CONTRACT (AMC)**		
(a)	Annual Maintenance Contract (AMC) of Complete System Supplied for Initial Period	Lot	1
(b)	Annual Maintenance Contract (AMC) of Complete system supplied for subsequent 6 years, after completion of initial period of AMC.	Lot	1
(c)	Annual Cyber Security Audit by Cert-IN certified Auditors during AMC Period	Lot	1
(d)	Annual Training under AMC period	Lot	1
(d)	Pre-deployment testing & Installation of Patches/Updates released during the AMC period for all Software Products (developed & supplied by the Contractor and also all 3rd partySoftware) supplied under this Project	Lot	1
G	**Additional Services during Maintenance period**		
(a)	Integration of PMUs with SLDC during the AMC period (50 PMUs per year)	Lot	1
(c)	Services for migration from IPv4 to IPv6 for all equipment control center wise	Lot	1

Signature of Tenderer with seal of Company

ANNEXURE-IV: ABSTRACT OF PRICE COMPONENT

Abstract of price component [to accompany Part-II of this specification]

(To be filled up by the tenderer as indicated in the excel sheet)

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

ANNEXURE-V: SCHEDULE OF PRICE

SCHEDULE OF PRICE……. TENDER SPECIFICATION No…….

(To be filled up by the tenderer as indicated in the excel sheet**)**

1. The tenderer should fill up the price schedule properly in excel file in e-tender mode. The tender will be rejected, if the price bid is not submitted in accordance with the price schedule. No post tender correspondence will be entertained on break-up of prices. Also, the supplier should agree for delivery at the desired site.
2. The Tenderer will give an undertaking in part-I of the bid that, entire implication of lower tax and input tax credit benefit have been fully passed on to the purchaser as per anti-profiteering and other provisions under GST Laws while quoting the tender price.
3. Conditional offers will not be acceptable.

Signature of Tenderer

Name, Designation and Seal

ANNEXURE-VI: BG FOR EMD

PROFORMA FOR BANK GUARANTEE FORM FOR EARNEST MONEY DEPOSIT

(To be stamped in accordance with Stamp Act and the Non-Judicial Stamp Paper of appropriate value should be in the name of Issuing Bank)

Ref No: …….

Bank Guarantee No. …….

Date: …….

BG Amount: …….

Validity Period: …….

This Guarantee Bond is executed this…… day of …… by us the…… Bank at ……, P.O……, Dist....., State…… and Code No……..

Whereas the ODISHA POWER TRANSMISSION CORPORATION Limited, Janpath, Bhubaneswar, a company constituted under the Companies Act-1956 (hereinafter called SLDC, OPTCL) has invited Tender vide e-NIT No……. Dated…… for the purpose of …… Work under Package(s) No……../ purchase of……..

1. Now, therefore, in accordance with Notice Inviting Tender (e-NIT) No… .....Dated …… of SLDC, OPTCL, Ms. /Shri……Address… .....Wish / Wishes to participate in the said tender and as a Bank Guarantee for the sum of Rs ……. [Rupees in ***words***----------] valid for a period of ……days is required to be submitted by the bidder, as per Tender Specification, we the_____) [indicate the name, Address & Code of the bank] [hereinafter referred to as "Bank"] at the request of Ms./Shri……... [hereinafter referred to as "Bidder"] do hereby unequivocally and unconditionally guarantee and undertake to pay during the above said period on written request by the <Tender Issuing Authority, SLDC, ODISHA POWER TRANSMISSION CORPORATION Ltd. , Bhubaneswar an amount not exceeding Rs……. to SLDC, OPTCL., without any reservation. The guarantee would remain valid up to .....[Date] and if any further extension to this is required, the same will be extended on receiving instruction from ----------on whose behalf this Bank Guarantee has been issued.

2. We, the_____[indicate the name of the Bank, Address, Code] do hereby further undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from SLDC, OPTCL. Any such demand made on the Bank will be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee will be restricted to an amount not exceeding Rs…… (Rupees in words…)

3. We undertake to pay to SLDC, OPTCL any money so demanded not withstanding any dispute or disputes so raised by the bidder 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 will be a valid discharge of our liability for payment thereunder and the bidder

will have no claim against us for making such payment.

4. We, the_____Bank further agree that the guarantee herein contained will remain in full force and effect during the aforesaid period of_____days [in words]..... (as per Tender Specification) and it will continue to be so enforceable till all the dues of SLDC, OPTCL under or by virtue of the said Bid have been fully paid and its claims satisfied or discharged or till SLDC, OPTCL certifies that the terms and conditions of the said Bid have been fully and properly carried out by the said bidder and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us or our Branch Office at Bhubaneswar <Mention Name, Address & Code of the Branch Office at Bhubaneswar of Issuing Bank> in writing on or before_____we will be discharged from all liability under this guarantee thereafter.

5. We the_____Bank further agree with SLDC, OPTCL that SLDC, OPTCL will 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 Bidder from time to time or to postpone for any time or from time to time any of the powers exercisable by SLDC, OPTCL against the said Bidder and to forbear or enforce any of the terms and conditions relating to the said Bid and we will not be relieved from our liability by reason of any such variation, postponement or extension granted to the Bidder or for any forbearance, act or omission on the part of SLDC, OPTCL or any indulgence by SLDC, OPTCL to the said Bidder or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have the effect of so relieving us.

6. This guarantee will not be discharged due to the change in the name, style and constitution of theBank and/or of the Bidder.

7. We_____[indicate the name of Bank, Address &Code] lastly undertake not torevoke this guarantee during its currency except with the previous consent of SLDC, OPTCL in writing.
8. We, the_____Bank (Name, Address & Code) further agree that this guarantee will also be invokable at our place of business at ---------- Branch of **Bhubaneswar** (indicate Name, Address & Code of the Branch at Bhubaneswar) in the State of Odisha."

"Notwithstanding anything contained herein"

a) Our liability under the bank guarantee will not exceed Rs.----------(Rupees in words----------.....) only.

b) This Bank guarantee will be valid up to---------- --.

c) We or our Branch at Bhubaneswar <Mention Name, Address & Code..... > will be liable to pay guaranteed amount or any part thereof under this guarantee only if you serve upon us at --------- Branch of Bhubaneswar a written claim or demand on or before .....,

The Bank Guarantee is issued in paper form and Advice transmits Bed through SFMS with required details to the beneficiary's advising bank (ICICI Bank Bhubaneswar, IFSC Code ICIC0000061).

Dated, the_____Day of _____

For_____[Indicate name of Bank]

Signature ……
Full name …….
Designation ……
Power of Attorney No. …….
Date…….
Seal of the Bank…….

WITNESS: (SIGNATURE WITH NAME AND ADDRESS)
(1)
Signature ……
Full name …….
(2)
Signature ……
Full name …….

N.B.:

1. Name of the Bidder: ……
2. BG No & Date: ……
3. Amount (In Rs.): ……
4. Validity up to: ……
5. E-NIT No……..
6. Package/Works No……..
7. Name, Address & Code of Issuing Bank: ……
8. Name, Address & Code Bhubaneswar Branch of the Issuing Bank: ……
9. The Bank Guarantee will be accepted after getting SFMS advice as per details below.

Format for SFMS details

(The Unique Identifier for field 7037 is "SLDC/ OPTCL541405793")

Table 8 Format for SFMS details

Sl. No.	PARTICULARS	TYPE	DETAILS
1	Type of Bank Guarantee	Mandatory	EMD
2	Currency & Amount	Mandatory	
3	Validity Period (from—to --)	Mandatory	
4	Effective Date	Mandatory	
5	End date of lodgment of Claim	Mandatory	
6	Place of lodgment of claim	Mandatory	Bhubaneswar, Branch Name----------of Bhubaneswar Branch code----------of Bhubaneswar Branch Address ---------- at Bhubaneswar
7	Issuing Branch IFSC Code	Mandatory	
8	Issuing Branch name & address	Mandatory	
9	Name of applicant and its details	Mandatory	
10	Name of Beneficiary and its details	Mandatory	
11	Beneficiary's Bank/Branch and IFSC Code	Mandatory	ICICI Bank Ltd IFSC Code-ICIC0000061
12	Beneficiary's Bank/ Branchname and address	Mandatory	ICICI Bank Ltd Bhubaneswar Main Branch, Bhubaneswar
13	Sender to receiver information	Mandatory	
14	Purpose of Guarantee	Mandatory	EMD
15	Reference/Description of the underlined tender/contract	Mandatory	NIT No

ANNEXURE-VII: CPBG

[PROFORMA FOR COMPOSITE BANK GUARANTEE FOR SECURITY DEPOSIT PAYMENT AND PERFORMANCE]-

(To be stamped in accordance with Stamp Act and the Non-Judicial stamp paper of appropriate value should be in the name of the Issuing Bank.)

Ref No: …….
Bank Guarantee No. …….
Date: ……
BG Amount: …….
Validity Period: ……..

This Guarantee Bond is executed this…… day of …… by us the…… Bank at ……, P.O……, Dist....., State…… and Code No……..

Whereas the ODISHA POWER TRANSMISSION CORPORATION Limited, Janpath, Bhubaneswar, a company constituted under the Companies Act-1956 (hereinafter called SLDC, OPTCL) has issued Letter of Award (LOA) No…… Dated…… for the purpose of …… work under Package No……. (herein after called "the Agreement") to M/s/Shri …….. , Address…….. (herein after called the "Supplier") for supply, erection, installation & commissioning and associated civil works under the above LoA and whereas SLDC, OPTCL has agreed (1) to exempt demand of security deposit under the terms and conditions of the LOA (2) to release payment of the cost of the Contract Price to the Supplier on furnishing by the Supplier to SLDC, OPTCL a Contract Performance Bank Guarantee (CPBG) of the value of 10% of the Contract Price of the said Agreement.

1. Now therefore, in accordance with the terms and conditions of LOA No._____dated _____ for the due fulfillment by the said Supplier of the terms and conditions contained in the said agreement, on production of a Bank Guarantee for Rs._____ (Rupees_____) only, we the bank_____[Indicate bank Name, Address & Code] (hereinafter referred to as "the Bank") at the request of M/s/Shri _____ supplier do hereby undertake to pay to SLDC, OPTCL, an amount not exceeding Rs._____ (Rupees_____) only.
2. We, the_____Bank [indicate the name of the Bank, Address & Code] do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from SLDC, OPTCL. Any such demand made on the bank will be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee will be restricted to an amount not exceeding Rs._____(Rupees---------- In Words).
3. We, the..... Bank also undertake to pay to SLDC, OPTCL any money so demanded not withstanding any dispute or disputes raised by the Supplier in any suit or proceeding instituted / pending before any court or tribunal relating thereto, our liability under this present being absolute and

irrevocable. The payment so made by us under this bond will be a valid discharge of our liability for payment thereunder and the Supplier will have no claim against us for making such payment.

4. We, the_____Bank further agree that the guarantee herein contained will remain in full force and effect during the aforesaid period of_____days and it will continue to be so enforceable till all the dues of SLDC, OPTCL under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till SLDC, OPTCL certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said supplier and accordingly discharges this guarantee.

   Unless a demand or claim under this guarantee is made on us or our Branch Office at Bhubaneswar <Mention Name, Address & Code of the Branch Office at Bhubaneswar of issuing Bank> in writing on or before ..... (Date), we will be discharged from all liability under this guarantee thereafter.

5. We, the_____Bank [indicate the name of the Bank, Address & Code] further agree with the Board that SLDC, OPTCL will 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 or 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 SLDC, OPTCL against the said supplier(s) and to forbear or enforce any of the terms and conditions relating to the said Bid and we will 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 SLDC, OPTCL or any indulgence by SLDC, 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 the effect of so relieving us.

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

7. We, the_____Bank [indicate the name of the bank, Address & Code] lastly undertake not to revoke this guarantee during its currency except with the previous consent of SLDC, OPTCL in writing.

8. We, the_____Bank (Name, Address & Code) further agree that this guarantee will also be invokable at our place of business at **Bhubaneswar** (indicate Name, Address & Code of the Branch at Bhubaneswar) in the State of Odisha.

"Not withstanding anything contained herein"

a) Our liability under the bank guarantee will not exceed Rs.----------(Rupees in words----------.....) only.

b) This Bank guarantee will be valid up to---------- --.

c) We or our Branch at **Bhubaneswar** <Mention Name, Address & Code.....> will be liable to pay guaranteed amount or any part thereof under this guarantee only if you serve upon us at..Branch of Bhubaneswar a written claim or demand on or before.....,

The Bank Guarantee is issued in paper form and Advice transmit Bed through SFMS with required details to the beneficiary's advising bank (**ICICI Bank Bhubaneswar**, IFSC Code ICIC0000061).

Dated, the_____Day of _____
For_____[Indicate name of Bank]

Signature……..

Full Name…….

Designation……..

Power Of Attorney……..

Dated……

Seal of the Bank……..

WITNESS: (SIGNATURE WITH NAME AND ADDRESS)

1. Signature…….
   Full Name…….
2. Signature…….
   Full Name…….

N.B.:

1. Name of the Supplier: ……
2. BG No & Date: ……
3. Amount (In Rs.): ……
4. Validity up to: ……
5. LOA No……..
6. Package No……..
7. Name, Address & Code of Issuing Bank: ……
8. Name, Address & Code of Bhubaneswar Branch of the Issuing Bank: ……
10. The Bank Guarantee will be accepted after getting SFMS advice as per details below.

Format for SFMS details

(The Unique Identifier for field 7037 is "SLDC, OPTCL541405793")

Sl. No.	PARTICULARS	TYPE	DETAILS
1	Type of Bank Guarantee	Mandatory	Contract Performance
2	Currency & Amount	Mandatory	
3	Validity Period(from—to --)	Mandatory	
4	Effective Date	Mandatory	
5	End date of lodgment of Claim	Mandatory	
6	Place of lodgment of claim	Mandatory	Bhubaneswar, Branch Name ---------of Bhubaneswar Branch code ----------of Bhubaneswar Branch Address --------- at Bhubaneswar
7	Issuing Branch IFSC Code	Mandatory	
8	Issuing Branch name & address	Mandatory	
9	Name of applicant and its details	Mandatory	
10	Name of Beneficiary and its details	Mandatory	
11	Beneficiary's Bank/Branch and IFSC Code	Mandatory	ICICI Bank Ltd IFSC Code-ICIC0000061
12	Beneficiary's Bank/Branchname and address	Mandatory	ICICI Bank Ltd Bhubaneswar Main Branch, Bhubaneswar
13	Sender to receiver information	Mandatory	
14	Purpose of Guarantee	Mandatory	Contract Performance
15	Reference/Description of the underlined tender/contract	Mandatory	LOA No----

ANNEXURE-VIII: EMD

CHART SHOWING PARTICULARS OF EARNEST MONEY DEPOSIT FURNISHABLE BY TENDERERS-

Table 9 Earnest Money Deposit

1.	Central and State Government Undertakings	Exempted
2.	All other inside & outside state units.	The amount of EMDas specified in the specification /TenderNotice 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.18 of Section-II of this specification.

Suits, if any, arising out of EMD will 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: EXPERIENCE

DATA ON EXPERIENCE

(a) Name of the Organization, where PMU is implemented.

(b) Standing of the firm as PMU manufacturer /System integrator /equipment quoted.

(c) Description of software / equipment similar to that quoted [supplied and installed during the last five years with the name of the organizations to whom supply was made].

(d) Details as to where implemented / installed etc.

(e) Software Development and testing facilities supplier's premises.

(f) A list of purchase orders, executed during last three years.

(g) A list of similar Software /Hardware/ equipment of specified Architecture/ Design, Developed /manufactured, tested and commissioned which are in successful operation for at least one year 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: SPARE PARTS

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

Table 10 Spare Parts

SL. No	Particulars	Quantity	Unit delivery rate	Total price

Place:

Date:

Signature of Tenderer

Name, Designation, Seal

Note: Bidders to include the cost of all spare parts required during AMC in the AMC price schedule.

ANNEXURE-XI: SCHEDULE OF INSTALLATIONS

SCHEDULE OF INSTALLATIONS.

Table 11 Schedule of Installations.

PMU Project	Projects/Scheme	Place of installation and complete postal address	Year of commissioning

Place: -

Date

Signature of Tenderer:

Name, Designation, Seal

ANNEXURE-XII: DEVIATION

DEVIATION SCHEDULE.

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

TO ACCOMPANY PART-I

(To be filled up by the tenderer as indicated in the excel sheet**)**

A. Technical deviations TO ACCOMPANY PART-I

(To be filled up by the tenderer as indicated in the excel sheet**)**

Bidder's Name & Address

To
The CLD,
SLDC, Bhubaneswar.

Ref.:

1. E- NIT No: …….

Sub: Technical Deviation Sheet.

Dear Sirs,

The following are the Technical Deviations and exceptions from the specifications and documents for the subject works. These deviations are exhaustive, except for these deviations, the entire package/works shall be performed as per your specifications and documents.

Volume/Clause	**Ref./Page No.**	**As specified in the Technical Specification**	**Technical deviations , if any**

Note:
1. Continuation sheets, of like size and format, may be used as per Bidder's requirements and annexed to this Schedule.
2. The deviations, if any, shall be brought out separately for each of the equipment/Materials/works.
3. Deviations mentioned other than the above shall constitute Nil/No deviation.

Date: **(Signature) ……..**
Place: **(Printed Name) …….**
(Designation) ……..

(Common Seal) ……

(This form shall be duly filled-up, signed by the bidder & uploaded as an attachment)

B. Commercial deviations.TO ACCOMPANY PART-I

(To be filled up by the tenderer as indicated in the excel sheet**)**

Bidder's Name & Address

To
The CLD,
SLDC, Bhubaneswar.

Ref.:
E- NIT No: …….

Sub: Commercial Deviation Sheet.

Dear Sirs,

We hereby undertake to execute the work without any deviation to the Commercial terms and conditions of the Works contained in the tender specifications.

Sl. No.	Tender Clause Reference	Page Ref. No.	Commercial Deviation, if any

Date:
Place:

(Signature of the Bidder)
(Printed Name) …….
(Designation) ……..
(Common Seal) ……

Note: ***1. Deviations, if any, mentioned elsewhere shall constitute Nil/No deviation.***
(This form shall be duly filled-up, signed by the bidder & uploaded as an attachment as a token of acceptance towards the NIL/NO deviation to the Commercial Terms and Conditions)

ANNEXURE-XIII: LITIGATION

LITIGATION HISTORY

Table 12 Litigation History

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

ANNEXURE-XIV: DELIVERY SCHEDULE

Delivery Schedule

Table 13 Delivery Schedule

Activity	Start Date	End Date	Duration	Risks/ Dependencies

Place: -

Date

Signature of Tenderer:
Name, Designation, Seal

ANNEXURE-XV: CHANGE REQUEST FORMAT

Change Request Form Format

State Load Despatch Centre, OPTCL

1. **Project Name: Sub System Name: Module Name:**
2. **Request Number & Date of Request:**
3. **Requester:**

   Requester Email Id/ Contact Phone Number
   Requester Project Role: End User / Project Coordinator/Vendor PM etc.

   Name, Designation and Signature of the Requester:

   Clause number, para etc.>
4. **Subject/Reference:**

   <Deviation reference to the scope viz. Name of Requirements Document, clause number, para etc.>
5. **Description of Change:**

   Problem definition
6. **Proposed Changes:**

   High level explanation of solution

7. **Impact Analysis:**

   Resources, Schedules and modifications as a result of the Change – locations where software needs to be updated – changes in database to be taken care of - impact on on-going training and handholding etc.

8. **Effort Estimation:**

   Number of person-days
9. **Evaluation for Acceptance of Change Request:**

   Evaluation Comments
   Name, Designation and Signature of Evaluator
   Date of Evaluation
10. **Priority:** High / Medium / Low
11. **Approved:** Yes / No

    Name, Designation and Signature of Approver
    Date of Approval
    Expected Date of Start of Work
    Expected Date of Completion Work

ANNEXURE- XVI: BANK CERTIFICATE

PROFORMA FOR BANK BALANCE, FIXED DEPOSITS AND AVAILABILITY OF CREDIT FACILITIES

BANK CERTIFICATE

This is to certify that M/s. …… (Full Name & Address), who are submitting their bid to SLDC, **OPTCL** against their Tender Specification vide Ref. No…….& Date …….is our Customer for the past……. Years.

Their financial transactions with our Bank have been satisfactory. Their Current A/c Balance & Fixed Deposit Balance as on <Date> <Month> <Year> is also indicated below:

SL.NO.	TYPE OF ACCOUNT (CURRENT/FD/RD/ANY OTHER)	ACCOUNT NUMBER	BALANCE as on Dt….. (Rs. in Cr)

They enjoy the following fund based and non-fund based limits (Cash Credit, Bank Guarantees, L/C and other credit facilities) with us against which the extent of utilization as on <Date> <Month> <Year> is also indicated below:

SL.NO.	TYPE OF FACILITY	SANCTIONED LIMIT AS ON DATE	UTILISATION AS ON DATE	AVAILABLE AS ON DATE (Rs. in Cr)

This letter is issued at the request of M/s …….

Sd/-

Name of Bank……..

Name of Authorised Signatory ……..

Designation …….

Phone No. ……..

Address …….

SEAL OF THE BANK.

N.B. : To be issued by the Issuing Bank in their Letter Head.

ANNEXURE- XVII: ABSTRACT OF GTCC

ABSTRACT OF GENERAL TERMAS AND CONDITIONS OF CONTRACT

[COMMERCIAL] TO ACCOMPANY PART-I:

(To be filled up by the tenderer as indicated in the excel sheet for "Acceptance of Important Terms and Conditions – Schedule-II)

ANNEXURE-XVIII:

(Reverse Auction Process Compliance Form)

(To be submitted on letter head of the bidding company with sign and stamp and along with technical bid)

To
The CLD,
SLDC, Bhubaneswar.

Sub: Agreement to the Process related Terms & Conditions for e-Reverse Auction.

Dear Sir,

This letter is to confirm that:

- The undersigned is authorized representative of the company.
- We have studied the Commercial Terms and the Business rules governing the Reverse Auction as mentioned in your tender and confirm our agreement to that.
- We also confirm that we have gone through the auction manual and have understood the functionality of the same thoroughly.
- We, hereby, confirm that we will honor the Bids placed by us during the tendering/ e- Reverse auction process as called as e-RA.
- We also confirm that we will accept our Rank / Position that will be displayed when the Bidding Time for the Online Reverse Auction is over.

With regards,

Signature with Designation with company seal Name & Address

Person having power of attorney for the subject package.

PART-I

SECTION IV

SCOPE OF THE WORK FOR SURVEY, PLANNING, DESIGN, ENGINEERING, DOCUMENTATION, INTEGRATION, SUPPLY, INSTALLATION, TESTING, COMMISSIONING OF PMU BASED WAMS PROJECT FOR STATE LOAD DESPATCH CENTER, OPTCL, ODISHA

SCOPE OF WORK

The Scope of the proposal shall be on the basis of a single Bidder's responsibility, completely covering Survey, Planning, Design, Engineering, Documentation, Integration, Supply, Delivery to site, Unloading, Insurance, Storing, Handling, transportation to final locations, Installation, Commissioning, Termination, Testing, Demonstration for acceptance, and Commissioning of all the Hardware/equipment's specified under the accompanying Technical Specifications. OPTCL/SLDC Odisha. . It will include among others as specified therein the following:-

A. Detailed design, Engineering with Technical specification and plan for Total Solution.
B. Complete integrated solution for WAMS Project, Maintenance of complete solution for five years after one-year warranty period.
C. The broad scope of Total solution is described below but detail scope of work is specified in Technical Specification of individual item and Special terms and condition of contract.

1. Providing, Testing and commissioning of PMUs with GPS complete with all necessary accessories Switch/Router, Panels, Cables, Patch Cable, FO/Ethernet Cables, Converter (Fiber to Ethernet) etc. at the Substations as per the **Annexure**.
2. Phasor Data Concentrator (PDCs) along with State-of-the-art user interface and analytics to the extent identified in BoQ at Control Centre.
3. Historian solution for PMU data,
4. Associated computer system hardware and software, networking hardware & software along with associated items at respective location & Control Centreas per BOQ.
5. Integration of supplied PMUs with PDCs.
6. Integration of all existing PMUs and PDC under URTDSM Project of PGCIL, which may involve different makes as per the list.
7. Project management, project scheduling, and project charter including periodic project reports documenting progress during the contract period.
8. Mandatory Spares as identified in the BOQ.
9. All cabling, wiring, terminations and interconnections to the equipment including necessary trench/surface conditioning to interconnect the Control Centre equipment being supplied & integrated under this project.
10. Communication required within the substation including communication cable as well as the interface requirement.
11. Development of database & displays for utilization of PMU data for reporting and analysis purpose.
12. Integration of all the supplied equipment with existing system.

13. Testing of PMU & PDC as per IEEE C37.118.2011-1, C37.118.1a-2014, C37.118.2011-2 with all amendments.

14. Testing of all PMU data of all location including (WAMS Project & URTDSM) PMUs with PDC at control center.

15. Maintenance of the system as per the specification for six years period including one year warranty period.

16. Engineering and technical assistance during the contract warranty and maintenance period.

17. The system shall be provided with database connectivity for exchanging the data with other systems. Integration shall also involve different make PMUs & PDCs.

18. Factory and site testing of all hardware and software provided.

19. Design and configuration of entire WAMS system supplied shall be compliant to the Cyber Security requirements mentioned in detail technical specification.

20. Conduct Type test and provide Type Test report as per specification.

21. All software/database backup of PMUs installed at all locations.

22. To maintain systems availability as per term & condition.

23. Data exchange with existing SCADA/EMS System of SLDC.

24. The Contractor's scope shall include customization of its database and protocol (IEC 60870-5-104 or ICCP or ODBC/OPC) such as configuration of database, scan period and all other database parameters required to integrate existing systems (as identified in this specification) successfully. The existing system may have different profiles of these protocols across control centers.

25. Integration and monitoring of new device/ Node on NMS cum CMC including defining configuring/ interfacing /interpreting MIBs.

26. Integration with existing VPS.

27. Remote Consoles to be supplied under this project shall have access to both real time data as well as Historian data.

28. All cabling, wiring, and interconnections to the equipment being supplied and to be integrated including communication equipment and power supply.

29. Design and configuration of entire WAMS system supplied shall be compliant to the Cyber Security requirements.

30. Auditing of Cyber Security implementation by CERT-In empanelled auditors.

31. Training of personnel.

32. Any other work which is not identified in the specification but is required for completion of the project within intent of the specification shall also be in the scope of the Bidder.

33. An analysis of the functional and performance requirements of this specifications and site surveys, design and engineering may lead the bidder to conclude that additional items and services are required that are not mentioned in this specifications. The bidder shall be responsible for providing at no added cost to the purchaser, all such additional items and services such that a viable and fully functional system is implemented that meets or exceeds the capacity, and performance requirement specified. Such materials and services shall be considered to be within the scope of the contract to the extent possible, bidder shall identify and include all such additional items (hardware/software) and services in their proposal.

PART-I

SECTION – V

TECHNICAL SPECIFICATIONS (TS)

SCHEDULE OF TECHNICAL REQUIREMENTS AND DETAILED TECHNICAL SPECIFICATIONS FOR DESIGN, DEVELOPMENT, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF WIDE AREA MEASUREMENT SYSTEM FOR STATE LOAD DESPATCH CENTER, OPTCL, ODISHA.

1.0 GENERAL INFORMATION OF PROJECT

1.1 INTRODUCTION

Presently real time operations of the Power system are carried out through SCADA/EMS system, which is an essential tool for Grid Operation as well as market operation. The intent of this specification for WAMS project is to provide complete observability of the Odisha Power system in real time at SLDC, Bhubaneswar by installing of Phasor Measurement Units (PMUs) at the Power Plants & Substations, and Phasor Data Concentrators (PDC) at control center. It is also proposed to provide required data acquisition, visualization tools along with PDC & other components for PMU data presentation and archiving. WAMS Project shall involve installation of PMUs at Generating stations, 400kV, important 220 kV Substations. The PMUs shall measure currents of all the feeders and Voltages of the all the Buses and 400 kV Transmission elements.

The purpose of this technical specification is to provide overview of the Project, Scope of work, General information about the existing systems and the proposed system under this project, requirements, responsibilities & obligations of Bidder & SLDC- OPTCL

1.2 EXISTING WAMS INFRASTRUCTURE AT SLDC- OPTCL

1.2.1 URTDSM PROJECT OF POWER GRID

Power Grid has installed PMUs at 09 Nos. OPTCL Grid substation in addition to 0**8** Nos. of power grid substation, Total 61 PMUs are reporting to URTDSM control center PDC installed at SLDC Bhubaneswar .Total Direct PMUs are 32 & Indirect PMUs are 29.

PMU is taking line voltage & current inputs of two feeders. Voltage inputs have been provided from CVT of line bay. Phasor data at each PMU is being sampled at 25 samples per second with GPS time stamping and transferred to phasor data concentrator (PDC) provided at SLDC-OPTCL through communication link. The phasor data received from all the locations is merged and time aligned in the PDC. The time-aligned data from PDC is provided to operator console for visualization. PDC data is also fed to a data historian provided at SLDC-OPTCL.

1.3 PROPOSED COMMUNICATION SYSTEMS

To meet the Power system communication requirements from field to control center, fiber optic based communication network, shall connect all substations and power plants where PMUs are being installed under WAMS location

Establishment of communication link is not under the scope of this bid.

2.0 GENERAL TERMS AND CONDITIONS

i. THIS TENDER SPECIFICATION CONSISTS OF THE FOLLOWING TWO JOBS OF TECHNICAL SPECIFICATION.

JOB - 1	**SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF PMU AT 21 LOCATIONS UNDER WAMS PROJECT**
JOB - 2	**SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF CONTROL CENTRE HARDWARE & SOFTWARE UNDER WAMS PROJECT**

ii. The offered system shall be complete in all respect with all components and necessary software for specified purpose. The survey of all locations, engineering, design, development, testing at works, supply, installation, commissioning and testing at site of total WAMS system shall be deemed to be within the scope of bidder's, irrespective of whether those are specifically brought out in this specification or not.

iii. The total solution must be offered by single bidder partly offer will not be accepted. Total solution includes providing, testing, commissioning and maintenance of PMU, PDC, Control center hardware, integration of existing URTDSM PMUswith PDC, required additional hardware, LAN, integration with present SLDC LAN system and all other associated hardware and supplementary software required forsuccessful commissioning and functioning of the total solution as per technical specification is in the scope of bidder.

iv. Communication link from substation communication panel to control center communication panel will be provided by SLDC-OPTCL

v. The proposed WAMS project consists of installation of PMUs with GPS system at various substations/Power stations of OPTCL Grid. The location will be finalized by SLDC- OPTCL and which may supposed to change however at the time detailsproject plan it will be finalized**.** The PDC will be at Control Centre which is SLDC Bhubaneswar, with historian, visualization and Archiving facilities at Control Centre. The detailControl center specification is given in **SECTION-2** PDC must meetor exceed this specification bidders should clearly mention any further availability inrespect of

PDC.

vi. It should be noted that design information, architecture and bill of quantity (BOQ) are provisional only. The bidder shall verify the design data during the site surveys and during detail engineering, finalize BOQ as required for ultimate design and system performance. SLDC reserve the right of execution of works within the stipulated quantity variation provision other than those indicated in the BOQ at the same rates, terms and conditions.

vii. The bidders are requested prior to the submission of the offer, understand complete solution and offer prototype of total solution in technical offer, mainly covering:

a. Phasor Measurement Unit (PMU) along with GPS system.
b. Control cable supply, laying and termination at both end (PMU and Source Panel) for CT/PT/Status wiring, Earthing, Router/Switches, LAN/FO cable and signal cable for GPS system.
c. Cabling arrangement for PMU at substation with communication hardware. Supply and laying of communication cable (FO/Ethernet), Hardware (Modem/Converter) up to existing OPTCL Communication panel.
d. Computer Hardware with System software for control center for visualizing PDC data at workstation console.
e. Phasor Data Concentrator (PDC) at control center
f. Dual LAN network with all necessary hardware, caballing and accessories at control center.
g. User interface with PMU data archiving software and Visualization software.
h. System storage, Historian data storage for one year at 50 samples/second.
i. Application/Analytic software with the use of PMU data received from PDC after handling will be developed by software developer decided by SLDC- OPTCL the necessary cooperation and help will be require to extend. The API or protocol of the PMU, PDC and other requested by software developer must be extended by bidder and necessary confirmation must be given to SLDC- OPTCL.
j. One year warranty after TOC
k. AMC for five years (as per AMC Scope of work) after warranty period.
l. All additional items required for Total integrated solution.

viii. If required, Bidder can do site survey activity at his own before bidding with prior permission of SLDC- OPTCL, however detail site survey and study will be in the scope of successful bidder for finalization of all aspect of the project.

ix. SLDC- OPTCL has made full attempt to bring out all need and requirement while describing the scope of work. **However, any features functionality and material essentially required for the integrated solution of this package, will be sole responsibility of the bidder to provide and do so at no extra cost.** Bidder cannot deny these requirements unless, it has a major cost impact and decision of SLDC OPTCL shall be final and binding to the bidder.

x. The software or operating system, data base used in this proposed solution must have perpetual license on the name of SLDC- OPTCL. Bidder must propose this with document support any

license issue of software and operating system used in the proposed system must be dealt by bidder and bidder should assure this feature in their proposal. Bidder shall supply life time license required for software used for this total solution.

xi. The hardware used in the proposed project must have warranty and support from OEM up to minimum of six years (after installation and commissioning period, 1-year warranty period + five years AMC).

xii. Security of the system

The proposed system must be secure and capable to withstand any cyber indiscipline and shall be protected from anti-threat from outside world. Bidder mustspecify the features of their solution in this respect in detail technical response. General security criteria mainly as following must be maintained.

a. The Access of PMU must be through password and with log of same shall be maintained.
b. The system shall not be affected by any outside programs like spam, malwareetc.
c. The system must be designed on standard IEEE C37.118.2011-1, C37.118.1a-2014, C37.118.2011-2 with all amendments & IEEE Guide line of PMU & PDC.
d. Any configuration change must be through access right and log of the same must be maintained, all logs of event shall report to PDC at SLDC.

xiii. The bidder shall observe all safety measure as per OPTCL norms during installation and commissioning activity of project & AMC period.

xiv. Bidder has to submit the BAR CHART & PROJECT CHARTER with detail of project execution time line, schedule planning for each and every installation on various locations, schedule date for project completion, number, list of engineer and technician for carrying out the project.

xv. SLDC- OPTCL reserve rights to inspect / test / verify the material / component/ module during any stage of supply starting from procurement to shipment.

xvi. Bidder shall provide support for firmware up gradation or license version up gradation for adopting new features during AMC period after successfully commissioning of project at free cost.

xvii. The bidder should provide demonstration of PMU for integration with existing control center PDC at SLDC (on both protocol TCP and UDP Protocol).

xviii. The bidder should submit proof of PMU CERTIFICATION (as conforming IEEE Standard C37.118.2011-1, C37.118.1a-2014, C37.118.2011-2 with all amendments. The testing of product conducted at IEEE certified/NABL Accreditedlaboratory.

xix. The bidder must submit the type test report of quoted PMU model with test results of the same from the IEEE certified/Accredited laboratory. The type test results should not be older more than five years. Submit the type test report along with technical bid. Offer would be rejected without type test report.

xx. The bidder shall supply all materials, cable, panel & miscellaneous item of project as per OPTCL approved standard.

3.0 SCOPE OF WORK FOR WAMS PROJECT

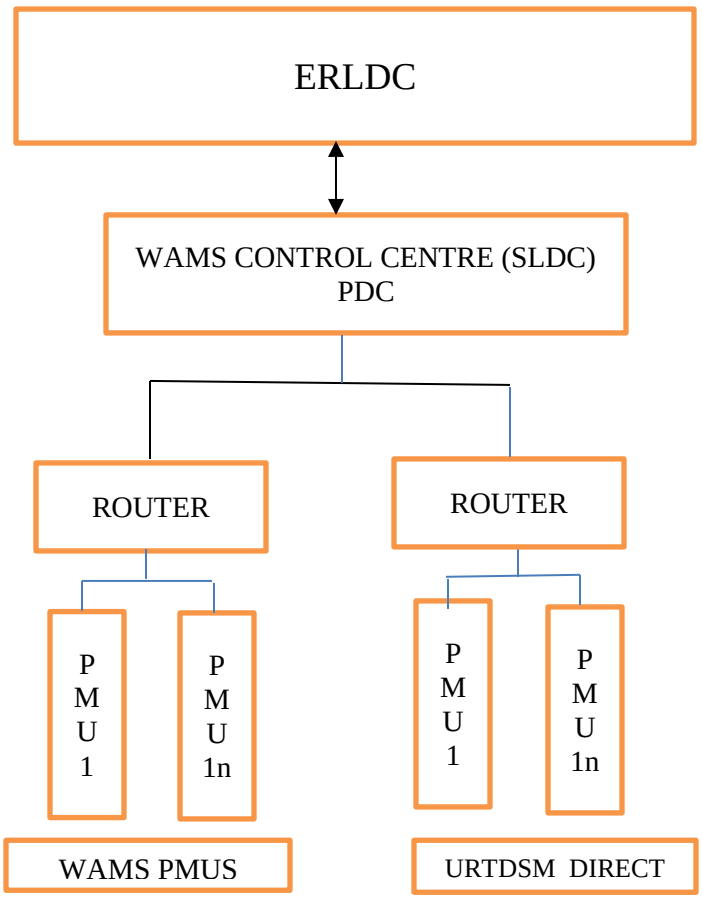
The scope of work under project include Survey, Planning, Design, Engineering, Documentation, Integration, Supply, Delivery to site, Unloading, Insurance, Storing, Handling, transportation to final locations, Installation, Commissioning, Termination, Testing, Demonstration for acceptance, and Commissioning of all the Hardware/equipment's specified under the accompanying Technical Specifications. It will include among others as specified therein the following:-

A. Detailed design, Engineering with Technical specification and plan for Total Solution.
B. Complete integrated solution for WAMS, Maintenance of complete solution for five years after one-year warranty period.
C. The broad scope of Total solution is described under PART-I SECTION-IV

4.0 WAMS SYSTEM HIERARCHY

The PDCs shall be placed at the Control Center at SLDC- OPTCL. SLDC shall acquire data from Substations/Power Plants PMUs installed under WAMS Project directly, indirectly from other PDC (ERLDC). SLDC shall exchange data withERLDC bidirectional. The design of PDC shall be such that it meets the capability requirement of PMU data. Based upon this PMU data several online and offline functions shall be performed based upon the requirement of Power System operation. Due to its size and nature of the project, it is intended to use latest computer hardware and software for data along with presentation and archiving as well as cyber security aspects. System Hierarchy for WAMS project is as per figure: 1.0

Fig.: 1.0


ERLDC
WAMS CONTROL CENTRE (SLDC)
PDC
ROUTER
ROUTER
PMU 1
PMU 1n
PMU 1
PMU 1n
WAMS PMUS
URTDSM DIRECT

JOB: 1

SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF PMUs AT 21 LOCATIONS UNDER WAMS PROJECT

1.0 PHASOR MEASUREMENT UNIT

1.1 INTRODUCTION

The Bidders are required to offer their standard products that meet or exceed the specification requirements. These products provided from their **in-house** baseline offerings although the bidder is required to use as much standard hardware and software as possible, the proposal will be judged by its conformance to the Specification.The proposal shall clearly identify all features of the specification to help SLDC, OPTCL evaluate the degree of conformance of the Bidder's offering.

The OPTCL substations / Generating stations are installed with CTs on each bay of the switchyard and PTs /CVTs in each transmission Bus / line bay. Generally, CTs have onemetering core and four protection cores. The PTs /CVTs are provided with two / three cores, one for metering and other for protection. The PMUs to be supplied need to connect to either of these CT, PT / CVT cores. PMUs shall be suitable for measurement on both the cores (Metering & Protection). Exact core to be connected shall be confirmduring engineering stage.

The specification identifies some minimum requirements for each of the major component, which are essentially required for measurement of complex quantities and transmitting the same to the PDC at Control Centre SLDC-OPTCL.

1.2 PMU REQUIREMENTS

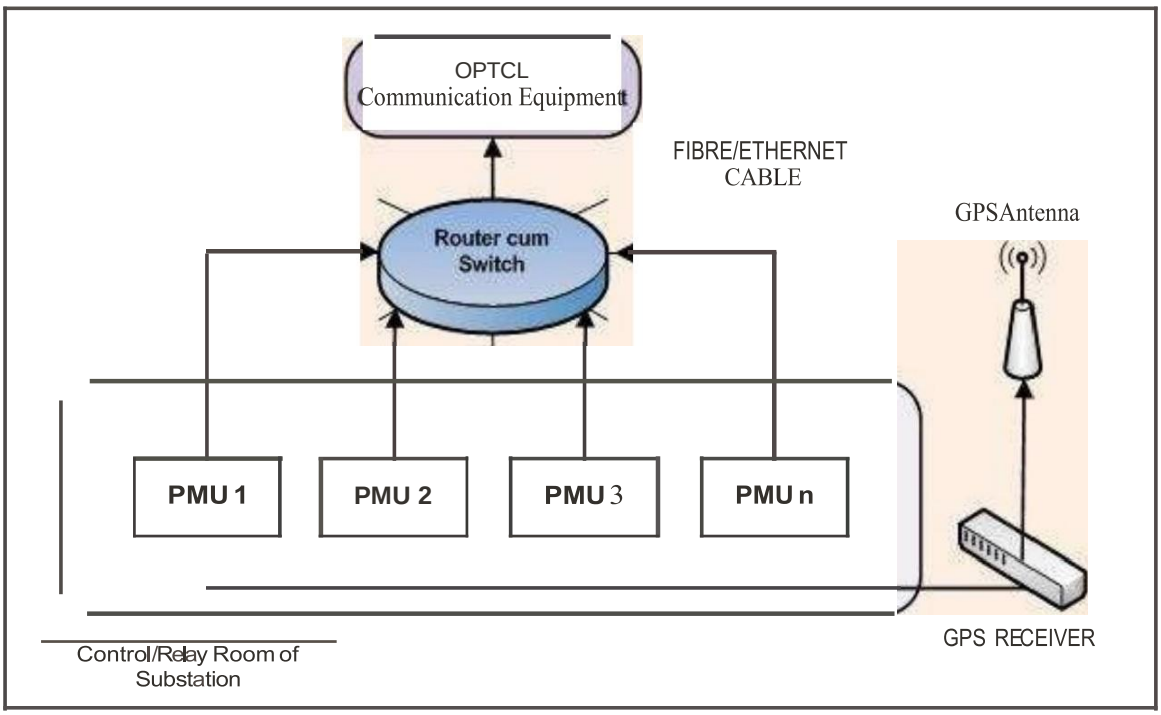
The intent of this section of specification is to describe the technical requirements for supply installation, testing, commissioning & integration of PMUs. The PMUs to be supplied under this Specification shall be installed at the Substations / Power stations, shall communicate to the Phasor Data Concentrator (PDC) at the Control Centre as per **IEEE C37.118.1-2011, C37.118.1a-2014 & IEEE C37.118.2-2011 standard with all amendments.**

Generally, the PMUs shall be install in the Control/Relay Rooms of substations / powerplants, which have single control room with C&R panels for all the Bays, some of the location have Bay Control Units (BCUs) as part of Substation Automation System (SAS).Where the Control & Relay panels are installed in the switchyard, in such cases, PMU shall be installed in the Bay Kiosks in switchyard. In case of multiple PMUs at a substation / power plant, the Router or any other mode of communication shall be provide which has to interface PMUs to OPTCL communication equipment.

The list of 21 locations of PMUs installation with total phasor measurement requirements in project is given in APPENDIX I, PART: C.

The PMU shall support data ‘Reporting Rates’ of 10, 25, and 50 or above frames/samples per second for 50 Hz System. The actual sample rate should be user selectable.

The typical network layout diagram of PMUs at substation is given below:



PMU install at control/relay room at sub-station control room

1.3 PMU TECHNICAL / FUNCTIONAL REQUIREMENTS

The PMUs to be supplied under this specification shall provide phasor and analog data and switch position at the selected periodicity. The offered PMUs shall be complete in all respect so that they can be install at the substation, generating stations and can communicate with the Phasor Data Concentrator (PDC). The input to PMU shall be all bus voltage and three-phase current for all feeders emanating from substation, but for 400 kV Feeder bay there is three phase current as well as three phase line voltage, thiscan be achieved either by one PMU or Group of PMUs. The bidder shall also supply thenecessary cable and connector and installation hardware for complete solutions up to OPTCL Communications panel.

The PMUs shall conform to latest version of IEEE C37.118.1-2011, 37.118.1a-2014, C37.118.2-2011 standard with all amendments. The synchronization & installation of PMU shall follows IEEE C37.242-2013 guideline and has to meet the following requirements:

i. The PMU shall support the following IEEE synchro-phasor standards:
   a. IEEE C37.118.1-2011 and C37.118.1a-2014 (Measurements)

b. IEEE C37.118.2-2011 (Data Communication)

ii. The PMUs shall have phasor measurements accuracy as per latest IEEE Standard C37.118.1-2011 and C37.118.1a-2014, data reporting to PDC as per standard IEEE C37.118.2-2011.

iii. The PMUs shall measure the electrical parameters in the power system frequency band of 48-52 Hz with the accuracy as per standard IEEE C37.118.1-2011, C37.118.1a-2014, C37.118.2011-2 standard with all amendments; however, data from PMU shall be available below 48 Hz frequency and above 52 Hz bidder has to assure this feature. The PMU design shall ensure that the impact of frequency fluctuation on accuracy is within permissible limit as per prevailing standards, the bidder shall explain in their offer this aspect of PMU design.

iv. The PMU shall receive time from reliable and accurate Global Positioning System through GPS receiver. GPS shall provide time traceable to coordinated universal time with sufficient accuracy. The PMU with supplied GPS shall keep the total vector error (TVE), the frequency error (FE), and the Rate of Change of Frequency (ROCOF) within the limits specified as per IEEE C37.118.1-2011, IEEE C37.118.1a-2014.

v. The supplied PMU will be mount in separate panel in the substation control rooms /relay panel room in case of conventional substation & power plant or in case of kiosk based substations PMU panel to be install in Bay Kioskin switchyard.

vi. The minimum offered configuration of PMU shall have at least 6 analog input channel (1 set of 3-phase voltages, 1 set of 3-phase current) and 5 digital inputs. In case of substations & power plants where all the control & relay panels are installed in a single room, the Bidder may offer higher configuration to meet the requirement of multiple feeders and BOQ may be adjusted accordingly.

vii. The auxiliary power supply to PMUs will be provided from the station DC which is used for control and protection of substation devices. Accordingly, the PMUs shall be suitable to operate on unearthed **220 V / 110 V/48 V DC** (+10%, -15%) DC power supply depending upon the station DC supplyavailable.

viii. The offered configuration of PMUs used in substation shall be two types:
   a. For 400 kV feeder Bay PMUs shall measure Bus Voltage, LineVoltage and Line current with 5 digital signal per feeder.
   b. For 220/132 kV feeder Bay PMUs shall measure Bus Voltage & linecurrent with 5 digital signal per feeder.

ix. The proposed 21Nos. location with list of phasor measurements of PMU installation and commissioning are as per **APPENDIX-I, PART-C**. There may be change in

location however, it will be confirm with successful bidder at the time of detail engineering.

x. The PMUs shall support data reporting at 10, 25, 50 or above frames/second for 50 Hz input signal. Actual rate shall be user selectable.

   a. 3-phase voltages (Bus & Line) as magnitude and angle (polar form/rectangular) quantities.
   b. 3-phase currents magnitude and angle (polar form) quantities.
   c. Digital input of circuit breaker & bus isolator on/off status.

xi. Frequency, Rate of change of frequency, Sequence component of voltage, Sequence component of current & Active, Reactive power and Power factor may be derived at PMUs from the measured values. The PMUs shall be capable of transferring all the measured & derived quantities to PDCalong with timestamp and same sampling rate.

xii. All the measurements shall be tag with UTC (Coordinated Universal Time). The time tagging accuracy shall be at least one micro-second.

xiii. The PMU output shall be in latest version of C37.118.2-2011 format and shall communicate with the PDCs in the same format.

xiv. The PMUs shall have continuous self-monitoring, diagnostic feature and capable to identify & communicate problems and shall generate alarm in case of any abnormality which shall be displayed locally as well as shall be transferred to the PDC. The indication shall be available for each module on the front panel of the PMU.

xv. The offered PMUs shall meet the measurement compliance for M class of measurements as given in Section 5.5- Measurements Compliance of IEEE C37.118.1-2011 standard & amendment of IEEE C37.118.1a-2014, which shall be user selectable. **The Bidder shall submit the test reports for measurement compliance for both class of measurements along with the Bid.**

xvi. Documentation shall be provided by bidder claiming compliance with IEEEstandard that shall include the following information:

   a. Performance class
   b. Measurements that meet this class of performance
   c. Test results demonstrating performance
   d. Equipment settings that were used in testing
   e. Environmental conditions during the testing

xvii. PMU shall verified for a P & M class shall meet all performance requirements specified in standards for that class at all reporting rates & all technical condition mention in IEEE Standard.

xviii. The PMUs shall communicate with PDC over the communication link provided by the SLDC-OPTCL. For this, PMU shall be provided with eithertwo Ethernet port of 10/100 Base Tx or two optical fiber port or one Ethernet and one optical fiber port each for streaming the data in TCP/UDP method as per IEEE C37.118.2-2011 format. PMU shall communicate to PDC as per IEEE standard C37.118.2-2011 with all amendments. PMU shall be configurable on IP network (PMU shall have IP address).

xix. There shall be provision for HMI (Human Machine Interface) in PMU to perform configuration-setting changes. Provision should also be available to check the status, software version of PMU etc. In addition, HMI should display the measured quantities for ease during testing. The Operation indications and time tagged events shall be available by the Local HMI.

xx. There shall be provision for HMI (Human Machine Interface) in PMU to perform setting changes. The HMI shall also display the real time measured values. Alternatively, Portable configuration device for PMUs at end can be provided for configuring the PMUs.

xxi. The PMU shall be able to display the following quantities on the HMI.

- **a.** Measured voltages, currents, frequency, active, reactive andapparent power and power factor.
- **b.** Primary/Secondary phasors
- **c.** Positive, negative and zero sequence components of currentsand voltages.
- **d.** Digital status position in logic form

xxii. PMU requires remote configuration facility, the supplier shall supply the necessary hardware/software required for remote configuration of PMU.

xxiii. PMU shall have LED for ON/Off status with tag name for digital status forfeeder wise configurations.

xxiv. Each Phasor calculation shall be done independently; it should not be depending on first or any other channel either of voltage or current channelof PMU.

xxv. The PMU shall have internal clock, which shall be synchronized with GPSclock. Upon loss of signal from the GPS source, the PMU shall detect a loss-of-signal and generate an alarm, which will be transferred to PDC. Upon loss of signal, the PMU time facility shall revert to an internal time base. The internal clock shall have minimum stability of 1 ppm. Within one minutes of re-acquisition of signal, the time shall return to within 0.2 micro-second of UTC. Proper correction of leap second shall be provided.

xxvi. PMU real-time output reporting latency shall be determined for each reporting rate Fs using at least 1000 consecutive messages. The reportinglatency is the maximum of these values. The latency shall be determined to an accuracy of at least 0.0001 s.

Performance Class	Maximum Measurements reporting Latency (s)
M Class	5/Fs

xxvii. The PMU shall be able to perform synchro-phasor reporting for minimum 2 clients over TCP and/or 2 UDP group clients for multicast or unicast.

xxviii. PMU shall support multiple data stream i.e. a PMU shall be capable to transmit its data in separate data streams (more than one). Each stream shall be configurable independently based on the following.

a. Contents
b. Sampling rate
c. Class of service (M)
d. Communication mode (TCP & UDP)
e. Different destinations with separate IDCODE

xxix. The PMUs shall have a local configuration port of database upload & download. Testing & configuration accessories such as test switch, connector, software etc which are not in-built to the PMUs but are required for testing and configuration changes, at least one set of such testing & configuration accessories shall be supplied complete with necessary hardware.

xxx. The PMU shall support the following logic functions, a substantial number of logic functions that are freely configurable and can be combined with the protection, control and monitoring functions inside the PMU. These logic function shall be:

a. Basic configuration function blocks, such as AND, OR, XOR, INVERTER, TIMER, flip-flop function blocks, Boolean to integer conversion, and integer to Boolean conversion.

xxxi. In case of multiple control rooms within a substation/power plant, CT/PT cables will not travel out of Control & Relay (C&R) panels from the respective control room. Optimization of no of PMUs shall be considered accordingly.

xxxii. In case of substations/power plants having SAS system will remain withinthe respective bay kiosks. Optimization of no of PMUs & cable length shallbe considered accordingly.

1.4 PMU DATA TO BE REPORT TO PDC (MINIMUM REQUIREMENT)

a. PMU to PDC Interface

Sr. No.	Description	Quantity
1.	3 phase Current magnitude	Selection by bidder (to take all Phasor input)
2.	3 phase Voltage magnitude	As per APPENDIX-I, PART-A Voltage input
3.	Phase angle of current and voltage	As per APPENDIX-I, PART-A
4.	Sequence current phasor (+ve, -ve, and zero)	Of all current phasor
5.	Sequence Voltage phasor (+ve, -ve, and zero)	Of all voltage phasor
6.	Frequency	1
7.	Rate of change of frequency	1
8.	Active Power	of all the feeders
9.	Reactive Power	of all the feeders
10.	Power Factor	of all the feeders
11.	Sampling Rate (User Selectable)	50 samples/sec

Table No: 1.1

Note: - The PMU should get all input of all feeders where it has placed as per APPENDIX - I, PART-C.

b. Substation to PMU data

Sr. No	Description	Quantity
1.	Voltage input from PT from each Bus	3 Phase V
2.	Current input from CT from each line bay	3 Phase I
3.	Voltage input form CVT from 400 kV each Bay	3 Phase V
4.	Current input from CT from GT/ICT/TR Bay/Bus Coupler/Bus Sectionlizer/ TBC	3 Phase I
5.	Status Indicator from each bay	5 Inputs

Table No: 1.2

1.5 POWER SUPPLY FAILURE INDICATORS

The PMU shall have a status point which shall be set if the power to the PMU has beencycled (off-on) for any reason (including maintenance). The successful transfer of this indication to Control Centre shall reset the power fail status point.

1.6 ENVIRONMENTAL REQUIREMENTS

The PMU will be installed inside buildings without temperature or humidity control. The PMU shall be capable of operating in ambient temperatures from -10 deg C to +55 degC and relative humidity up to 10-90%.

2.0 GPS BASED TIME FACILITY

A GPS based time facility to synchronize PMU clock with Coordinated Universal Time (UTC), shall be provided. At least one GPS System shall be provided at each Substation/Power stations to synchronize all the PMUs. The bidder shall ensure that thetime accuracy of PMU as specified is met. In case, more than one GPS is required to meet the accuracy requirement, the bidder shall provide the same.

The time receiver shall include propagation delay compensation and shall also include an offset to permit correction to local time to achieve time accuracy of at least ± 0.1 microseconds (µs). Within one minutes of reacquisition of signal, the time shall return towithin 0.2 micro-second of UTC. Proper correction of leap second shall be provided. The PMU requires time reference to UTC. The signal sent to PMU from the GPS receiver shall be UTC or provide information to the PMU to correct the time to UTC by using the IRIG-B time profile given in IEEE Standard C37.118.1-2011 & C37.118.1a.-2014 with all amendments & synchronisation guideline of IEEE C37.C37.242-2013.

The timing signal should be accurate enough to allow the PMUs to maintain synchronism with an accuracy sufficient to keep the total vector error (TVE) within the limits defined in IEEE C37.118.1-2011& C37.118.1a-2014 (Refer Section: 4.3 of standard).

GPS module should be equipped with adequate no of IRIG-B and PPS ports to synchronize the PMUs so that at any given location having more than one PMU, all the PMUs can be synchronized with single GPS module provided the specified time accuracy is met. All additional required interface in this regard shall be included in the scope of supply.

The no of GPS receivers shall be minimum two at every substation/power plant. However, in case of in any of substation/power station if one or two PMU is required, one GPS receiver shall be consider for such location.

In case of Generating station, Kiosk based substation PMU panel to be installed in each unit control room & kiosk bay, in such case bidder have to provide standard solution for GPS synchronisation with PMU unit. GPS must be suitable to work in such environment. Refer substation typical layout diagram of fig.1.1 & 1.2.

3.0 SUBSTATION GRADE ROUTER/SWITCH (LAYER-3)

In case of multiple PMUs at a substation/power plants all the PMUs shall be connectedto the communication equipment through an industrial grade router/switch. The industrial grade router/switch shall interface PMUs on one side and communication equipment on the other side,

PMU at substation shall be installed with router/ necessary layer 3 switch, from router/switch fiber and Ethernet input and output port shall be available to communication equipment. Routers/switch shall have the built-in firewall features as required.

In case kiosk base substation, PMU Panel will be installed at each Kiosk, in such case of multiple PMU Panels at a substation / power plant, the Router/switch, LIU (Line interface unit) or any other mode of communication shall be provide which has to interface PMUs with OPTCL communication equipment.

The no. of industrial grade Router/Layer-3 LAN switches and the no of ports in each Router/LAN switch for connecting the PMUs and communication equipment in the substations/power plants shall be based on the no. of PMUs. The no of ports required in each Router/LAN switch shall be based on the no of PMUs in the substation, including 50% spare ports. The Router/LAN switch shall operate on 220V DC or 110 V DC or 48V(+10%, -15%) DC supply voltage.

4.0 PMU PANEL

4.1 SCOPE OF PMU PANEL

i. The PMUs, Router Cum Switch & GPS shall be installed with separate panel inControl room/relay Room/BCU/Unit control room at location decided.

ii. The design, preparation of schematic and drawings, manufacture, testing at manufacturer's works, mounting and wiring up of all the equipment of F.O.R destination supply thereof, testing and commissioning at site.

iii. Design and fabrication of PMU panels for mounting the PMU and PMU assemblies along with all necessary accessories like GPS, Router/switches etc. and wiring up of the same to provide self-contained and ready to use as per specification.

iv. Generating stations is considered in PMU location, Bidder shall provide a separate panel in case GT Panel is installed in unit control room & Separate PMU panel for switchyard control room. Size of panel can be adjusted accordingof PMU requirement in substation or power plant.

v. Complete testing at manufacturer's works of the PMUs & complete solution after mounting and fully wiring up in the PMUs panels.

vi. F.O.R. destination supply of completely assembled PMUs panels. Testing and commissioning of these panels at site.

vii. Preparation and furnishing of all the required drawings including schematic, internal external cable connection drawings and wiring schedules. All wires shall be printed ferruled at both ends even on shorting links also and shall be clearly shown in the schematic drawings.

viii. Preparation and furnishing of erection, commissioning instructions, operation and maintenance manuals all operational features/optional features.

ix. The successful Bidder have to submit five sets of all types of drawings,schematics and electrical internal circuits, indicating measuring points and measuring values, external cable connection drawings, wiring schedules, erection instructions, operation and maintenance manuals.

4.2 SIZE AND GENERAL DIMENSIONS REQUIREMENTS

400/220/132KV PMU panel: The panels shall be `Simplex' type. The overall panel dimensions shall be 2312mm H (Height – H) x 750mm (Depth-D) x 900mm W (Width – W).

At Generating station, Substation having BCU unit in switch yard, Bidder can changeheight of panel as per site requirements. Substation wise minimum one PMU panel shall be provided by bidder & in case of Nos. of PMU is higher in one substation in that case bidder shall provide separate panel for 400 kV feeder & 220 kV feeder in one substation.

Nos. of PMUs in one panel shall be finalized after finalizing PMUs configuration & Site survey of locations.

The panels shall be modular rack mounting type consisting of standard width racks, in accordance with the IEC – 297. The panel have full transparent (Perspex) front door with lockable handle.

4.3 GENERAL REQUIREMENT FOR PMU PANEL

Panels shall be completely metal enclosed and shall be dust, moisture and vermin proof to meet the requirement to IP-54 of IS: 2147.

The panels shall be free standing, floor mounting type and shall comprise rigid, welded structural frame enclosed completely with specially selected, smooth finished cold rolled sheet steel of thickness not less than 3.0 mm for load bearing members (front panel, base frame, door frame) and 2.0 mm for non-load bearing members (sidepanel, cubicle roof, door). There shall be sufficient reinforcement to provide level surfaces, resistance to vibration, and rigidity during transportation and installation. Nodeviation to this clause is permitted.

All doors and removable covers shall be gasketed all round with neoprene gaskets, ventilating louvers, with screens and filters.

Design, material selection and workmanship shall be such as to result in neat appearance inside and outside with no weld, rivets or bolt heads apparent from outside and with all exterior surface true and smooth.

Cable entries to the panels shall be from the two numbers of screwed type removable gland plates in panel bottom. Each of size 350mm x 200mm with punched hole for suitable size cable glands.

Simplex panel shall consist of vertical front panel with equipment mounted thereon and having wiring access from the rear. It shall have two doors.

4.4 LABEL

All front mounted equipment as well as equipment mounted inside the panels shall be provided with individual labels with equipment designation engraved. The labels shall be mounted directly below the respective equipment. Label with large and boldletters engraved with panel designation shall be provided at the top of each panel onfront and rear side.

All the front mounted equipment shall also be provided tag numbers corresponding to the ones shown in the panel internal wiring to facilitate each tracing of wiring. Theselabels shall be mounted directly by the side of the respective equipment and shall not be hidden by the equipment wiring.

Labels shall be made of Aluminum anodized plate P.V. Castings. Labels shall have white letters on block background. All PMUs shall be given standard abbreviation numbers with name of device, corresponding to the ones shown in the panel internal wiring.

4.5 PANEL INTERNAL WIRING

All wiring shall be carried out with 1100V grade single core multi strand flexible copper conductor wires with HRPVC insulation and shall be flame retardant, vermin and rodent proof. The current carrying capacity of wire shall be adequate for the duty assigned to it considering short circuit condition and shall have sufficient flexibility to facilitate proper termination at any location. Colour coded wires (red, yellow, blue, black) shall be used for CT, VT and CVT secondary connections. The copper conductor used for internal wiring be as follows:

- **CT circuit - 4.0 Sq. mm per lead**
- **VT/CVT circuit - 2.5 Sq. mm per lead**
- **AC/DC Supply - 2.5 Sq. mm per lead**
- **Digital status - 1.5 Sq. mm per lead**

The wire numbers shown in the wiring diagram shall be in accordance with IS375/BS152/BS156. Panel wiring shall be securely supported, neatly installed by lacing and tieing, readily accessible and connected to equipment terminals and terminal blocks. Flame retardant, plastic wiring channels/troughs with strap on plastic covers shall be used for this purpose. Sufficient space in channel for modification of wiring shall be kept.

The unused space on the front or rear of the panels shall be kept clear of wiring to facilitate addition of devices without rewiring associated portion of the panels.

Wire termination shall be made with solder less crimping type of tinned copper lugs, which firmly grip the conductor. Insulation sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules, marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Printed ferrules shall fittightly on the wire and shall not fall off when the wire is disconnected from terminal blocks.

The bidder shall be responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.

4.6 INTERIOR LIGHTING

The panel shall be provided with fluorescent LED light with lighting fixture rated for 240V AC supply, controlled by panel door switch and fuse. The number of such lightingfixtures shall be 1 no. per panel.

The panel shall be provided with 240V, 50Hz. 15 A, 3 pin universal socket with switch.The socket with switch shall be mounted inside the panel at convenient location.

4.7 EARTHING

Each panel shall be provided with earth bus tinned copper, having minimum cross section area of 25 x 6 sq mm flat securely fixed along with inside base of panels. Sinceseveral control panels are to be mounted adjoining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply. Provision shall be made to extend the earth bus barsto future adjoining panels. Provision shall be on the earth bus of the end panels for connecting owner's earthing grid. Necessary terminal clamps and connectors for this purpose shall be included in the scope of supply, of the contractor.

All metallic cases of PMUs, GPS, Router/Switches and other mounted equipment shall be connected to earth bus by copper wires of size not less than 2.5 sq. mm. The colour of the earthing wire shall be green.

Looping of earth connections which would result in loss of earth connection to other devices when the loop is broken shall not be permitted. However, looping of earth connections between equipment to provide alternative paths, to earth bus shall be provided.

VT, CVT and CT secondary neutral or common lead shall be earthed at one place only. Such earthing shall be made through links, so that earthing may be removed from onegroup without disturbing continuity of earthing systems for other group.

4.8 TERMINAL BLOCKS

Terminal blocks shall be 1100 V grade, 45 amps rated, one piece moulded, complete with insulated barriers, stud type, melamine housing brass terminals, washers, brass nuts and brass lock nuts and identification strips. Markings on the terminals strips shall correspond to wire number on the wiring diagrams. Not more than 2 wires shall be connected to any terminals.

Terminal blocks for CT, CVT and VT secondary leads shall be provided with test links and isolating facilities. CT secondary wiring should be such that it can connect additional circuit in series.

At least 20% spare terminals shall be provided in each panel and these spare. Terminals shall be uniformly distributed on all terminal blocks, near each group of connections for

feeder/PMUs wise circuits.

All spare contacts and terminals of the panel mounted equipment and devices shall bewired up to terminal blocks with ferrule numbers starting with U.

Cable gland plate fitted on the bottom of panel shall be connected to earthing of panel/station through a flexible brained copper conductor rigidly.

There shall be minimum clearance of 250mm between the first row of terminal blocks and the associated cable gland plate. Also the clearance between two rows of terminalblocks edge shall be minimum of 150mm.

Molding materials shall be self-extinguishing or resistant to flame propagation, substantially non hydroscopic and shall not carbonized when tested for tracking. The insulation between any terminal and framework between adjacent terminals shall with stand test of 2 kV rms. For one minute. The molding shall be mechanically robust to withstand handling while making terminations.

Easily removable Protective transparent plastic covers for placing over the live parts of the terminal blocks shall be provided invariably.

4.9 PAINTING

All sheet steel work shall be phosphate in accordance with the following procedures and in accordance with IS: 6005 `Code of Practice for phosphating iron and steel'.

Oil, grease, dirt and swart shall be thoroughly removed by emulsion cleaning.

Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

After phosphating, through rinsing shall be carried out with clean water followed by finalrinsing with dilute bi-chromate solution and oven drying.

The phosphate coating shall be sealed by the application of two coats of ready mixed, stowing type zinc chromate primer. The first coat may be `Flash dried' while the second coat shall be stowed.

After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stowing. The second finishing coat shall be applied after completion of tests. The panel shall have colour confirming to shade 631 of IS-5 for outside. Inside of the panel will be egg shell white.

Each coat of primer and finishing paint shall be of a slightly aesthetically pleasing appearance free from dirt and uneven surface.

Finished painted appearance of panel shall present an aesthetically pleasing appearance free from dirt and uneven surface.

The bottom plate shall be painted with anti-corrosive paint. A small quantity of finishingpaint shall be supplied for minor touching up required at site after the installation of the panel. The paint thickness shall be 60- 100 microns for powder coating.

4.10 MOUNTING

All equipment on front of panel shall be mounted flush.

Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent equipment. Equipment mounted inside the panel shall be so located that terminals of adjacent devices are readily accessible without the use of special tools. Terminal markings shall be clearly visible.

Cut-outs and wiring for free issue items. If any, shall be according to corresponding equipment manufacturer's drawings, cut -out, if any provided for future mounting of equipment shall be properly blanked off.

No equipment shall be mounted on the doors without prior approval of the purchaser.

Panels shall be matched with other panels in the control room/Relay room in respect of dimensions, colour, appearance and arrangement of equipment on the front.

4.11 D C DISTRIBUTION AND DC SUPERVISION RELAY

220/110 V DC distribution for the C&R panels shall be such that separate sub – circuits with suitable HRC Fuse is provided for each of the following:

- Main DC Supply
- PMU wise circuits
- GPS
- Router/Ethernet Switch

DC supervision shall be provided to supervise continuously the DC supply for the abovecircuits the scheme shall be suitable to work on 220/110 VDC supply from the station battery, and shall have position for visual alarm. One number indicating lamp along with
`Accept' push button shall be provided on each control panel for this purpose.

There shall be two DC source. Distribution of circuit should be as per working Source Iand Source II, independently.

4.11.1 DC SUPERVISION RELAY

The contractor shall provide DC Supervision relay & shall be capable of monitoring thefailure of D.C supply to which it is connected. It shall have adequate potential free contacts to meet the scheme requirement. The relay shall have a time `delay on drop- off' of not less than 100ms. In addition, be provided with operation indicator/flag. However, Contractor shall supply panel as

per OPTCL approved technical specifications.

5.0 CABLE

5.1 WIRING AND CABLING REQUIREMENT

i. The cables offered must be ISI marked. The Bidder shall invariably submit the attested copy of ISI certificate. Any cables without this mark will be out rightly rejected.

ii. The bidder shall be responsible for laying and termination of all cables at both ends required under the project which includes inter OPTCL connections among bidder supplied equipment and their interconnection with OPTCL Control/Relay Panel. Testing and commissioning of these interconnections shall also be done by the bidder.

iii. Shielded (screened) cables shall be used for external Cabling from the PMU panels. These external cables (except communication cables) shall have the following characteristics:

a. All cables shall have stranded copper conductor.
b. Minimum core cross-section of 2.5 sq.mm for PT/CVT cables, 4 sq.mm for CT cables and 2.5 sq.mm for Power inputs and 1.5 sq.mm for Digital Status inputs.

iv. The Current input and voltage input shall be taken from control/relay panel with standard copper wire. The estimated length from PMU panel to far most control/relay panel may be around 40 meter. Length may be vary & as per site survey**.** PMU to control/relay panel, wiring, termination at both end (Source &PMU panel) will be in the scope of the bidder.

v. Cable laying & termination at both end under the scope of bidder (PMU Panel & C/R Panel):

Cable Laying Work
PMU Panel to Relay Panel of Feeder Bay for CT Connection (In/out)
PMU Panel to Relay Panel of Feeder Bay for CVT Connection
PMU Panel to Control Panel of Feeder bay for Digital Input
PMU Panel to Control/Relay Panel for PT Connection
PMU Panel to AC/DC Distribution Board for Supply

vi. CT/CVT/PT input shall be given from metering/protection core of CT/CVT/PT, Bidder shall provide necessary TB arrangement, Wiring Interconnections & terminations works at Control/Relay panel for PMU connection in series with Protection/Metering core. Bidder shall mention interconnection drawing in PMU panel drawing for connection at opposite end.

vii. In case of digital input connection, if spare auxiliary output contact of CB ON/OFF, ISO ON/OFF status is not available in Control panel of respective feeder in such case bidder have to provide contact-multiplying relay (CMR) of standard make with **2 NO-2 NC contact** with mounting base for connection of digital status (for 110 V DC & 220 V DC Supply). Necessary interconnection of wiring at control panel end for digital status connection is in scope of bidder. Necessary technical assistance will be provided by SLDC- OPTCL during work.

viii. Termination of CT/PT/CVT/Digital input cable, lug, printed ferruling & additional terminal block for wiring in existing OPTCL C/R Panel is under the scope of bidder.

ix. The Bidder shall supply cable as per OPTCL approved technical specification & from approved supplier; major technical specification is mention herewith.

x. PMU will connect on HV side of Generating Transformer. In case of outage of GTwill not permit, in such case bidder shall provide clamp on type CT for measurement.

5.2 COMMUNICATION CABLE: (PMU to Router/Switch, PMU to PMU, Router/Switch to Communication Panel)

a) The output of the PMU from panel to communication equipment shall be through Ethernet/optical fibre. The estimated length from PMU panel tocommunication equipment may be around 100 meter however, it may vary and PMU to communication link on Ethernet/optical fiber will be inthe scope of the bidder.

b) In case of more than 40-meter length between Router/Switch to OPTCL communication equipment, Bidder shall provide/lay down armoured Fiber Optics cable for interfacing purpose.

5.3 STANDARDS

a. The control and power cables shall conform to the following Indian / International standards, which shall mean latest revisions, amendments / changes adopted and / or published as on the date of opening of the Tender.

Sr. No.	Indian Standards	Description
1.	IS : 1554 (Part – I)	Cables
2.	IS : 5831	Insulation Sheath
3.	IS : 8130	Copper And Aluminium
4.	IS : 10418	Wooden Drums
5.	IS : 3975	Armouring
6.	IS : 3961	Current Rating

b. Over and above, any other standards which are relevant may be quoted by the bidder. However, in an event where the supplier offers Control and / or power cables conforming to standards other than the above, then the salient points of comparison between the standards adopted and the standards quoted herein shall be detailed in relevant schedule with an authenticated English version of such standards referred to. OPTCL also reserves

right to ask any supplier to supply the control / power cables related to any other IS or International Standards which maybe found to give better quality and performance of the cables.

5.4 CLIMATIC CONDITIONS

The cables to be supplied under these Specifications are to be used in various Sub-Stations of the Odisha State, located at different locations having varying atmospheric and climatic conditions and are supposed to operate satisfactorily under any conditions.

5.5 PRINCIPAL PARAMETERS

i. The control cables shall be round copper conductor (of required size) with PVC insulation, armouring and sheath, colour coded as per relevant standards or as specified / instructed by the OPTCL The control cables shall be rated for minimum 1100V, however Bidder may quotefor higher voltage ratings, which shall be clearly brought out in the Technical Bid.

ii. All the cables quoted / supplied shall be ISI marked.

iii. The insulation of each core and outer & inner sheath, shall comply with the relevant IS / this Specification, whichever is stringent, for control and / or power cables.

iv. All the armouring shall be strip / round wire type, hot dip galvanized. The armouring and galvanizing shall comply with relevant standards and or this Specification and shall be ISI marked.

v. The copper conductor used shall be electrolytic grade annealed and shall be made of minimum 99.5% pure copper, thus the total impurities shall not exceed 0.5%.

vi. The Control / Power cables shall be suitable for being laid directly in the ground,in the pipes or in the cable trenches.

vii. The cables shall therefore be suitable for satisfactory operation under the anytropical climatic conditions.

5.6 MATERIALS

i. The conductors shall be manufactured from Electrolytic annealed copper suitably hard-drawn on wire drawing machines. The copper rods used shall comply with all the relevant ISS, BSS, or other standards to be specified along with the due justifications and this Specification.

ii. Galvanized steel wire shall be drawn from high carbon steel rods produced by either acidic or basic open hearth process, electric furnace process or basic oxygen process. All the properties of the steel strips and wires shall conform to the relevant standards.

iii. The zinc used for galvanizing shall be electrolytic high grade Zinc not less than 99.95 percent purity. It shall conform to and satisfy all the requirements of relevant ISS, BSS, the Specification or other Standards to be specified with the due justification. Galvanizing shall be done by hot dip galvanizing process.

5.7 FREEDOM FROM DEFECTS

The wires shall be smooth and free from all imperfections such as spills, splits, slag inclusion, die marks, scratches, fittings, blow-holes, projections, looseness,overlapping of strands, chipping of copper / aluminium layers etc. and all such other defects which may hamper the mechanical & electrical properties of the conductor as also the installation of the cable at the site etc. Special care should be taken to keep away dirt, grit etc. during stranding / applying PVC coating.

5.8 JOINTS IN WIRES

i. Copper / Aluminium Wires

No joints shall be permitted in the copper / aluminium wires in any of the cablesand any of the cores.

ii. Galvanized steel wires

There shall be no joints except those in the base rod or wire before final drawing insteel wires and strips forming the armouring of the copper / aluminium cables.

5.9 STRANDING

i. The wires used in the construction of galvanized steel armouring of copper and aluminum cables before stranding and after stranding shall satisfy all the relevant requirements as per the standards indicated or any other standards with due justification and this Specification.

ii. The zinc used for galvanizing shall be electrolytic high grade Zinc. It shall conformto and satisfy all the requirements of relevant standards indicated or any other standards with due justification and this Specification. Galvanizing shall be done by hot dip galvanizing process.

5.10 STANDARD LENGTH

i. The standard length of the conductor shall be 500 meters for all control cables, if in the substation/location total length of cable requirement is less than 500 metersthan it will be allow accordingly. Length of cable of each PMU location requirement is actual site survey of locations.

ii. All the cables shall be marked at every meter with the name and logo of the manufacturer & purchaser, rating & size of the cable, and date of manufacture, along the length.

iii. Every core of the cable shall be marked with **bold letter** core no. at every meter, serially.

5.11 INSPECTION

At least 5% of the total number of drums subject to minimum of two in any lot foreach size put up for inspection. The sample cut from any numbers of drums for carrying out any type of tests shall be to the suppliers account.

5.12 DOCUMENTATION

i. Two sets of type test reports, duly approved by the SLDC- OPTCL shall be submitted by the Bidder, before commencement of supply. A copy of acceptance and routine test certificates, and drawings duly approved by the SLDC- OPTCL shall accompany the dispatch consignment.

ii. The manufacturing of the cables shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the SLDC-OPTCL. All manufacturing and fabrication work in connection with the cable prior to the approval of the drawing shall be at supplier's risk.

iii. Approval of drawing etc. by OPTCL shall not relieve the Bidder of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The cables shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards in vogue on the day of opening of the Technical Bid and purchaser shall have the power to reject any work or materialwhich in his judgment is not in full accordance therewith.

5.13 PACKING & FORWARDING

i. The cables shall be supplied in non-returnable strong wooden drums provided with lagging of adequate strength, and displacement during transit, storage and subsequent handling and laying operations in the field. The drums shall generally conform to relevant IS accept otherwise specified hereinafter.

ii. The drums shall be suitable for wheel mounting and for jetting off the cable undera minimum controlled stress of the order of 5 Kg/Sq.M for copper cables and 15 Kg/Sq.M for aluminium cables.

iii. The bidder should submit the proposed drum drawings along with the bid. However, the same shall be in line with the requirements as stated herein. After placement of the Letter of Award, the Bidder shall submit two copies of fully dimensional drawing of the drum and cross section(s) of the cable, for SLDC-OPTCL approval before taking up manufacturing of Cables and or drums. After getting approval from the SLDC- OPTCL, Bidder shall submit 5 copies of the approved drawing to SLDC- OPTCL for further distribution and field use at SLDC-OPTCL end.

iv. All wooden components shall be manufactured out of seasoned soft wood free

from defects that may materially weaken the component parts of the drums. Preservative treatment for anti-termite/anti-fungus (Aldrime / Aldruse) etc. shall be applied to the entire drum with preservatives of a quality which is not harmful to the cable or to the persons using or storing the same.

v. The cable ends shall be properly sealed and secured with the help of U-nails on one side of the flanges. The cable shall be banded by use of galvanized steel wire / aluminium wire.

vi. Wire shall be bound at least at three locations at the most 75 mm apart covered with PVC adhesive tape so as to avoid loosening of cable in transit and handling.

vii. If any bidder wishes to supply the cables in the non-returnable steel drums the same will be acceptable, however they shall be without any additional cost to the SLDC- OPTCL.

5.14 MARKING

Each drum shall have the following information stencilled on it in indelible inkalong with other essential data:

- Contract Award letter / order number
- Name and address of consignee
- Manufacturer's name and address
- Drum Number
- Size of cable
- Length of cables in meters
- Gross weight of drum with cable
- Weight of empty drum with lagging
- Arrow marking for unwinding.

5.15 DRAWINGS

All the bidders have to submit the drawings for the sectional view of Control cables and drawings of drums as per IS 10418,1982 and technical specificationsto be utilized for packing of the control and power cables and as per the lengthsspecified in this Tender Specification and other parameters The cable drawing shall be enclosed with the calculations of current rating, dimensions etc. and drum drawings with calculations in support of the size of the drum to accommodate therequired length of cable.

5.16 DEVIATIONS

Any deviation to this Technical Specification will be out rightly rejected. All the Bidders have to submit this specification duly authenticated without any alterations, additions etc. on each page along with the Technical Bid. Any offer without this will be out rightly rejected.

5.17 TECHNICAL SPECIFICATIONS (CABLES)

Sl.No.	Description	Control cable. sq. mm.	
		2.5	4.00
1	Number of Strands – Nos.	7	7
2	Diameter of – mm. I) Strands a) Nominal b) Minimum II) Overall Conductor /Core (Min.)	 - - 2. 0 6	 0.85 0.85 2.55
3	Cross Sectional Area of – Sq. mm. a) Whole Conductor b) Total c) Each Strand (Minimum) d) Conductor / Core	 As Per Requirement - 2. 5 0	 As Per Requirement 0.5672 4.00
4	Laying of Strands – Nos.	As Per Requirement	As Per Requirement
5	Weight – Kg / Km. a) Whole Conductor b) Strand (At Nominal Dia.)	To Be Furnished by The Bidder	
6	D.C. resistance at 20 0C - Max. a) Whole ConductorM Ohms b) Conductor of core - Ohms / Km (All 3/7 strands ofa core)	To be Quoted by the Bidder	
		7.41	4.61
7	Specific Insulation Resistance– Ohms – Cm. i) At 27^0C ii) At 75^0C	1×10^{13} 1×10^{10}	
8	Ultimate Tensile Stress – KN a) Insulation b) Sheath i) Inner ii) Outer	To Be Furnished by The Bidder	
9	Modulus of Elasticity – a) Kg / Sq. Cm. b) GN / Sq. M	To Be Furnished by The Bidder	

10	Coefficient of linear expansion - per deg. C.	To Be Furnished by The Bidder	
11	Chemical Composition - %		
	a) Conductor Cu / Al. b) Copper (Max.) c) Carbon d) Manganese e) Phosphorous f) Sulphur g) Silicon	99.5 N.A. N.A N.A N.A N.A N.A	
12	Zinc Purity - %	99.95	
13	Resistivity – Ohms Sq.mm / Mtr.	0.28264 (Al) 0.01724 (Cu)	
14	Density (At 20^0C) – Gm / Cu Cm.	2.703 (Al) 8.89 (Cu)	
15	Constant Mass Temp. Co-efficient of resistance – Per^{0}C	0.004	
16	Elongation (Minimum) - % a) Conductor b) Insulation c) Sheath	To Be Furnished by The Bidder	
17	Minimum Current Rating at Max. operating temp. – Amp. a) Continuous b) Short time	27 16 50	50 3000
18	Type of Armouring	Round Wire up to 7C & Steel Stripabove 7C	Round Wire for 4C & Steel Strip for 12C
19	Standard Length – Mtrs	501± 5%	

6.0 TESTING

6.1 TYPE TESTING

A complete integrated unit shall be type tested to assure full compliance with the functional and technical requirements of the Specification. The list of Type tests to be performed on the PMU is mentioned in **Table-6.1.**

The contractor shall submit type test reports for all the EMI/EMC tests conducted at accredited laboratory for review & approval by SLDC- OPTCL Functional/Performance test under type test of (1 Nos PMU) shall be carried out at accredited laboratory in presence of SLDC- OPTCL representatives. However, in the event, the type test reports are not meeting the specification requirement, OPTCL may ask for additional No of PMU for the type testing of any or all of the above tests as required at no additional cost.

The PMUs with highest configuration to be supplied for the project shall be type tested. In case, the supplied PMUs with higher configuration are designed to operate at lower configuration, then also the PMUs shall type tested for the highest capable configurationof the PMU.

The type test of PMU with respect to functional tests shall be carried out in all cases. Contractor shall commence commercial production of PMU after successful completion of all type tests and approval from SLDC- OPTCL.

6.2 ROUTINE TESTING

Each complete unit shall undergo routine testing. The list of Routine tests to be performed in the factory is mentioned in **Table-6.1** Few samples of PMUs shall be testedat the PMU Test Lab being set up in India before taking up mass production.

6.3 FIELD TESTS

After PMU panel installation and interface cabling with C&R panels and communication equipment, the Bidder shall carry out the field-testing. The list of field tests is mentioned in **Table-**

6.4 AVAILABILITY TESTS

After field-testing, PMU shall exhibit 99.95 % availability during test period of 1000 hours. Availability tests shall be performed along with control station. The PMU shall be considered available only when all its functionality and hardware is operational. The non-available period due to external factors such as failure of DC power supply, communication link etc. shall be treated as hold-time & availability test duration shall beextended by such hold time.

Test Nos.	DESCRIPTION OF THE TEST	Type test	Routine test	Field test
	FUNCTIONAL TEST			
1.	Check for BOQ, Technical details, Construction & Wiring as per PMU drawings	√	√	√
2	Check for PMU database & configuration settings	√	√	√
3.	Check the operation of all Analog inputs, Digital and Status input points of PMU	√	√	√
4.	Check operation of all communication ports of PMU	√	√	√
5.	Check for communication between PMU and PDC	√		√
6.	Test for downloading of PMU database from PDC	√		√
7.	Test for PMU time synchronization from GPS	√		√
8.	Test Power Supply Voltage Margin, Ripple Levels andShort Circuit Protection	√		
9.	Test for PMU operation with DC power supply voltagevariation	√		
10.	Check for auto restoration of recovery after its failure	√	√	√
11.	Test for PMU diagnostic feature	√		

12.	Accuracy tests as per IEEE C37.118.1-2011 & C37.118.1a-2014, C37.118.2-2011 with all amendment.	√		
13.	Test for PMU internal Clock stability	√	√	√
14.	Test for Peak-Peak variation in PMU measurement (Noise) (During each Step of the Steady State frequency and phase angle tests Observed TVE max – TVE min to be reported)	√		
16.	Other functional tests as per technical specification requirements	√	√	
17.	End to end test (between PMU & PDC) for all I/O points	√		√
	EMI/EMC IMMUNITY TESTS FOR PMU			
1.	Surge Immunity Test as per applicable IEC Std.	√		
2.	Electrical Fast Transient Burst Test as per applicable IEC Std.	√		
3.	Damped Oscillatory Wave Test as per applicable IEC Std.	√		
4.	Electrostatic Discharge test as per applicable IEC Std.	√		
5.	Radiated Electromagnetic Field Test as per applicable IEC Std.	√		
6.	Damped Oscillatory magnetic Field Test as per applicable IEC Std.	√		
7.	Power Frequency magnetic Field Test as per IEC-applicable IEC Std.	√		
	INSULATION TEST FOR PMU			
1.	Power frequency voltage withstand Test as per applicable IEC Std.	√		
2.	1.2/50 µs Impulse voltage withstand Test as per applicable IEC Std.	√		
	Insulation resistance test			
1.	Environmental Test for PMU	√		
2.	Dry heat test as per applicable IEC Std.	√		
3.	Damp heat test as per applicable IEC Std.	√		
4.	Cold Test as per applicable IEC Std.	√		

Table: 6.1

The PMU shall be supplied with performance test certificate of eligible testing laboratoryas per applicable standard C37.118.1-2011, C37.118.1a-2014, C37.118.2-2011 with latest amendments.

The performance certificate shall cover the entire required performance compliance under steady & dynamic test condition as per standard IEEE C37.118.1-2011 & IEEE C37.118.1a-2014 clause 5 for supplied model.

The actual performance of PMU shall comply as per above given performance certificate and it will be observed for one month and after it will be considered for passing in Site acceptance

test (SAT) along with other requirement of SAT.

==========END OF JOB-1==========

JOB -2

SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF CONTROL CENTRE HARDWARE & SOFTWARE UNDER WAMS PROJECT.

1.0 GENERAL REQUIREMENTS OF CONTROL CENTRE DEVELOPMENT

1.1 GENERAL REQUIREMENT

The Bidder is encouraged to offer standard products and designs. However, the bidder must conform to the requirements and provide any special or additional equipment/s or software necessary to meet the requirements stated in the specification. The SLDCOPTCL reserves the right of execution of works within the stipulated quantity variation provision other than those indicated in the BOQ at the same rates, terms andconditions.

The Bidder's proposal shall address all functional and performance requirements within this specification and shall include sufficient information and supporting documentation in order to determine compliance with this specification. The Bidder's proposal shall clearly identify all features described in the specifications or in any supporting reference material that will not be implemented; otherwise, those features shallbecome binding as part of the final contract.

An analysis of the functional and performance requirements of this specification and/or site surveys, design, and engineering may lead the Bidder to conclude that additional items and services are required that are not specifically mentioned in this specification. The Bidder shall be responsible for providing at no added cost to the SLDC OPTCL, all such additional items and services such that a viable and fully functional Project is implemented that meets or exceeds the capacity, and performance requirements specified. Such materials and services shall be considered to be within the scope of the contract.

All equipment provided shall be designed to interface with existing equipment and shall be capable of supporting all present requirements and spare capacity requirements identified in this specification.

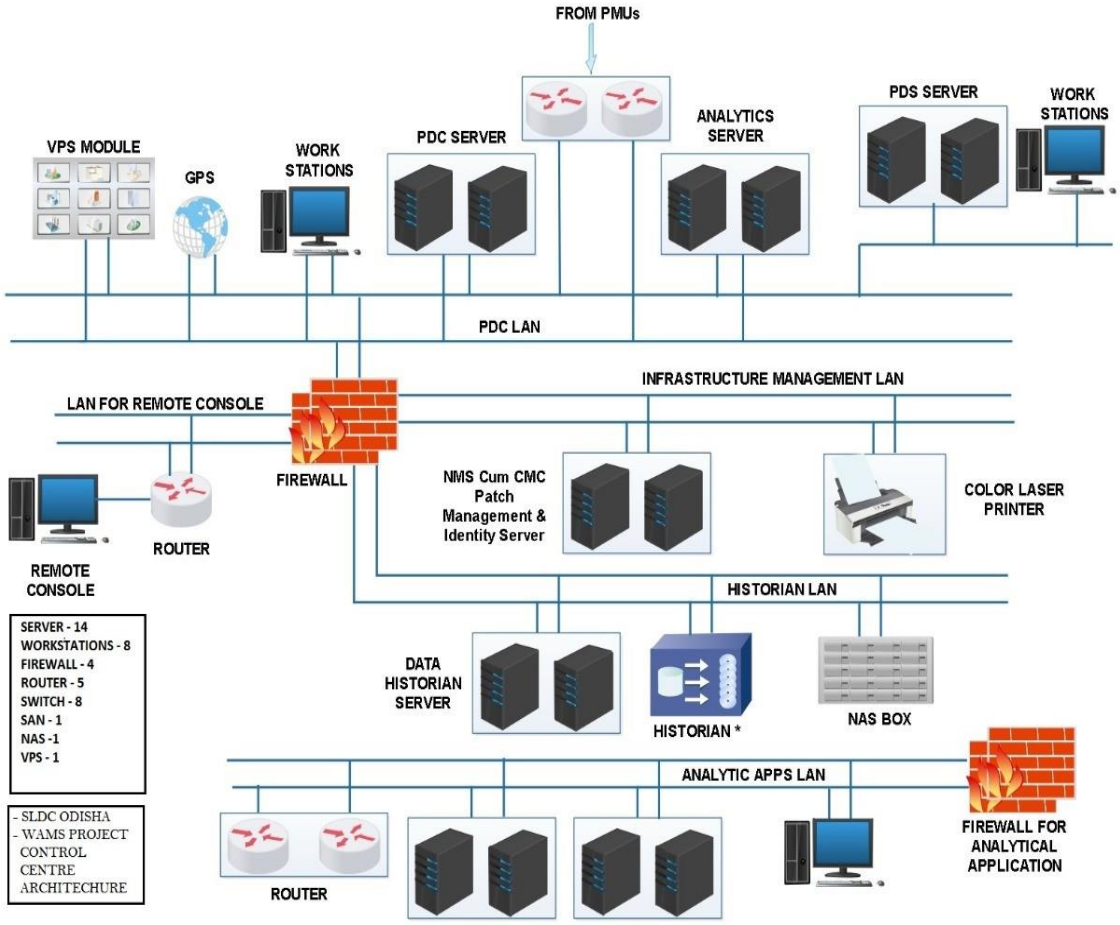
The Bidder shall demonstrate a specified level of performance of the offered items during well-structured factory and field tests.

The successful bidder is required to visit sites. The site visits/routes shall include all necessary surveys to allow the bidder to perform the design and implementation functions. The bidder shall inform their site survey schedule to the Owner well in advance. The site survey schedule shall be finalized in consultation with the SLDC OPTCL. After the site survey the bidder shall submit to the SLDC- OPTCL a survey report.

This report shall include at least the following items:

- Layout of all equipment’s to be installed at control center (PDCs, Server, Work Station, etc) in the rooms and buildings as required for final and intermediate positions.
- Proposed routing of power, earthing, LAN cable and signal cables along with trench size at Control Center to be supplied under this project.
- Availability of Space, Air conditioning and AC/DC Power supply

- Proposals for new rooms/buildings/ trench/ facility modifications, if required
- Identify all additional items required Control Centre development for successful integration new PMU and existing PMU under WAMS Phase-I project and URTDSM project.



DATA CENTER ARCHITECTURE

1.2 SIZING REQUIREMENT OF PDC

The PDC sizing requirement in terms of its capacity for collecting the Phasor Analog/Digital data directly from the PMUs and indirectly through other PDCs as per Table No:1.0. However, all the PDCs shall be designed and tested to accommodate 50% additional phasor data (direct as well as indirect reporting) without compromising the performance on any account. WAMS phase II PMUs data shall send data at 50 frames/second to PDC. Existing PMU of WAMS Phase-I project and URTDSM Project shall report the data at 25 frames/seconds to PDC, supplied PDC shall have capability to accommodate the same without affecting performance.

Sr. No.	Control Centre	No of PMUs to be reported (All WAMS PMUs shall send data at 50 frames/second, & URTDS MPMUs shall send data at 25 frames per second. PDC shall be designed accordingly)	
		From other PDC (In direct reporting)	From PMUs (Direct reporting)
1.	SLDC	250	500

Table no: 1.0

Note: The above sizing is exclusive of the 50% expansion requirement.

PDC sizing considering as per one PMU having Approximate 44 output phasor. Considering one Physical PMUs having 2 Voltage & 2 Current analog channel with 10 digital input. Phasor calculation is as per Table No: 1.2.

PHASOR CALCULATION PER PMU

Sl.No.	Description	Quantity
1	3 Phase Current phasor	6
2	3 Phase Voltage phasor	6
3	Sequence current phasor (+ve, -ve, and zero)	6
4	Sequence voltage phasor (+ve, -ve, and zero)	6
5	Frequency	2
6	Rate of change of frequency	2
7	Active Power	2
8	Reactive Power	2
9	Power Factor	2
10	Digital Phasor	10
	Total Phasor per PMU (Approximate)	**44**
	Sampling Rate (User selectable) present considering	**50 samples/sec**

Table no: 1.2

EXISTING PMU DETAIL

Existing PMUs	PMU Configurations	Data Reporting Rate	Nos. of PMU
URTDSM	Two Voltage Channel & Two Current channelwith 2 Digital Input	**25 sample/second**	**Direct- 32 Indirect-29**

Table no: 1.3

Bidder shall design PDC considering No of Direct PMU, Indirect PMU will report to PDC & Total input phasor handling capacity of PDC as per Phasor calculation per PMU shown in Table no:1.2 PDC can handle PMU ID, Individual IP address, TCP/UDP Port simultaneously with 50 % expandable capacity.

1.3 WAMS SYSTEM FUNCTIONS

The WAMS system shall comprise of the followings:

a. Phasor Data Concentrator (PDC)
b. User Interface
c. Network Management System (NMS)
d. Historian System

The functionality of PDC, User Interface requirements, NMS functions and Historian System requirements are specified in subsequent sections of this specification**.** This specification describes the functional requirement of each of the above components, the Bidder may combine the requirements of some of the functions as long as the functional requirement is met and performance criteria are not compromised. The design shall ensure the interoperability of PMU and PDCs, which shall be demonstrated by the contractor during testing. The offered PMUs & PDCs shall be interoperable with other make PMUs and PDCs compliant with IEEE C37.118.1-2011 and C37.118.2-2011 standard with all amendments

The proposed architecture for Control Centre is depicted above. This architecture is provisional only, Detail architecture will be finalized during detail engineering of Project.

2.0 PHASOR DATA CONCENTRATOR (PDC)

The PDCs shall be designed to work in dual redundant configuration with dual LAN architecture at the Control Centre so as to ensure uninterrupted availability of data to the users. These PDCs shall be used for protection, control and monitoring of the powersystem, the PDC shall be designed with due consideration to these aspects of power system**.** The design of supplied PDCs shall be in line to latest version of IEEE C37.244-2013 Guide. The design shall also ensure the availability of data to real time applications within the latency requirement mentioned subsequent paragraph of **Section: 2.14**. Therequired software tools shall be provided along with PDC for the display, calculation of data, report generation, alarm and storage of data for online & off line analysis. The PDCs shall be compliant to environmental standards, e.g. IEEE Std 1613, IEC 61850- 3, as applicable.

2.1 DATA ACQUISITION

The PDCs shall perform the following data acquisition functions:

a. The PDCs shall collect and aggregate the data received directly from the PMUs located at various substations/power plants and from other PDCs which may be located at the same control center or at other control center or at the substation/power plant in compliance to the IEEE C37.118-2011 (Part-1&2) standard at user selected phasor data reporting rates.
b. The PDCs shall conform to IEEE C37.118-2011 (Part-1&2) standard streaming protocol

for both the phasor data inputs and the combined data output stream.

c. The PDCs shall also be capable of communicating on C37.118-2005 protocol with the existing PMUs and PDCs.
d. The PMU data includes 3-phase voltage phasors, 3-phase current phasors, frequency, digital status inputs and Rate of Change of Frequency (ROCOF), P, Q & Sequence component.
e. PDC shall have capability to calculate Active Power, Reactive Power, Sequence component (Positive, Negative, Zero), Power factor etc.
f. The PDC shall be able to collect the active and reactive power, sequence component and Power factor, if measured by PMU.

2.2 CONFIGURATION CHARACTERISTICS

The PDC's administrator shall be provided with tools to configure the system, such as:

- Connection of PMUs
- Data output streams
- User profiles
- Alarm thresholds

The PDCs shall have the following configuration characteristics:

a. Shall have available up-to-date configuration information for all input and output streams. It is required to request appropriate configuration files (data) from PMUs or PDCs whenever it has been off-line for some time, e.g. for more than one minute as specified by IEEE Std C37.118-2011 (Part-1&2). PMUs are required to indicate in their data frames that their configuration has changed, so that the PDC can request a new configuration file (data). The same mechanism also applies when a PDC sends synchro phasor data to another PDC.

b. Shall have the ability to retrieve the data stream configuration from a data source (PMU or PDC) after an incoming data stream interruption and restoration. It shall also send the corresponding information to its data destinations.

c. Shall have the ability to request a device capability file (a list of all available signals) from data sources (PMUs, PDCs), combine them and send the combined list to its data destinations as defined in IEEE C37.118-2011 (part-1&2) Standard.

d. The PDC shall perform a sanity check on the received configuration. This may include check on the CRC, the number of bytes expected, and the actual number of bytes received, etc.

e. The PDC shall determine if the configuration has changed, by comparing the newly received configuration with the previously stored configuration. If the configuration has changed, the PDC should take appropriate action based on user defined rules to reconfigure its outputs and communicate the change to all affected output destinations and

applications,

In addition to the above, it shall be possible to configure the PMU or another PDC remotely from PDC. The remote configuration utility shall support proper authorization & authentication in order to verify the configuring authority.

2.3 CALCULATION OF DATA IN PDC

PDC can be able to calculate Active, Reactive Power, Sequence component, Power factor from PMU row data, For Active & Reactive Power calculation, PDC can be able to calculate independently whether PMU can send voltage channel or not in one PMU ID. Auto selection of PMU channel for P, Q calculation of feeder can be possible in PDC, same can be transmitted in output stream of PDC. Calculated Data of PDC can be further updated in UI, Analytics & all modules of systems.

2.4 REDUNDANT DATA HANDLING

The PDC shall be able to handle redundant data sent by alternate devices, either in aggregated or time aligned PMU streams. The PDC shall allow the user to designate a preferred source for data to be included in an output stream. The PDC shall also permit the user to designate alternate source(s) for the output stream if the preferred data fails to arrive. PDC shall indicate in the output stream that the alternate data source is used.

2.5 DUPLICATE DATA HANDLING

The PDC shall be able to handle duplicate data. The PDC shall receive data sent by alternate communication paths or data sent in both aggregated and time aligned data streams. The PDC shall use the data that arrives first, and discard the data that arrives later than the waiting period. The PDC shall also be capable of choosing data without errors for use and discarding all other data.

2.6 LATE DATA AND LOST DATA HANDLING

The programmer shall be able to independently assign the following processing for each value to be executed when the value is missed /arrived lately in the PDC. The values maybe missed /arrived lately for reasons such as PMU failure or communication data link failure etc.

(i) Store the last good data value, with a questionable data quality code, for each missed value.

(ii) Store zero and a telemetry failure quality code for each missed value. When the next good hourly value is obtained, store that value with a questionable data quality code as the value for passed time.

(iii) PDC shall provide a function to allow users to configure a maximum waiting time for PMU data arrival for each output data stream. The PMU data arriving before the waiting time shall be included in the output data stream, but the data arriving later than the waiting period, that late data sample shall be filled with the previous sample with a quality code indicating the late data.

2.7 DATA PROCESSING

The PDC system shall process the acquired data for use by the power system applications or analytical applications. PDC shall provide, as a minimum of the following data processing capabilities.

a. Data quality check and flagging.
b. Data format conversion
c. Data scaling
d. Re-sampling of a received data stream. (The re-sampling is defined as changingthe data rate of a PMU data stream from one rate to another rate)
e. The PDC shall provide a reporting rate conversion function. The data reporting rate conversion function shall include both down-conversion and up-conversion functions. Reporting rate conversion should be user-configurable toaccommodate the compatibility needs of all the devices and applications in the synchrophasor system, as well as all the applications that might be using the datafrom the PDC.
f. The PDC shall support input rate conversion, which shall be user selectable, fromall rates specified in IEEE C37.118.1-2011 standard to output streams having anyrate specified in IEEE C37.118.1-2011 standard.
g. The PDCs shall align the data received from the PMUs by time tag to create a system wide measurement set and feed it as a single stream as input to the other PDCs/ applications but PDC shall also support data aggregation without time alignment also.
h. The PDC shall be able to indicate the absent data in its outgoing data stream and shall accept such indications from the sender, and interpret them appropriately.
i. A PDC shall support basic data validation and checking as accommodated in the communication protocol used. It shall check the status of the time quality of all PMUs, and perform data integrity check on all received data. Any errors detectedand suspected corrupt data shall be flagged in output data stream.
j. The PDC shall support synchrophasor data latency calculation. To perform this function a GPS clock shall be provided with PDC, the GPS clock shall also be used for synchronisation of other devices/servers of WAMS system at the control centre. The calculated latency values shall be stored for statistical analysis and reports to the user. Statistics shall include functions such as minimum, maximum,average, mean, deviation etc. over a specified period.
k. Synchrophasor data may be available in rectangular or polar coordinates and may be in fixed integer or floating point formats. The PDC shall have functions to process and convert data between these common coordinates.
l. PDC shall have the capability to scale synchrophasors or magnitudes by user configurable scaling factors to account for transformer ratios. A PDC shall also have the capability to shift synchrophasor data phase.
m. PDC shall check the disturbance flags and trigger recording of the disturbance, monitor

the overall measurement set and provide a display and record files of datafor analysis.

n. PDC shall be able to generate alarm based on the limit violation.

o. PDC shall have buffer input data streams to accommodate the different times ofdelivery from individual PMUs.

p. PDCs shall be able to forward the data with or without modification as well as selectively. The supplied PDCs shall support the following modes of data exchange with other PDCs. Data modification may include data format and coordinated conversion, phase and magnitude adjustment, decimation, interpolation etc.

The data processing requirements shall apply to data collected from all specified sources. All time stamp used for data shall be in Indian Standard Time (IST). Wherever source datareported in any other time format it shall be converted to IST. All input data andparameters, whether collected automatically or entered by a user, shall be checked for reasonability and shall be rejected if they are unreasonable. All intermediate and final results shall be checked to prevent unreasonable data from being propagated or displayed to the user. When unreasonable input data or results are detected, diagnostic messages,clearly describing the problem, shall be generated. All programs and all computer systemsshall continue to operate with the old data or manually replaced data in the presence of unreasonable data.

2.8 DATA EXCHANGE

2.8.1 DATA EXCHANGE WITH OTHER PDCS

The PDCs shall be capable of receiving real-time synchrophasor data streams from PMUsand other PDCs. The PDC shall support parsing, interpreting and sending data in compliance with synchrophasor data transfer protocols such as IEEE Std C37.118-2005,IEEE C37.118-2011.

The PDCs shall be able to re-send the data to other higher level PDCs. The dataexchange between any of PDCs shall be bi-directional.

2.8.2 DATA EXCHANGE WITH HISTORIAN SYSTEM

PDC shall be able to exchange all types of Data including PMU raw data, calculated dataand any other application data with Historical system as per user defined rate. By default,the rate shall be the sampling rate of PMU.

2.8.3 DATA EXCHANGE WITH EXISTING SCADA/EMS SYSTEM

The data output from the phasor data concentrator would be transferred to EMS applications with required time frame. The PDCs shall support to exchange the all data (raw data/calculated data/Digital signal) with existing SCADA/EMS systems installed at Control Center on both IEC 60870-5-104 and ICCP Protocols.

2.8.4 DATA EXCHANGE WITH ANALYTICAL APPLICATIONS

The PDCs shall be capable to exchange data with Analytical applications, which are under development and shall be procured separately. The PDC shall be able to exchange the data with the analytical applications in IEEE C37.118.2011 stream at user defined rate (By default

sampling rate).

Further the PDC shall have capability of exchanging the data through ODBC interface/ OPC interface/Web API interface/ SOAP with other applications at user defined rate (Bydefault rate).

API should support this type of quarries like All PMU data (Phasor data, Analog, Digital data) can be available in single time stamp & it should be also export in .CSV file format.

2.8.5 OUTPUT STREAM OF PDC

The PDCs shall be capable to give output stream to other PDC, there shall be no limit to define nos. of output stream in each PDCs.

The frame rates should be individually user selectable for every output stream and PDC should support up and down frame rate conversions.

Size of individual stream shall be as per IEEE C37.118.2-2011 standards.

2.8.6 DATA TRANSFER PROTOCOL SUPPORT/CONVERSION

PMU data may be available in different synchrophasor data transfer protocols such as IEEE Std C37.118,-2005, IEEE Std 1344-1995, IEC 61850-90-5, etc. PDC shall supports
multiple synchrophasor data transfer protocols, it should convert synchrophasor data from one synchrophasor data transfer protocol to another to the extent possible.

2.9 PDC PERFORMANCE MONITORING

The PDC shall monitor the performance of the data to check the error which may be in the source of data or due to communication and shall be able to monitor the overall measurement system. PDC Monitoring shall include the following features:

i. Both real-time reporting and recorded data for historical assessment. The real- time monitor shall demonstrate that the PDC is currently operating and what the state of operation is. State of operation includes the status of each input and output and recent operating history.
ii. Recorded data shall include errors, events, and overall system operation. The firstcategory of errors is those reported by the data source, which can be a PMU or another PDC. These errors shall include loss of time sync, computation errors (PMU error), data invalid, or data sets matched with local time (sort by arrival). In some cases the source will have additional reporting assignments, and these canbe included.
iii. The second category is communication related issues such as a lost TCP connection, buffer overflow, and related issues detectable by the receiving PDC.
iv. The third category is internal PDC problems such as system reset, program error,memory overflow, etc. All errors shall be recorded with a timestamp.
v. The PDC shall have overflow blocking to prevent repeated errors from overfilling the buffer or causing other problems.
vi. The PDCs shall monitor the events that affect the status and operation of the phasor measurement system. These include loss and restart of the PDC, power loss to a system component, configuration change, and similar type events. Theseare things that are not a failure or error condition, but do impact the measurementsystem operation.
vii. The PDCs shall log the number of data measurements received vs. those expected, packet

errors, missing data, and similar information including computed statistics in order to assess the overall system operation.

viii. PDC shall monitor synchro phasor system condition that affect performance like loss of communication links, resets, and configuration changes etc.

System monitoring include logging of

- Total number of measurements not received but expected
- Measurements received with values out of range, per absolute range checks ormodel-based data validation
- The quality of received synchrophasor data
- Measurements received but corrupted
- Good data received, but with a bad timestamp so it cannot be integrated asexpected
- Good data

2.10 PDC DATA VALIDATION

The PDCs shall perform basic data validation and checking for the data arriving at the PDC. This function shall include simple and basic communication validations like CRC checking on all received data. More advanced data validation techniques such as data sanity checks, etc shall also be provided. As per the requirement of cyber security standards, data validation function shall be regarded as the first activity towards their fulfilment.

The PDC shall perform various quality checks on the phasor data and should insert the appropriate flags or quality codes into the correlated data stream. Quality codes indicate the presence of one or more factors that affect the validity of a data value. All quality codesthat apply to a data value shall be maintained in the database for that data value.

For the data acquired from PMUs, the PDCs shall be able to receive the time and message time quality codes as per IEEE C37.118.2011 standard.

2.11 PDC SCALABILITY

The delivered PDCs shall be completely equipped and activated with hardware and software for the integration of PMUs as per the sizing requirements mentioned. The PDC sizing details mentioned is as per the present requirement. In addition to the capacity given in the Table: 1.0, the PDCs shall be capable to accommodate an expansion requirement of 50% more. The spare capacity may also be used for integration of PMUs of different make conforming to the IEEE C37.118-2011 standard, with all necessary protocol emulations.

2.12 REDUNDANCY

The PDCs shall work in dual redundant configuration at control Center to maintain wide- area visibility and phasor data applications integrity against the sudden loss of a PDC or communications link.

2.13 PDC DATA COMMUNICATION

The PDCs shall support the following UDP/TCP operating modes for communicating withPMUs and PDCs:

- PDCs shall be capable of supporting the communications needs using both TCPand UDP protocols as per IETF RFC 793 and RFC 768.
- PDCs shall be configurable to use either TCP or UDP for its messaging communications with each PMU or PDC.
- PDCs shall be configurable to use either TCP or UDP for its data communicationswith each PMU or PDC.
- PDCs shall support using TCP for messaging and using UDP for data streaming operation mode configuration with each PMU or PDC.

2.13.1 COMMUNICATION PROTOCOLS

PDC shall support the following communication protocols.

2.13.1.1 IEEE C37.118 COMMUNICATION PROTOCOL

a) PDC shall, as a minimum fully support IEEE C37.118-2011 standard communication protocol between PDC and PMU for data receiving and messaging related communications.

b) PDC shall as a minimum fully support IEEE C37.118-2011 standard communication protocol for PDC to other PDC data receiving and messaging related communications.

c) PDC shall as a minimum support extend messaging communication protocol based on IEEE C37.118-2011 standard messaging communication protocol for additional PDC-PDC messaging related communications.

2.13.1.2 ICCP & IEC 60870-5-104

The PDC shall be able to supply synchrophasor data with quality flag in ICCP and IEC60870-5-104 format.

2.13.1.3 IPV4 AND IPV6

Presently, the PDC shall support both IPv4 and IPv6 Internet protocols simultaneously.

2.13.1.4 IP MULTICAST

The PDCs shall be capable of supporting IP multicast when using UDP/IP for streaming data communications. The PDCs shall support receiving UDP/IP multicast input data from multiple data sources. The PDCs shall support sending output data as UDP/IP multicast output data stream. The destination multicast IP address shall be user configurable.

2.14 PERFORMANCE REQUIREMENT OF PDC

2.14.1 PDC LATENCY

The latency of the data at PDC level is defined as the difference in time between the timestamp on the data and the UTC time for the point in question during the progress ofdata from a PMU through PDCs. The main points of consideration for the latency are the PMU timestamp value, the UTC time of the data arrival at the input of the PDC andthe UTC time of the data departure at an output of the PDC. The latency through the PDC depends on the operating mode of the PDC. Since a PDC output may combine data from several PMUs or other PDCs, there may be multiple data arrival times for eachoutput.

PDC latency is defined as the time interval between the receipt of the first packet of a given time stamp until the combined packet containing that packet is sent from the PDC. It will vary depending on the time difference between various packets that are receivedby the PDC. It shall be measured in two different operating modes viz., data aggregationmode (with & without time alignment) and data forwarding mode. Again in data aggregation mode, latency shall be calculated in time alignment to absolute time reference and time alignment to relative time reference.

2.14.1.1 DATA AGGREGATION WITH TIME ALIGNMENT TO ABSOLUTE TIME

For the case of data aggregation using absolute time alignment, the PDC waits a giveninterval after the time corresponding to a given sample absolute time to receive all datafor that sample time. At, the end of this interval, the data which has been received will be packaged and sent. Any data that arrives later than this timestamp time plus absolutewait time is lost for that output.

Applicable parameters are the data rate of the output, the absolute wait time, the timestamp time being aligned and the PDC processing completion time. The PDC latency start is the interval from the receipt of the first sample for that time period and the event time when it is sent with the timestamp time. The worst case PDC latency shallbe the absolute wait time, plus the PDC processing completion time. Any data that arrives later than its timestamp time plus the absolute wait time is lost for that output.

2.14.1.2 DATA AGGREGATION WITH TIME ALIGNMENT TO RELATIVE TIME

For the case of data aggregation using relative time alignment, the PDC waits a given interval of time from the receipt of the first packet corresponding to a given time interval to receive packets for that relative time interval. At the end of this interval, the data whichhas been received will be packaged and sent. Any data that arrives later than this wait time is lost for that output. The applicable parameters are the data rate of the output, thetime of arrival of the first relevant PMU data packet, the relative wait time, and the PDCprocessing completion time.

The PDC latency start event is the time of the arrival of the first relevant PMU data packet until the time when it is sent. The worst case PDC latency shall be the time of egress of the output data minus the time of the PDC latency start event for this timestamp. This latency shall be

approximately the relative wait time, plus the PDC processing completion time. Any data that arrives later than the PDC latency start eventplus the relative wait time shall be treated as lost.

2.14.1.3 DATA AGGREGATION WITHOUT TIME ALIGNMENT

For the case of data aggregation without time alignment, the PDC waits a given time interval to collect data and then sends all the data without regard to the packet time stamps. The applicable parameters are the start time of the processing window, the datarate of the output, and the PDC processing completion time. The start time of the windowshall be the time from which the PDC accepts data for the next output record. The outputperiod shall be the time during which data is accepted for the next output record.

The PDC latency start event shall be the start time of the processing window. The worst case PDC latency shall be the output period plus the PDC processing completion time. Any data that arrives at the PDC is forwarded so no data shall be considered lost at thePDC.

2.14.1.4 DATA FORWARDING

For the case of Data Forwarding, it is essentially data aggregation with no wait time. Assoon as a packet is received, it is sent on. The applicable parameters are the time of thearrival of the data packet, and the PDC Processing Completion Time. The PDC latency start event shall be the time of arrival of the PMU data packet. The worst case PDC latency shall be the time of egress of the output data minus the time of the PDC latencystart event for this timestamp. This latency shall be approximately the PDC Processing Completion Time. Any data that arrives at the PDC is forwarded so no data shall be considered as lost at the PDC.

2.14.2 PDC LATENCY REQUIREMENT

The PDC latency is determined by the data aggregation mode and the output processingtime of the PDC. For the time alignment modes, the latency is determined by the user set wait time and the output processing time. Wait time for absolute time alignment hasto be long enough to get the data as this time interval includes the PMU and communication delays. Relative time alignment can be shorter as it only includes the difference in delays from various sources. In both cases the measured PDC latency is from the receipt of the first sample of data until the entire package is sent. PDC latency for aggregation without time alignment is the same, measured from the first sample untilthe block of data is sent. PDC latency for data forwarding is essentially only the output processing delay as there is no wait time.

Bidder shall specify the average and maximum output processing times for the PDC. The maximum shall be less than **2 ms** in all conditions. The SLDC-OPTCL shall be ableto confirm this using a single input and forwarding mode or relative time alignment with 0 wait time. Bidders shall specify the communication requirement along with thecalculations such that the PDC latency for each output data stream in each PDC operation mode is less than 20 milliseconds. The maximum PDC latency shall be **40 milliseconds** including PMU latency,

Communication Network latency, intermittent PDC latency, PDC processing and PDC output. Additionally, PDC latency statistics shallbe provided, including but not limited to mean value, standard deviation, etc.

The Bidders shall also specify the operating conditions upon which reported PDC latency specification applies. The offered PDCs shall be configurable with the full number of inputs and outputs and determine PDC latency using either absolute or relative wait timing. If using absolute wait time, it shall be set just long enough to receiveall inputs. The latency time for all outputs shall be reported along with all specify the operating conditions including the wait time upon which reported PDC latency specification applies. For example, maximum number of phasors and input data streams, etc. Specification for the worst-case scenario shall be provided, assuming thatall data processing functions are in operation, and the output data stream includes data from all input data streams. For PDCs with more than one output data stream, the PDC latency requirement for each output data stream shall be different depending on the PDC operation mode. The Bidder shall specify the conditions for each output data stream for which PDC latency specification is provided.

2.15 SCADA/EMS INTEGRATION

The WAMS should be integrated with the SCADA/EMS to provide operators with real- time synchrophasor-based information as an enhancement to traditional SCADA/EMS data. It should provide integration of the WAMS data with the SCADA/EMS.

It must be possible to send data from the WAMS software to the SCADA/EMS for use in its applications.

The Bidder shall provide the following features at a minimum:

- Data exchange between WAMS and SCADA/EMS (measurements, alarms, indicators) through standard interface protocols, such as IEC 60870-5-104 and ICCP.
- Down-sampling of phasor data to lower rates in order to accommodate the SCADA/EMS required input data rate.
- The WAMS server should also be able to receive data from SCADA/EMS using protocols such as IEC 60870-5-104 and ICCP. WAMS server should be able to use this data in Measurement display, User Interface, calculations, alarms and totrigger storage of PMU data for an event.

3.0 USER INTERFACE REQUIREMENTS

3.1 GENERAL REQUIREMENTS

This part describes the User Interface requirements for the WAMS System. All user interactions shall be from Web-based Full-Graphics display.

The user interface requirements specified in this section are applicable for the user interface application of the WAMS including Historical Storage System. All the features & functions shall be available to any user, except for certain features & functions for which access is

deliberately restricted according to access control restrictions. The User Interface offered by the Bidder shall have openness, and shall enable user modifications, expansions and export possibilities.

3.2 SYSTEM USERS

The term "user" is applied to the personnel interacting with the WAMS including Historical Storage system. These users shall be required to login in one or more of following user modes, which include:

- Administrator Personnel responsible for administration and management such as assigning the access area to users, creating users etc.
- Engineer Personnel responsible for support activities such as post fault analysis,report generation, regular backup of database.
- Programmer Personnel responsible for continuing development and maintenance of the system functions, databases, displays and report formats.
- Operator Personnel responsible for operation & maintenance, supervision of real-time Power system operations of the system.

User access to all functions of system shall follow a consistent set of common user access guidelines. A single sign on mechanism for defining and controlling user access to the system shall be provided.

Password security shall be provided for access to the system, its operating system, its layered products, and other applications. Each password shall be validated against the corresponding user information in the database. Individual user shall be provided with asingle set of username & password, for secured login to access all applications. Users shall have the ability to change their own passwords.

3.3 FUNCTION AND DATA ACCESS SECURITY

After a user has successfully logged on, access to the functions, displays, reports, and database elements shall be restricted by pre-assigned operating jurisdictions. These operating area assignments shall be made when the function, display, report, or database element is defined. Any change in privileges for any user account should not require restarting of any servers.

The access security function shall compare the user's assigned operating jurisdiction against the operating jurisdictions assigned to the function, display, report, or database element each time a user attempts a console action, such as:

- Calling a display
- Viewing, editing, or printing a report
- Entering or changing display data
- Web browsing from each operator console & remote operator consoles (forserver)

Each user login and logout attempt- success or failure shall be logged in an activity log maintained on the system and also recorded as an event and posted to the event log. An alarm shall be defined after a configurable number of unsuccessful attempts to login.Each user action shall be recorded in event log and identified by username. A feature shall be available to automatically log off the user of a workstation after a predefined period of inactivity to safeguard against users who may leave workstation unattended. Administrator shall be able to define time period (e.g. one year, one month, one week, one day etc.) for which user account shall be active/valid. Administrator shall also be able to define time period (e.g. one year, one month, one week, one day etc.) for whichuser password shall be valid.

3.4 IDENTITY MANAGER

An Identity management application shall be deployed to manage and to achieve seamless access to all applications for authenticated users. Identity management system shall have following capabilities:-

- The administrator shall be able to assign the operation of certain functions, orfeatures of functions, to specific user modes.
- Each individual user shall be assignable to any one or more user modes.
- It shall be possible to assign user workstations/Remote Workstation to modes of operation.
- The functions permitted for each mode shall be defined in a table.
- User access to all functions of system shall follow a consistent set of commonuser access guidelines.
- A single sign on mechanism for defining and controlling user access to thesystem shall be provided.
- Password security shall be provided for access to the system, its operatingsystem, its layered products, and other applications.
- Each password shall be validated against the corresponding user information inthe database.
- Individual user shall be provided with a single set of username & password, forsecured login to access all applications.
- Users shall have the ability to change their own passwords.
- Shall support Role based Access and Security integration with ADS/LDAP.
- Shall have Directory service for defining the user access permission.
- Manage to identify and eliminate orphan, dormant and ghost accounts automatically.
- Able to maintain records of changes related to access rights.
- Able to maintain summary of separation of users those who are transferred, retired or leave the organization.
- An Identity management application shall be supplied and installed at the SLDC-OPTCL's facility by the contractor along with minimum **100 number of client access licenses.**

3.5 USER INTERFACE (UI) ENVIRONMENT

Displays should be based on object oriented approach and geo-graphical in nature. Any object can be used for drag & drop within an application as well as from one application to other applications (for example, dragging a value from a single line display into a trendview to see its history). All the displays shall be accessed through web (any web browser).

A common User Interface shall be provided across applications. It shall provide a common look and feel across all system functions and environments. The same user interface and displays used for real-time shall be used for historical playback. A differentbackground colour or similar mechanism shall distinguish between these modes.

It shall be possible to save user specific choice and display configuration and same shallbe made available to user whenever user logs in. UI shall allow each user to configure and save a preferred layout, size, and location of items and elements in windows and displays. The World Display Features shall provide full-graphic world displays that a user shall be capable of panning and zooming. The world display features such as Layers, De-clutter levels, Overlays shall be supported. It shall be possible to use Geo- spatial display for one of the layers for background. Geo-spatial display shall be updatedon monthly or on-demand by user.

3.6 DATA INPUTS TO USER INTERFACE

The user interface or visualization system offered shall be independent of data source inputs. The data source inputs shall be as follows.

- PDC system
- Historian
- NMS
- Analytical Applications
- Existing SCADA Data

3.7 DYNAMIC DASHBOARDS

A feature to create dynamic dashboards, simply by selecting, dragging and dropping thepoints on a dashboard template shall be provided. The dashboard shall have displays like Speedometer, Bar chart, pie chart, trend etc. Dashboards shall be definable by theend user without requiring the involvement of an administrator or programmer. The operator shall be able to create their own dashboard displays to assist in assessment ofa situation. Dashboard displays shall be created on fly, by combining subsets of differentdisplays on to a dashboard area also. For e.g. user wants to monitor particular problem in the network and will need information from a number of displays to do this. The usershall be able to select particular area in the existing displays that are of interest and dragthe selected portion onto the dashboard. The portions of the displays that are dropped onto a dashboard display continue to be updated in real time.

Dashboards once created can be saved and recalled later just as any other display in the system

and are refreshed with live data. This feature shall allow the operator to create, on the fly, a display that best suit the monitoring of a problem.

Dynamic dashboard feature shall be available for showing line/Equipment outage & tripping detail in separate window.

3.8 DISPLAY RECORDING AND PLAYBACK

An application shall be delivered to capture any display screen continuously. The recording should enabling playback in standard format such as mp4.

3.9 DISPLAY INTERACTIONS

The basic User Interface shall provide a map view of the Operating area, for both localized regions and the entire system. Intuitive navigation and drill down capability intothe measurement level and the application results shall be provided.

A graphical representation of voltages, angle and magnitude shall be provided for real time monitoring, together with any defined angle differences. It shall be possible to replay geographical representations of historic events by selecting a period of time, thenuse playback, fast forward, pause, rewind etc, or to manually find a specific time by dragging a time bar. Convenient and reliable display requests shall be provided using the following methods. It shall be possible to select display from/ by:

- A menu display
- Cursor target selection on other displays
- Selection of an alarm or event message
- Re-call command for previous display
- Selecting a point of interest (substation) from an Overview display
- Right click menu option on any display link to enable the user to open the displayin a new window or active window.
- It shall be possible to reach any display of the system with maximum 3 (three) numbers of clicks.
- The content of user display can be seen by any other User but can be deleted byonly that particular user having access rights.

3.10 DISPLAY NAVIGATION

Display navigation methods shall provide a consistent approach for moving within a display. The use of appropriate methods for Panning with cursor positioning device as well as from scroll bars, Zooming with cursor positioning device, Navigation window forrapid movement on a world display and Rubber-band zooming shall be supported.

3.11 QUALITY CODE

All displays and reports shall have a data quality indicator associated with each data field as available in the Data source. The quality indicator shall reflect the condition of the data on the display or report. When more than one condition applies to the data, thesymbol for the highest

priority condition shall be displayed. The following are the data quality codes that have been defined

Limit Exceed	Limit Violated
Questionable/In valid	When the data is not valid
Manual Entry	Values entered Manually
Not in service	Point is temporarily removed from service
Alarm Limit flags	Which Alarm limit is exceeded
Suspect data	Data is "suspect" quality by probable reason
Uninitialized	Data has not been initialized even once
Good	Data is available with "Good" quality

3.12 DISPLAY NOTE PAD/MEMO

A User shall be able to place and edit a note on any display. A symbol shall appear on the display indicating the presence of Note on that display. The content of the note shallbe callable using a cursor target. The contents of these pages shall be editable and accessible by any console. The user shall have the ability to clear any page of this display and to type over previous messages.

3.13 USER INTERACTION TECHNIQUES

The user's interaction with the WAMS system be accomplished using a menu item selection technique. The first step in the interaction will be selection of the item to be operated upon. The user shall then be provided a menu of operations applicable to the selected item. The required operation alternatives include:

- Trend.
- Data entry
- Device status entry
- Scan inhibit/enable

A set of parameters shall be presented appropriate to the item type and operation to be performed. For example, selecting a phasor value for trending shall cause a menu of parameters, such as range, Trend type and trend rate etc., to be presented.

As appropriate for the data and function requested, a menu containing output destinations such as screen, printer, or file shall be presented. When the destination is selected by the user, the requested action shall begin.

The user shall be able to end the interaction sequence at any time by selecting a cancelcommand. A programmer-adjustable time-out cancel shall also be provided.

Read & Write facilities for real time data from the WAMS system shall be available to external systems at user define rate. at 1 min, 5 min, 15 min etc..

3.14 FUNCTION KEY USAGE

In order to alleviate the operator from the repetitive task, such as calling a particular function, use of virtual keys on the monitor and function keys on the standard keyboardshall be provided.

3.15 TRENDING

Trending is a display of series of values of parameters on a time axis. Both graphical trend and tabular trends shall be supported by the system. The attributes of the trend display shall be user configurable. The user shall be able to select real-time or historicaldata for trending on graphical displays and on tabular displays. It should be possible to trend different types of parameters (Phasor Voltage, Angle, Phasor Currents, Frequency, df/dt) with associated Scales on the same display. The trending display should be user configurable in a different trend window. There shall not be any limitations on the trending of parameters in a single window. Similarly, there shall not beany limitations on the number of trend windows in a single display. The user shall be able to select a trend rate different than the sampling rate separately for each trended parameter.

Objects like small window showing trend curve or any table in a selected display should be possible. All points shall be made available for trending, by default (including calculated point).

It should be possible to highlight or locate the minimum or maximum value of each visible trend through a simple user action.

All points, System parameters such as communication and application parameters shallbe made available for trending, by default. Once the point is selected for trending, it shalldisplay previous 24 hours history, both in graphical and tabular form. Trend database and historian database must be updated parallel with database

It should be possible to plot historical trend & real time trend in single window on same axis with different colour shade for identification with legend facility. There should be no limitation of data point for trending.

3.16 GRAPHICAL TRENDING

The user shall be able to select and configure trending on Graphical displays enablinguser for entry of the following parameters:

a. Data values/ name
b. Trend header

c. Scales (unidirectional and bi-directional)
d. Zero offset
e. Trend data rate
f. Trend start time and date (historical data only)
g. Total trend duration (historical data only)
h. Reference lines or shading axes (with default to alarm limits))
i. Colour should be user configurable

There shall be automatic movement of data down or across the screen as new values are generated. When the number of real-time trend samples reaches the limit that can be displayed, the oldest value shall automatically be removed as the display is updated. The trend shall have facility of Zoom-in and zoom out the selected window of the trends. Further the trends display shall have the feature to export the selected window in the CSV file output.

The magnitude of all the trended quantities at a particular time instant shall be displayedwhen the cursor is placed on the timescale on the trend display. Further the user shall be able to scroll the viewed area forward and backward.

Shading between each trend value and user-definable axes shall be provided. Trend colour shall be changeable based on a comparison of the trend value against associatedalarm limits.

The user shall be able to print the trend on a user-selected printer without interfering with the continuing trending process.

3.17 TREND TYPE

At least following trend types shall be supported

- Two dimensional trend with Multi level axis with different scale limits
- Three dimensional trend

3.17.1 TRENDING APPLICATIONS

The trending Application shall support at least following analysis tools:-

- **Spectral Analysis** such as Fast Fourier Transform to find out the small signals in the Power system.

- **Autocorrelation analysis** for finding repeating patterns, such as the presence of a periodic signal which has been buried under noise, or identifying the missing fundamental frequency in a signal implied by its harmonic frequencies.

- **Spatial Analysis** to visualize the spatial representation of data such as Visualization of geographically spread Voltage like Contour

- **Prediction analysis** to predict the next events

3.17.2 TABULAR TRENDING

Tabular trending shall be a listing of the time-sequential values of parameters. The tabular trend shall present the data in a tabular form with one column for Date/time and additional columns for each of the trended parameter. It shall be possible to scroll up and down to see the rows. The sampling rate shall be individually definable for each tabular trend.

The user shall be able to print the trend on a user-selected printer without interfering with the continuing trending process, Trend & tabular trending will generate simultaneously.

3.18 ALARMS

Alarms are conditions that require user attention. All alarms shall be presented to the user in a consistent manner. Alarm conditions shall include, but not be limited to, the following:

(a) Telemetered or calculated value limit violations
(b) Values returning to normal from a limit violation state event.
(c) Communication link failures.
(d) System hardware or software failures.(e)
User Configurable logics

Each alarm shall be subjected to a series of alarm processing functions. Alarm conditions shall be assigned to one or multiple alarm category and alarm priority levels.The results of the alarm processing shall determine the console(s) that will receive and be authorized to respond to the alarm and the associated actions with the alarm.

All alarm messages shall be recorded and archived in chronological order. It shall be possible to sort, display and print user selected alarm messages from any console by the user. There should be provision to automatically generate and sent email and sms to the configured operator for user defined alarm as well as selected alarm.

3.19 ALARM CATEGORIES

An alarm category provides the logical interface that connects an alarm condition to a specific Area of Responsibility (AOR) as defined and accordingly alarm shall be reported to user. Every alarm shall be assignable to a category. Each category shall, in turn, be assignable to one or more consoles. A means shall be provided for changing operating shifts without reassignment of alarm categories at a console. Console failure shall result in automatic reassignment of alarms to other consoles in a pre-defined manner and shall generate an alarm. Each log-on and log-off shall be reported as an event.

3.20 ALARM PRIORITY LEVELS

Each alarm shall be assigned to an alarm priority level. At least 10 alarms priority levelsshall be supported. Each alarm priority level shall be presented in separate display. For each alarm, it shall be possible for the programmer to independently configure the following actions:

- Audible alarm tone type selection and its enabling/disabling. The silencing of audible alarms shall be recorded as event.
- Alarm messages to be displayed on an alarm summary
- Alarm message deleted from alarm summary when acknowledged
- Alarm message deleted from alarm summary when return-to-normal alarmoccurs
- Alarm message deleted from alarm summary when return-to-normal alarm is acknowledged
- Alarm message deleted by user action.

Every Alarm shall be accompanied by an Audible tone which shall be user configurablealso in real time for some particular events also, like:

- Frequency drop.
- DF/DT limit crossed
- Overloading of some important 400kV/220KV lines.
- Generation tripping of important stations (individual and total).
- And as per the operator's requirement.

A dedicated display shall be provided for selection of Audible Tone in separate category of Alarms. The automatic generation and sending of an E-mail or SMS containing operator selected Alarm or user-defined data shall also be possible.

This assignment shall determine how the alarm will be presented, acknowledged, deleted, and recorded. All acknowledged Alarms shall be reported as an event along with the identification of user and/or the workstation.

3.21 ADVANCED ALARM FILTERING & EVALUATION TOOL

Additional standard products for advanced alarm management shall be provided. Minimum features of the alarm management function, as available in the standard product shall be supplied which may include:

Minimization of nuisance alarm messages (e.g., repetitive alarms for the same alarm condition)

- Highlighting of the most urgent messages
- Display of Alarms Substation wise
- Sort, filter of alarms by users by node, element, type, date & time.

3.22 USER INTERACTION FOR ALARMS

The User shall be able to perform the alarm interactions described below:

- Alarm Inhibit/Enable
- Alarm Acknowledgment
- Change Alarm Limits
- Annotate an alarm by adding a comment
- Attach a note or document to an alarm
- Copy / Paste Alarms into an spreadsheet for offline analysis

3.23 ALARM PRESENTATION

Alarm presentation shall be determined by the alarm's category and priority. Displays shall highlight every alarm condition using a combination of colour, intensity, inverse video, and blinking. In addition to display, audio annunciation for user selected categories alarms shall also be provided. The alarm condition highlighting shall show whether the alarm has been acknowledged. The highlighted alarm condition shall appear on all displays containing that device or value at all consoles regardless of the alarm's category.

Alarm messages shall be a single line of text describing the alarm that has occurred andthe time of occurrence. The alarm message shall not require the use of a reference document for interpretation.

The user shall be able to change the alarm limits, inhibit/ enable alarms and acknowledge alarms. All actions (except acknowledgments) shall be logged as events.

3.24 ALARM WINDOW

Each screen shall include a scalable window containing symbols for substations, generating stations and others. These symbols shall blink when an alarm condition is detected for a device or value associated with the symbol. Blinking shall cease and the symbol shall be highlighted when all alarms associated with the symbol are acknowledged. The symbol shall return to its normal presentation when the last alarm associated with the symbol is deleted. Cursor selection of the symbol in alarm shall result in the presentation of a display associated with the symbol.

A special alarm window shall be provided, in which the most recent alarm messages shall be displayed. All summary alarm views shall support ad-hoc sorting. Clicking on acolumn header in the alarm view (time, station, priority, etc.) shall sort the alarms by thatcolumn.

All summary alarm views shall support ad-hoc filtering in which a user can specify filtering criteria in order to easily locate specific types of alarms. Examples include, but are not limited to:

- Specific Time/Date ranges
- Alarms exceeding a particular severity
- Alarm messages containing particular device names
- Alarm messages containing user annotations

It shall be possible to save any number of filtered alarm views for easy retrieval in the future.

3.25 EVENTS

Events are conditions or actions that shall be recorded by the WAMS but do not require user action. Events shall be generated under the following conditions

(a) User initiated actions
(b) Conditions detected by application functions that do not require immediate user notification, but should be recorded.
(C) Values returning to normal from a limit violation state event.

Events shall be recorded in the form of an event message. The event message format shall be similar to the alarm message format. Event messages shall be displayed on anevents summary. Event messages shall be archived in chronological order. It shall be possible to sort, display, filter and print event messages from any console.

3.26 HARDCOPY PRINTOUT

The system shall have features to produce a print out of a display, reports, trends, alarms, events etc. from a menu. It shall be possible to take print with various options
e.g. Print the viewport, Print the complete display adjusting to a specified page size,Print a selected portion of a display or screen.

The displays shall be printed with white background by default. The borders of the viewport, rulers, file tab shall not be visible in the printout of any display unless specifically chosen. Multiple page displays shall have page numbers like Page X of Y.

Also, the options for printing shall include at least choice for orientation, background colour, page size, colour/ black & white and print preview.

All hardcopy printout shall include the following additional information apart from the display print out:

a) Date and time of the print out
b) Name of the user who has given the print out command
c) Identification of the console from where print out was generated
d) Name/ Identification of the display

Snapshot of any display full and part thereof if required should be printable in a fit to page format. The printout of the display, reports etc. should also be made available in pdf format along with corresponding licensed software.

3.27 DYNAMIC DATA PRESENTATION

It shall be possible to present any item in the database on any display. All data control capabilities shall be supported from any window of a world display. Device status or datavalues shall be displayable anywhere on the screen, excluding dedicated screen areas such as the display heading.

All fonts supported by the operating system delivered shall be supported by WAMS. Standard X-Window system fonts shall be provided with the WAMS. Hindi fonts (true type fonts) shall also be supported. All fonts shall be supported on the user interface devices and all printers supplied with the system. The types of fonts to be used in a particular display shall be selected at display definition time. It shall be possible to change font colour & size on any display. There shall not be any limitation on the colourand size used for the fonts.

Status and data values shall be presented in the following formats as appropriate:

- Numerical text that presents analog values, sign and flow direction arrows.
- Normally the MW-MVAR values along with the sign and direction shall be displayed on the Single line diagram (SLD). Bus Voltage & Frequency shall also be displayed on SLD & Network diagram.
- Symbols, including alphanumeric text strings for an item, based upon state changes e.g., circuit breaker (OPEN/CLOSE/ INVALID).
- Symbols, including alphanumeric text strings for indicating the data quality flags.
- Colours, textures, and blink conditions based upon state or value changes or achange of data quality, e.g., alarm limits.
- Display of static as well as dynamic fields at any desired angles should be possible.- e.g. Static Text of “MW” flow of a line aligned with the line on the world display.

The Monitoring function shall provide the following capabilities:

- Topological overview display of phasor data and oscillation application data, withuser defined background image
- Multi-tier hierarchy of views - Complete system, Regional and Substation view ofphasor data and oscillation application data
- Drill down from high level display to lower level detail (e.g. Regional toSubstation)
- Flexible phasor groupings to support uncluttered overview displays
- Ability to define Alarms on monitored data
- Ability to save and restore alarm configuration settings
- Ability to view, sort and filter event logs for alarm and systems events

3.28 LOGGING

The PDC shall provide automatic logging of events & alarms. The purpose of these logsis both to support the users of the PDC in their day to day activities, and also to supporttroubleshooting activities in the event of problems. All PDCs events shall be logged in aglobal log, as follows:

- Each log entry shall be time stamped
- Each log entry shall contain details including the applicable thresholds violated
- The user shall be able to filter and sort the alarm log on specific criteria, e.g.: Category of alarm (frequency deviation, angle difference, etc.),Classification by level of alarm (normal, alert, alarm), Location of alarms in the power system ,Type of signal(s) producing alarm
- Log should be generated for each system failure or equipment failure or service fail in systems

3.29 ELEMENT HIGHLIGHTING

Element highlighting techniques shall be provided to draw the attention of Operator to critical state of the system. The highlighting technique such as, change of colour, size, colour intensity, blinking, Character inversion, Line texture, appended symbols etc shall be supported. This feature shall be used to highlight alarms, power system device and measurement status, data quality, data entry locations on a display and error conditions.

3.30 DISPLAY TYPES

The following subsections describes the type of displays that are to be included in the system.

3.30.1 WAMS SYSTEM DISPLAY

A display shall have lists all WAMS system directory displays. The displays shall be listed in alphabetical order with suitable separation in the list to enhance readability. Each entry in the list shall have a cursor target for display selection. A search facility filtering should be provided. The display should have provision of listing/sorting of datain real time for a particular type of equipment for example – lines under outage, low/high voltage buses, overloading lines

etc. The displays shall have retrieval with maximum 3 clicks, layered architecture with full control of individual layer, 3D movement. Display features such as Auto-fit to screen shall be provided. Mash up interface with Google Earth shall also be considered for all types of displays like weather data superimposed on a geographical display. Features to find/search stations in the geographical display shall be possible

3.30.2 SUB STATION SLD DISPLAYS

SLD displays shall be provided for the monitored substations. Each display shall present synchrophasor, manually entered, and calculated power system data on a Single line diagram that shows substation layout in terms of its buses, switches, lines, andtransformers. The feeder names in the SLD shall have linkage with remote substation end SLD associated with that feeder. It shall be possible to move to remote-end substations SLD by selecting this feeder. The user shall be able to perform any user interaction defined by the Specification on these displays.

3.30.3 SUB STATION TABULAR DISPLAYS

Tabular displays shall be provided for each substation. These displays shall list the real-time values of synchrophasor data, manually entered, and calculated data associated with the substation as well as related information such as alarm limits. The user shall beable to perform any user interaction defined by the Specification on these displays. Display max/min/avg. of four pre-defined period i.e. 5min/15min/30min/60min/6hr/12hr/24hr data with timestamp.

3.30.4 VISUALIZATION DISPLAYS/ALARM GENERATION

The user interface application software is required to visualize & analyse the online andstored phasor data. User interface shall be provided for the configuration, monitoring and analysis of multiple synchronized phasor data on single and multiple displays. PDC real time data and displays shall be displayed on the consoles using internet browsers such as Internet explorer, fire fox etc.

3.30.5 REAL TIME DISPLAY

The Visualization Software should directly communicate with the PDC to display the data in real time. Provision to display Phasor magnitude, angle, frequency, df/dt, MW, MVAR should be provided. The time window (in the order of hours) of the real time display should be configurable along with the provision to visualize multiple displays with resolution of millisecond.

3.30.6 ARCHIVED/STORED DATA DISPLAY

The Visualization Software should be able to access and display the archived data. Provision to display Phasor magnitude, angle, frequency, df/dt, MW, MVAR shall be provided. The window of the real time display should be configurable along with the provision to visualize multiple displays. To visualize the data over a period of amonth/year, provision to average the data should be available.

It shall be possible for a user to define, modify and verify alarm conditions on-line. It shall be possible to trigger alarms & trigger storage of data on the following:

- Deviation of frequency from nominal
- Rate-of-change of frequency exceeding a set value
- Voltage magnitude outside upper or lower boundaries
- Active or reactive power exceeding limits
- Voltage angle difference between selected points exceeding limits

For each quantity triggering alarms, it shall be possible to define three states such as Normal, Alert and Alarm state. Alarm should be inhibited on detection of an invalid signal from a PMU, such as out of range voltage or frequency. Alarm displays shall have the identification of the source (station/PMU etc) where alarm is raised, type of violation and recent history of alarms.

All the events shall be logged in global alarm log so that each log entry is time stamped and shall contain the details of defining applicable threshold. The user shall be able to filter and sort out the alarm log on specific criterion such as category of alarm: freq, angle deviation, by level of alarm: normal, alert, location, time etc.

Visualization displays shall be provided to rapidly detect abnormal direction of power flow or sudden change in power across the line. Bidder is required to supply UI tool and create displays for use by SLDC OPTCL operator. Display should be user configurable by using various symbols etc.

3.30.7 SYSTEM DISPLAY

The basic User Interface shall provide a map view of the total system area, for both localized regions and the entire system. Intuitive navigation and drill down capability into the measurement level and the application results shall be provided. This shall have multi-tier hierarchy of views such as complete system, Regional and Substation view of phasor data and oscillation application data and Drill down from high level display to lower level detail (e.g. Regional to Substation).

3.30.8 POWER SYSTEM NETWORK DISPLAY

A Graphic overview of power system network display of the lines, feeders, network elements color coded by voltage shall be provided. This display shall present the transmission system in a graphic format. Telemetered and calculated data like Real and reactive power flows shall be displayed as a value with a direction arrow. Lines that have exceeded their loading limits shall be highlighted. Substations and power stations shall be depicted by symbols that reflect the presence of alarms at that substation or power station. Cursor selection of a substation/ power station symbol shall result in the associated Single line diagram display for that substation/ power station. Further a graphic overview of overall power system network display indicating the important feeders/network elements shall also be provided. This shall include topological

overviewdisplay of phasor data and oscillation application data, with user defined background image.

3.30.9 INTERCHANGE DISPLAY

The interchange display shall be provided as a schematic diagram showing power transfers between various area/ utilities/ entities. This diagram shall show each power system as a block with net interchange values outside/ inside the block, the angular difference between two blocks .Symbolic arrows shall indicate power flow directions aswell as angular difference.

3.30.10 ALARM SUMMARY DISPLAYS

Display that list or summarize all unacknowledged and acknowledged alarms shall be provided. The summary shall separate acknowledged and unacknowledged alarms. Capacity shall be provided for at least 12000 alarm messages for each alarm summary type/priority level. If an alarm summary display becomes full, the oldest messages shall be automatically moved to System Message log and the newest messages shall be added. It shall be possible to perform any alarm interaction from this display.

3.30.11 EVENT SUMMARY DISPLAYS

Event Summary displays shall list the most recent events and shall be organized by category for those categories assigned to a given console, as one summary display forall categories assigned to a console, or by all conditions system-wide without referenceto the categories assigned to a console, as selected by the user. The user shall be able to select between viewing events in chronological or reverse chronological order.

3.30.12 ALARM INHIBIT SUMMARY

This display shall list devices and data values for which the user has suspended alarm processing.

3.30.13 GRAPHICAL TRENDING SUMMARY DISPLAYS

The summary display shall list all items being trended. The list shall include the item name, trace number or color, trend orientation, and trend range.

3.30.14 TABULAR TRENDING SUMMARY DISPLAYS

The summary display shall list all items being recorded for tabular trends. The list shallinclude the item name and the file name.

3.30.15 LOG SHEET SUMMARY DISPLAYS

The summary display shall provide a list of the log sheets recorded during a 8 hour shift, day,

week and month as desired by the user. Further it shall be possible to list the log sheet by username, date, time, serial no.

3.30.16 NOTE PAD SUMMARY DISPLAYS

This display shall list all the notes attached with displays.

3.30.17 CONTROL CENTER SYSTEM ARCHITECTURE DISPLAY/SITE OVERVIEW

This display shall show status of the server/control center equipment being in online/fail mode. The display shall also indicate the healthiness/activeness of server/historian/router/switch all equipment used in architecture. Failure of main or standby equipment/ links shall be suitably display.

Additionally the status of all servers, router, switches, etc. shall be available through single command line.

3.31 CONTOUR DISPLAYS

It shall be used for showing large amounts of spatial data e.g. Bus voltage magnitudes, percent loading of lines and flow gate values. Displays shall be with facility of appearance of visual alarm of underlying layers and background color for gradient before alarm.

Contour of following analog shall also be available -

Line Flow contour, Overloaded Lines contour, Temperature contour, Generation contour, Load contour, etc. Contour of Bus summation should also be available so as to help in getting the mismatches in the data.

Geo-spatial display with contour map of Data within geographical boundary of Odisha shall be provided in which Zoom-in, Zoom-out, panning option shall be available in the map. Display Builder shall be capable of importing point and placing a pre-defined picture/symbol as per the Latitude and Longitude specified by the user. The “Playback” option shall be made available in the map so that the continuous pattern over the period of time shall be visualized. The pattern shall be exported in a video format so as to use it in offline mode.

3.32 LOG SHEETS DISPLAYS

This display shall facilitate operator to enter messages related to operation of power system. Each message shall have separate log sheets. These log sheets display shall contain serial no., date and time, User name, Message text and message code (if any). When a user requests for a new message entry in log sheet, the system shall open a new log sheet display with a continued serial no., date and time, User name and space for entering text (up to 5 pages) and code. On completion of the message entry, the system shall prompt for saving the log sheet in the log book

or for editing of the message. Once the message is saved in the logbook, the editing of the message shall be prohibited.

These log sheets shall be stored in the form of log book which shall be closed on monthlybasis. Closed Log books shall be stored in Historical Storage system as mass storage.

3.33 COMMUNICATION NETWORK DISPLAY

This display shall show status of the communication links being used for data exchange with PMUs/PDCs. The display shall also indicate the healthiness of standby communication links. Failure of main or standby communication links shall be suitably alarmed. Active channel should be differentiated from other channels.

3.34 COMPUTER SYSTEM CONFIGURATION AND MONITORING DISPLAYS

Graphic and tabular displays shall allow the user to:

- Monitor and revise the configuration of the computer system
- Monitor the system's resource utilization statistics

3.35 VOLTAGE PROFILE DISPLAY

Voltage profile displays shall be provided to present different voltage levels on a geographical display in form of contours as well as in three dimensional view. Further, the areas with various voltage levels shall be shown with different colors.

3.36 HELP DISPLAYS

Help displays shall be provided to aid the user in interpreting displayed information andto guide the user through a data entry or control procedure. Help displays shall be provided for each display that is provided with the system. Each display shall have a prominent cursor target that the user can select to request the associated help display. For standard displays, software aids (such as context sensitivity) shall be used to present pertinent help information in an expeditious manner. A programmer shall be allowed to modify and create help displays.

There shall be provision of view of user manual in form of PDF or other mode file at each application & user manual shall contain all information of application operation guidelines for operator use. Help will available of all section of systems likes data basedevelopment, etc.

3.37 HISTORIAN DATA DISPLAY

The graphical user interface shall be provided. The User interface shall facilitate contextual organization of information for decisions making. The GUI shall create and display real-time and historical data, including customizable equipment schematics and trends, for faster evaluation by users. Historian display shall be different from other displays and shall have user

friendly features such as tabs or icons for events, major disturbances, outages etc. for quick report generation for a defined time period. Recently and frequently used fields for report generation and configuration shall be stored as “favorite” reports. The display shall have drop down menus for:
Data Elements (I, V, F, DF/DT, MW, MVAR, Min, Average, Max, etc.) and calendar viewfor selection of Year, Month, week, date and time.

The UI of Historian shall have following feature:

- Drawing tools
- Ability to incorporate trends
- Easy to zoom-in/zoom-out capability.
- Reports shall be configurable for different time/region/substation ranges bysimply changing the report time/region/substation.
- Ability for report to carry some manual entry.
- Excel based add-in Reports.
- The UI should have interface with MS tool and XML.
- End-users tool to build, modify and manage displays SLD (Single-Line-Diagrams) and multiple build-in analytics from amongst graphs, bar-charts (horizontal or vertical), XY plots (can be rotated in any direction), pie-charts, scatter plot, surface graph, contour plot, gauge chart, line graph, box-plot, heat map , Correlation Matrix, Density Plot, histograms, 3-D plots, multi-state symbols, layers, etc
- The UI of Historian system shall have the capability for the data points to be presented in various formats .These shall include trends i.e. time series data, Tabular & Graphic and Static reports.

On the display, Provision for selection of format shall be made available (option for word,Excel, PDF) with Export button. On the top of the display types of reports should be displayed, e.g. daily report, Monthly Report etc.

3.37.1 REPORTS

A Business Tool shall be provided with user friendly configurable with drag and Drop query builder, report builder and trend builder facility. Reports can be generated on userdemand, on a preset timed interval, or be driven by specific events. The Bidder shall berequired to generate the Daily, Weekly, Monthly & Annual reports formats for predefinedpoints on defined scan rates. The output of the report shall also be available in csv, xml& MS office tools etc. The user shall be able to schedule periodic generation of reports, direct report to display, print report, and archive report using report scheduling display.The report scheduling display shall enable entry of the following parameters, with defaultvalues provided where appropriate:

Report name
Time (User Configurable) the system should produce the report.

The user shall be able to examine and modify the contents of reports for the current period and for previous report periods using displays.

3.38 INTEGRATION WITH ELECTRONIC DOCUMENTS

Information related to power system equipment often resides in standard format electronic documents (PDF, DOC, XLS, JPG, etc.). In order to minimize the time for users to locate this related information when needed, the user interface shall provide a mechanism for accessing electronic documents related to any device on a display. This shall be through right-click menu option or similar.

Examples of Electronic Documents that should be available in this fashion include:

- Digital Images
- Equipment Manufacturer documentation (PDF or HTML)
- Maintenance and other Historical Reports

3.39 SIGN CONVENTIONS

The following sign conventions for the display, data entry and reporting of active and reactive power flow shall be used universally by all WAMS functions:

Equipment	Flow Convention
Bus	Real power into Bus: Negative Reactive power : same as real power
Generator Transformer (telemetered at HV side)	Real power low to high side: Negative Reactive power: same as real power
Substation/Transformer (Measurement on HV side)	Real power high to low side: Positive Reactive power: same as real power
Substation Transformer (Measurement on LV side)	Real power high to low side: Negative Reactive power: same as real power
Generator	Reactive power out of generator: Positive
Loads	Real power into load : Positive Reactive power into equipment: Positive

3.40 CALCULATED DATA PROCESSING

WAMS system shall be capable of performing the following calculations at the indicated rates and storing the result in the database as calculated data available for display. The database variables to be used for arguments and the mathematical, statistical and logical functions to be used as operations shall be definable interactively at a workstation by dispatcher as well as by the programmer using database creation and maintenance procedures. Suitable API shall also be provided to define real time calculations. The Bidder has to ensure the working of API.

Calculated analog values shall use database points as the arguments and combined mathematical, logical and statistical functions. Functions such as addition, subtraction, multiplication, division, maximum value, minimum value, average value, count, square root, exponentiation, trigonometric functions, logarithms and other statistical functions, logical &

comparative operators such as AND, OR, exclusive OR, NOT, Less Than, Greater Than, Less Than or Equal To, Greater Than or Equal To, and Equal To etc. shall be provided.

Calculated status values shall use database points as arguments and combinational logical functions as operators that include the logical & comparative operators AND, inclusive OR, exclusive OR, NOT, Less Than, Greater Than, Less Than or Equal To, Greater Than or Equal To, and Equal To.

Suitable rules or operators (such as multi-level parentheses) shall be provided to indicate the sequence of operations in the calculation.

Calculation shall not be stopped due to single garbage value, it shall not be considered in calculation and generate output with proper alarms/flag. A separate list of all garbage/unutilized analog points shall be made available in separate display.

3.41 COMMON WAMS VISUALIZATION

The WAMS related information should be monitored on a unified user interface including:

- WAMS Overview Status Indicators.
- PMU data and application results in a geospatial display overlaid with the powersystem network model, showing substations, lines, and other assets and measurements on these assets such as,
    - Voltage Magnitude and Angle
    - Current Magnitude and Angle
    - Frequency and df/dt
    - Angle Differences
    - MW and MVAR line and corridor flows
- High speed trends of PMU data on 1 second time scale window of each measured& calculated data.
- WAMS based alert/alarm violations at specific substations/lines on the geo-spatial display
- Voltage and Frequency Contours
- Substation wise phasor data trend on 1 second window in real time.

The core components of the system monitoring, and situational awareness must be:

- Synchrophasor measurements must be shown within geographic display, whichinclude voltage magnitude and angle, current magnitude and angle, angle differences, MW and MVAR line and interface flows, frequency, delta frequency,and df/dt, which will refresh every one second.

- The contextual information associated with WAMS data applications must be provided; including overview status indicators that provide an alarm status view, phase angle information.

- Tabular list of information associated with WAMS data must be provided. Thismay include:
    - Measurement Nodes (showing WAMS data associated with stations suchas voltage magnitude and angles, frequency, df/dt etc.).
    - Lines (showing information associated with lines such as currentmagnitude and angles, MW and MVAR line flows),
    - Interface (where Interface MW and MVAR flows are shown), ViolationsTab (containing Alerts and Alarms),
    - User-defined Custom Lists

- A dynamic dashboard feature, where the end-user can create a dashboard.
- High speed sub-second (PMU sampling rate) trend plots that refresh at everysample must be provided.

The types of parameters that should be trended on these graphical displays or Time derivative display should include positive sequence voltage magnitude and angle, positive sequence current magnitude and angle, angle differences, MW and MVAR flows, frequency, and df/dt. The trending capability must support multi-level axis and different time scales.

3.42 OFFLINE TOOLS

The Bidder must offer a tool which enables the usage of historical phasor data (e.g. viafiles in COMTRADE format and directly interfacing with the WAMS historian), and simulation data to perform various analyses.

The Supplier must offer a tool that has the following features:

- **Multiple data sources:** access archived synchrophasor data, simulated data, anddynamic modal estimates obtained from the WAMS.
- **Time Domain Analysis:** chart various kinds of data (phasor, transient simulation and disturbance recorder) on a common time reference, for easy comparison.
- **Frequency Domain Analysis:** ability to obtain frequency domain information suchas power spectra, cross spectra, and coherency estimates on phasor or simulated data.
- Event Analysis (Frequency Response), Fault ride-through, Ring down analysis, Model Validation.
- **Custom Calculations:** supports user-defined custom calculations based on historical synchrophasor data.
- **Custom Plots:** allows users to define their own charts to create their own customviews.

3.43 REDUNDANT DATA SOURCE PROCESSING IN UI

Some data in the WAMS database may be obtained from more than one source. Typically, the "best available" source of the data shall be chosen for use in displays, reports, and other functions. This feature of choosing the best available source is "redundant data source processing" function. The data may be real time PMU data or SCADA data or the values from the indirect PMU from other control center. WAMS UI system shall support processing of same data from minimum two (2) number of sources for a point i.e a PMU point will have multiple sources of data and if one source fails it shall automatically switch to other source (e.g. redundant field data source, existing SCADA data, Calculation output, Application output etc.) in the order of priority (e.g. priority 1 to PMU data source, Priority 2 to SCADA data, or Calculation output, etc.) as defined by user during database modelling until good quality data is received. When anyalternate source is used in place of Primary/Main source then all the display will show a quality code indicating the source of data as alternative source. The resultant best valueshall be stored in the WAMS database with Quality Code.

3.44 DESIGN PARAMETER FOR USER INTERFACE FUNCTIONS

NAME	DESIGN CAPACITY
Function and Data Access Security Operating jurisdictions	16
TREND (Online) in PDC	
a) Trend	For each data points as received by the PDC.
b) Variables per trend Viewport/Window	16
c) No of trend view ports	20
d) Configurable Sampling rate	user defined by 50 sample per seconds
ALARMS	
Alarm priority levels	16
Alarm Message Recording on auxiliary memory	1,00,000
EVENTS	1,00,000
Event Message Recording on Auxiliary memory – events	
Trend database	No limitation in adding points & user configurable

4.0 HARDWARE REQUIREMENTS

4.1 GENERAL

This section describes the technical requirements of all the hardware envisaged in the **BOQ** for the WAMS system**. The minimum hardware specifications (RAM, Aux. Memory, interfaces etc.) for all equipment are specified in GTP in APPENDIX: I, PART: B and the bidder has to submit the details of the supplied hardware along with the bid as per format.** The Bidder shall assess the adequacy of hardware specified in the **BOQ** & if any additional hardware or higher end hardware configurationsare required to meet all the requirements of the technical specifications, the same shallbe included in the offer. The Bidder's proposal shall include necessary calculations to clearly establish that the proposed hardware meets the functional and performance requirements of the technical specification.

The bidders are encouraged to optimize the requirement of hardware for servers and processors where one or more applications can be combined or distributed in any combination with adequate redundancy. However, Historian applications, Analytics, andPDC are to be hosted on separate/independent hardware.

4.2 TECHNICAL REQUIREMENTS FOR HARDWARE

All hardware shall be manufactured, fabricated, assembled and finished with workmanship of the highest production quality and shall conform to all applicable quality control standards of the original manufacturer and the Bidder. All hardware components shall be new and suitable for the purposes specified. All hardware shall be of reputed make.

All hardware shall include self-diagnostic features. On restoration of power after interruption they shall resume operation. All servers, workstations and network equipment's (Switches, routers, firewall etc.) shall be compatible for remote monitoringusing secure SNMP Ver. 3.0. All hardware shall support both IPv6 and IPv4 simultaneously.

The bidder shall ensure that at the time of final approval of hardware configuration and **BOQ,** all the hardware is as per the current industry standard models and that the equipment manufacturer has not established a date for termination of its production. Anyhardware changes, except version upgrade in same series, proposed after contract agreement shall be subject to the following:-

- Such changes/updates shall be proposed and approval obtained from SLDCOPTCL along with the approval of Drawings/documents.
- The proposed equipment shall be equivalent or with better features than theequipment included in the Contract.
- Complete justification along with a comparative statement showing the original and the proposed hardware features/parameters including brochures shall besubmitted to the SLDC OPTCL for review and approval.
- Changes/updates proposed will be at no additional cost to SLDC-OPTCL.
- The porting of software shall be at no additional cost in case of replacement ofhardware during

the AMC period by Owner in consultation with contractor.

4.3 HARDWARE CONFIGURATION

In this technical specification all hardware has been broadly classified as “Server” and “Peripheral device”. The term “server” (also referred as “processor”) is defined as any general-purpose computing facility used for hosting application functions as defined in the specification. The servers typically serve as the source of data, displays and reports. The term “Peripheral Device” is used for all equipment other than servers. Peripheral device includes Workstation consoles, WAN router, LAN, printer, Time & Frequency system, etc.

All Servers and peripheral devices shall be connected on a dual optical fiber LAN. The redundant hardware such as Servers, Firewall, and LAN etc. shall work in hot standby manner. All the servers and networking equipment (Firewalls, LAN equipment etc.) shall be mounted in rack panel. Grouping of Network equipment in a rack shall be suchthat the primary and backup network equipment or a system function are located in different racks. The Typical hardware specification/configuration is attached in Guaranteed technical specification is as per **APPENDIX: I, PART: B**

4.4 SERVERS

The Servers shall have provision for expansion of the auxiliary memory and Main memory (RAM) by 100% of the delivered capacity. This expandability shall be possible at site with addition of plug in modules only. Initially USB ports of all work stations shall be disabled.

Servers shall be mounted in a rack (panel) and a single rack mountable TFT monitor, keyboard and mouse using an IP based KVM switch to access all servers & peripheralsin the panel. Further, a server management console shall be installed to access all servers centrally. Each KVM switch shall have minimum 16 ports. However the grouping of servers in a rack shall be such that the primary and backup servers for a system function are located in different racks.

All servers shall have dual redundant power supplies, capable to operate on single power supply module and there shall not be any interruptions in the operation of servers when there is a failover between the two AC Power Supply of the server.

The WAMS system (PDCs, Historian, NMS etc.) sizing in respect of databases, No. of Phasors, no. of PMUs, communication interface etc. shall be done to accommodate expansion by 50% i.e. equal to 150% of the present system sizes as specified. The auxiliary memory utilization of any of the Servers shall not exceed 50% of its delivered capacity.

4.4.1 APPLICATION SERVERS (PDC, HISTORIAN, ANALYTICS, IDENTITY, NMS SERVERS)

The minimum hardware configuration of the Application Servers PDC/visualization application

server shall be:

- 64 GB main memory expandable up to 128 GB
- 1 TB Hot pluggable, Expandable up to 2 TB HDD configured as RAID5
- Blu-Ray RW drive
- Dual FO ports for connecting the server in fiber LAN
- In addition to Ethernet port
- Dual AC power Supply
- Hardware shall be rack mounted

4.5 REMOTE CONSOLES

The Remote console with client software provided at as per BOQ. All remote consoles shall be equipped with software, applications, user license and database for user displays, data Analysis. The minimum hardware configuration of remote console shall be as Workstation consoles hardware.

4.6 NETWORKING EQUIPMENT

4.6.1 FIREWALL

Firewalls shall be provided as per BOQ. It is required that both side firewalls (Internal and External) are supplied from two different manufacturers. All firewalls shall be hardware box firewall as per the requirements.

4.6.2 ROUTERS

Routers shall be capable for data exchange between Control Centres, Remote Console, PDC & PMU over various communication media such as copper cable, PSTN /leased line, fiber optic cable, VSAT etc. Routers shall have the built-in firewall features as required.

4.6.3 LOCAL AREA NETWORK (LAN) AND DEVICE INTERFACES

Servers and peripheral devices shall be connected on an Optical Fiber Local Area Network (LAN). **Fiber Optical Dual LAN is proposed for the System at Control Centres.**

4.6.4 WORKSTATION CONSOLES

Workstation console shall consist of a workstation driving Touch-screen Monitors (Dual as per BOQ), a single wireless keyboard and a wireless mouse. The user shall be able to switch the keyboard and mouse, as a unit, among both the monitors at a console seamlessly.

- 32 GB RAM,
- 500 GB Internal Memory
- DVD R+W Drive
- USB powered external speaker
- Interface to display connect 2 touch screen monitor
- 4-front, 6-Real USB port
- Fiber/Ethernet dual port
- Desktop Mounting

Workstation consoles shall be used by the dispatchers for control, monitoring and operation of power system. All workstation consoles shall support full-graphics displays.

Each workstation in the Control room shall be provided with two speakers for alarming. In addition to the speakers, the Bidder shall provide all other interface hardware, such as cables and connectors as required.

4.7 STORAGE DEVICES

4.7.1 STORAGE AREA NETWORK (SAN)

A SAN (Storage Area Network) based storage shall be provided which shall be sized adequately and be used for online storage and all online data backup. SAN shall be connected to all servers through dedicated Optical Fiber Port. The SAN shall facilitate SLDC OPTCL's Application data storage also.

SLDC-OPTCL is propose storage capacity of **150 TB** but the sizing of the same shall be suitably sized by the bidder to meet the specification requirements & bidder shall proposed actual size requirement in bid. There shall not be any single point failure i.e. there shall be zero down time with single element failure. SAN shall be configured in High Availability (redundant) configuration. In case one SAN failed and after some time it made operational then it shall be synchronized with the available SAN automatically without any manual intervention, even if new SAN machine was installed for failed machine.

4.7.2 NETWORK AREA STORAGE (NAS)

A NAS shall be provided for storing image backup of all servers and workstation along with user data and shall be connected across the firewall. It should be possible to restore or recover any software/system at a selected time from backup.

4.8 GPS BASED TIME FACILITY

The WAMS server must have the facility to be time synchronised via a GPS, to determine Universal Coordinated Time (UTC) source, GPS based Time Facility shall beprovided for Control

Centre computer system. The time receiver shall include an offset to permit correction to local time.

The time receiver shall detect the loss of signal from the UTC source. A loss-of-signal shall be sent to the computer systems and used as a telemetry failure indication and result in an alarm in the PDC system. The technical specification of GPS shall be same as given for GPS of PMU in SECTION: I, PART: B GPS shall provide time sync to all WAMS applications

All required interface in this regard shall be included in the scope of supply.

4.9 INDUSTRIAL GRADE LAPTOP

The minimum hardware along with software license of the laptop shall be:

- 8 GB RAM, Intel i7 processor
- 500 GB HDD
- DVD Drive
- Windows 10 professional License
- Microsoft office license
- Anti-virus support
- USB 2.0, 3.0, HDMI/Serial, Ethernet port etc.

4.10 POWER SUPPLY REQUIREMENT FOR CONTROL CENTRE EQUIPMENT

The computer system should be suitable for operation with single-phase, 230 +/-10% Vac, 50 +/-5% Hz power supply. The Bidder shall provide additional fuses, switches and surge protection, if necessary to protect the computer system hardware. All cables supply, laying & their termination between existing UPS panel at SLDC-OPTCL to computer system/control center hardware shall be in the scope of bidder.

In case of low battery capacity condition in the UPS, the computer system shall undergo an orderly shutdown to avoid corruption of any software applications & damage to computer hardware.

4.11 ENVIRONMENTAL CONDITIONS

Equipment located in the computer/ control room shall operate over an ambient temperature range of 16 deg. C to 35 deg. C. Relative humidity will range from 20% to 80% non-condensing. Further, all Hardware to be supplied under the project shall be RoHS complaint (Restriction of Hazardous Substance) in Electrical & Electronics Equipment.

4.12 ACOUSTIC NOISE LEVEL

The noise level of any equipment located in the server room shall not exceed 60 dbA

measurements at three feet from the enclosure. The noise level of equipment located outside the server room shall not exceed 50 dbA three feet from the enclosure. Sound-deadening enclosures shall be provided where necessary to meet these requirements.

4.13 GENERAL CONSTRUCTION REQUIREMENTS

The enclosures/panels, used for mounting or placement of equipment, shall be constructed in accordance with the following requirements.

4.13.1 PANELS

In case the equipment are mounted in panel type of enclosures, then such enclosures shall be finished inside and out. All cabinet metal shall be thoroughly cleaned and sanded to obtain a clean, smooth finish. All surfaces shall be treated to resist rust and to form a bond between the metal and the paint.

Moving assemblies within the enclosure, such as swing frames or extension slides, shallbe designed such that full movement of the assembly is possible without bending or distortion of the enclosure or the moving assembly. Enclosures shall not requirefastening to the floor to preclude tipping of the enclosure when the moving assembly is extended. No cables shall be visible, all cables shall be properly clamped, and all entries shall be properly sealed to prevent access by rodents.

Cooling air shall be drawn from the conditioned air within the room. Ducted or directed cooling air to the enclosures will not be supplied by SLDC OPTCL.

All wiring shall use copper conductors/Fiber optic cables/Ethernet Cables. Conductors in multi core cables shall be individually colour coded. Wiring within the enclosures shallbe neatly arranged and securely fastened to the enclosure by non-conductive fasteners. Wiring between all stationary and moveable components, such as wiring across hinges or to components mounted on extension slides, shall allow for full movement of the component without binding or chafing of the wire.

All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trim shall be made of flame retardant material and shall not produce toxic gasses under fire conditions.

The finish colours of all enclosures/panels shall be finalized during detailed engineering.

4.13.2 ENCLOSURE GROUNDING

A safety ground in accordance with Indian standards shall be provided within each enclosure and shall connect to the ground (green) wire of the ac power input.

4.13.3 INTERCONNECTIONS

All signals cabling between component units of the computer systems shall be supplied by the Bidder. Plug-type connectors with captive fasteners shall be used for all signal interconnections. The connectors shall be polarized to prevent improper assembly. Bothends of each interconnection cable shall be marked with the cable number and the identifying number and location of each of the cable's terminations. Each cable shall be continuous between components; no intermediate splices or connectors shall be used.Terminations shall be entirely within the enclosure.

5.0 DATA HISTORIAN

5.1 DATA HISTORIAN REQUIREMENTS

The data historian shall capture raw data in real-time, at its original scan rate from the PMUs / PDCs and also from any other specified sources. The data historian shall provide user-configurable graphical visualization, reporting, analysis, and web software tools. It shall display current and past operating conditions on desktops anywhere and anytime throughout the enterprise and beyond. It shall store the information online, for minimum specified duration, at its original resolution, making it instantly available for deep and broad analysis, and trending,

The data historian shall support a role based access, and security integration with ADS/LDAP. It shall provide the security setting features either by group (Area of Responsibility) or by Point-by-point basis to ensure that every single data point availablein the data historian is checked for proper user access permissions. It shall be integratedwith directory service of the System for assigning the user access permission.

5.2 CONFIGURATION OF THE DATA HISTORIAN OF PDC

For handling data storage of WAMS, the data historians shall be installed at Control Centre in redundant configuration.

The data historian system shall communicate to the PDC System and collect the real- time values as per sampling rate selected by the User. The default sampling rate for theHistorian shall be the same as that of the PMU sampling rate.

The data historian shall support High Availability and shall have features such as highlyredundant environment with hot standby, automatic failover, interface data buffering to guarantee no data loss, and no impact to clients or applications in case of communication loss or data server shut down for maintenance or security patchinstallations, etc.

5.3 FEATURES REQUIRED WITH THE DATA HISTORIAN

The purpose of data historian is to store real-time and historical process values and theirquality in a

long term on-line disk storage file system, and also provide the means for users to access this data, to display high-quality graphics; plot and trend this data; and import this data into spreadsheets for off-line analysis. The historian system must be designed to accommodate very large real-time and historical databases so that every process point is stored on-line for in its original collected resolution. The historian compression must not in any way affect or filter the data from its original resolution and sampled state. With this high-resolution data available users can view an areas current condition while providing a very clear and accurate picture of past operations. The datahistorian shall provide the trace logs for audit trails and audit purpose.

The following features shall be provided along with the Data historian application:

5.3.1 INTERFACE WITH PDC FOR ACQUIRING THE REAL-TIME DATA

The data historian shall exchange data with the PDC system using a native interface toensure high performance for real-time data exchange. The data as well as quality codesshall be received from the PDC system. Data must be time stamped according to the sending system and not on receipt by the Data Historian. **It shall be possible to interchange data from Analytical functions.**

5.3.2 ORGANIZATION OF DATA AND CONFIGURATION

It shall enable assets to be defined in a standard manner as per Common Information Model standards of IEC, associate it with real time data, organized for viewing in logical groups, apply necessary calculations and display results in a uniform fashion. The DataHistorian must provide a way to flexibly set up the data exception and compression up to point-by-point basis to efficiently archive the data (eliminating the equipment noise but not losing the data accuracy). The exception and compression techniques shall storethe real-time time series data in an efficient way.

5.3.3 REAL-TIME DATA INTERFACES

The data historian shall provide real-time, fault-tolerant, high-speed links from any industrial automated real-time data sources through OPC and ODBC interfaces

5.3.4 ALARMING

The data historian shall have an Alarm function. The alarm function shall constantly monitor the process conditions (data values) and shall allow users to track, manage, and acknowledge alarm conditions caused by processes that exceed user-specified parameters. It shall monitor any data that is available in the data historian. Users shall view alarm data in a graphical display interface. Alarms shall be triggered by the durationof an event or deviation from norm. Alarm conditions are to be recorded and stored. TheData Historian shall allow users to configure custom alarms through a standard user interface based on any data. The data historian shall have generic data access and template-driven capabilities of the modelling engine so that users can redeploy alarm parameters to similar data points without requiring to go to each and every point.

5.3.5 CALCULATED VALUES

The Data Historian must be able to perform calculations such as arithmetic operation on raw data values before being displayed. The data historian shall also have data summary function for defining calculations such as totals, averages, and other aggregates from real-time data inputs. Calculations shall be started and reset based on time and event. The Data Historian must be able to save calculated values as separate data points.

The calculation engine shall be able to define aggregations based on data type, totalizers (accumulators), and performance equations formulas and shall support periodic or time-based or event-based triggers. The calculation expression shall allow the users to implement arbitrary and potentially complex calculations without any formal programming and coding. A performance equation shall have an intuitive syntax and may consist of the standard built-in mathematical and logical operators as well as a wide variety of advanced built-in functions. The calculations shall be able to be done by asset- based/group-based, instead of per-point bases. All calculations shall provide the re- calculation functionality too automatically or on-demand re-calculate the historical data.

5.3.6 ALERTS

Alert function shall be provided which shall allow notifications via email or SMS to a single recipient, a group of contacts, or an entire escalation team that reflects the organization's chain of command whenever operational excursions occur. The Alert shall have the ability to interface with SMTP server/ SMS service providers for emails or SMS. Alerts shall be user-definable based on any configuration logic.

5.3.7 GRAPHICAL USER INTERFACE

The Data Historian shall provide the ability to produce reports on data held within the Historian and any linked databases. Reports shall be configurable so that a single report (template) can be used for different time/region/substation ranges by simply changing the report time/region/substation cells. The report shall be Excel based add-in, to generate dynamic repots in tabular format and create and also have formulas on demand bases. It shall support time and event based scheduling options to generate reports automatically.

The Data Historian shall provide the end-users to build, modify and manage displays like Contour map, Transmission corridor, Geographical Power System Network and support build-in analytics like graphs, bar-charts (horizontal or vertical), XY plots, multi- state symbols, layers, etc The normal users shall have viewing rights for SLD and all other data analytics rights. The graphical displays or trending should be able to set up any refresh rate, up to millisecond update interval. The Data Historian shall be able to provide the automatic display play back feature, i.e. on single line diagram for any system disturbance, sequence of events or post mortem analysis, etc.

5.3.8 INTERFACE WITH OFFICE APPLICATIONS

The data historian shall allow automatic retrieval of data into Microsoft Excel. It shall transfer not only the values but the calculations behind these values also. The data historian shall provide easy-to-use menus to extract data into Microsoft Excel including features like Power Pivot. Extraction shall include current value, archive value, aggregation calculation (average, min, max, total, standard deviation) for specified period, tag-based calculation and calculations with filters.

5.3.9 MANUAL DATA ENTRY

The data historian shall have the capability to accept manual data also. This information shall be used to complete the picture of operations and required for problem diagnosis or reporting in conjunction with the data collected automatically. Manual data entry shallbe allowed from defined clients. The audit trail for such manual edit shall be maintainedin the system.

5.3.10 INTERFACE WITH BUSINESS APPLICATIONS

The Data Historian must have a well-documented API that provides good functionality to third party. The API must be able to query data and models held within the Data Historian. The Data Historian must offer connectivity to third party systems using at least API, OPC, ODBC, OLEDB, JDBC, etc. The Data Historian must be able to control the authorization of data extracted through any of the above interfaces.

5.3.11 DATA MIGRATION REQUIREMENT

The Data historian shall provide means of migration of data by exporting old data in a predefined format such as .csv files or through well documented APIs so that the data can be migrated to another system.

5.4 SIZING OF THE DATA HISTORIAN

The offered Historian System shall be sized to store the PMU data as specified in the PDC, the data of other applications as mentioned in this Section and the Analytical applications data for One year duration. The bidder shall submit the hardware requirements of Historian system along with the storage details.

5.5 DESIGN PARAMETERS FOR HISTORIAN SYSTEM FUNCTIONS

The offered Historian System shall be sized to store the PMU data as per PDC specification and the data of other applications for **One year duration at data reportingrate of 50 samples/second.**

The bidder shall submit the hardware requirements of Historian system along with the storage

details with bid. **The retrieval of complete data for 6 hours for 5 PMUs shall be less than 1 second irrespective of storage system** i.e. the data retrieval shall be fast enough whether it is stored on the local drive or SAN/NAS storage system. The report generation shall not take more than one seconds.

There shall be maximum 3 step procedure for retrieval of historical data of any data/calculated data point from historian systems.

6.0 SOFTWARE & CYBER SECURITY REQUIREMENTS

6.1 GENERAL REQUIREMENTS

This section describes the characteristics of system software such as Operating system,RDBMS and support software (programming language compilers, database development and maintenance, display development, network services, Report generation, diagnostics and Backup utilities) provided by Bidder and the original software manufacturer as necessary to support the applications of WAMS system. This section also describes the standards to be followed for all supplied software.

6.2 SOFTWARE STANDARDS

All software of WAMS system provided by the Bidder, including the Operating system, Database and support software, shall comply with the industry-accepted software standards. The Bidder shall commit to meet the "open systems" objective promoted byindustry standards groups.

6.2.1 DESIGN AND CODING STANDARDS FOR WAMS APPLICATIONS

All applications of WAMS system shall be maintainable by SLDC-OPTCL using the supplied software utilities and documentation. The software design and coding standards of WAMS system shall address the followings:

- **Expansion**: Software shall be dimensioned to accommodate the size of WAMS system as given in specification.
- **Modularity**: Software shall be modular i.e. functionally partitioned into discrete, scalable, reusable modules consisting of isolated self-contained functional elements and designed for ease of change. The system shall make maximum use of common industry standards for interfaces.
- **User-Directed Termination**: Functions taking long execution times shall recognize and process user requests to abort the processing.
- **Portability & Interoperability**: The system shall be designed for hardware independence and operation in a network environment that facilitates interoperability and integration of third party applications.
- **Programming languages**: The software shall be written using high level ISO or ANSI standard programming languages.

6.2.2 OPERATING SYSTEM

The operating system of all the equipment of WAMS system including network equipment shall be latest version released preferably up to **six months prior to FAT**.The operating system shall be hardened to provide robust security in line with the requirements by CERT-In or any other Statutory Agency. The operating system and data file shall be placed in different disk partitions.

6.3 TIME FEATURE

A GPS based time reference shall be used for synchronising the WAMS system time periodically. The internal clocks of all Servers and workstation consoles shall be automatically synchronised within the accuracy of +/-1 milliseconds of synchronised GPS time. The Bidder-furnished GPS based Time facility shall be read and compared to the time and date WAMS system. If the two times are within a user adjustable dead-band, the WAMS time shall be set to the GPS facility time. If the two times differ by an amount greater than the dead-band, the WAMS time shall not be updated and an alarmshall be generated. This time difference shall be alarmed every 15 minute if not corrected

The user shall be able to alter the date and time. The day shall be inDDMMYY/DDMMYYYY format. The alteration shall not adversely affect programsrunning at the beginning of the hour. The function shall enable day calculation e.g. Dayof the week/week of the year for reference for any display.

6.4 NETWORK SOFTWARE

The network software for WAMS system shall include software for network communication, Network security, remote diagnostic and network services. Network software shall include the user node software that provides the connection of that nodeto the network. The network node software shall be provided for each type of network node connection supplied with the initial system and shall be licensed for the quantitiesand types of nodes defined for the WAMS System configuration.

6.4.1 NETWORK COMMUNICATION

Users and various applications shall be able to communicate within the WAMS systemlocal area network and operate as described in Specification. The networkcommunications software shall use a standard network protocol such as TCP/IP. The software shall link dissimilar hardware nodes such as workstations, servers, andperipheral devices into a common data communication network allowing communications among these devices.

In case any communication link is DOWN/OUT/Failure then a pop-up should come up for it along with the SMS and e-mail facility shall be implemented for the same. The scope for supply of SMS Gateway or mail server as applicable shall be in the scope of the contractor.

6.4.2 REMOTE DIAGNOSTIC

Remote Diagnostic facility with necessary Hardware as required shall be provided for communication between the WAMS system at control center and the Bidder's & SLDC-OPTCL support office for the diagnosis of Hardware & Software problems. The login shall be protected by a user name & password entry. This facility through separate portshall also be extended to the Owner through a separate secure port for remotemaintenance.

6.4.3 NETWORK SERVICES

The following network services shall be provided for the users of WAMS system within the LAN:

a. File management and transfer of files containing text, data, and graphicsinformation
b. Printing management
c. Time synchronization
d. Backup over LAN
e. Task-to-task communications to external computers
f. LAN global naming facilities.
g. Remote procedure call
h. Remote terminal session

6.5 SYSTEM SECURITY

The Bidder shall document and implement a Cyber Security Policy in association with the SLDC-OPTCL to secure the system in line with Government Organizations such as Cert-In, NTRO, NCIIPC etc.. The overall policy and implementation shall account for:

- Network partition and DMZ through use of Firewall as required to maximize thesecurity of WAMS system.
- Implement trusted un-trusted and DMZ with clear perimeter
- Prevent unauthorized users from reading or writing data or files, executingprograms or performing operations without appropriate privileges
- Document all user sign on procedure
- Auditing by third party during FAT, SAT and annually during AMC period
- Record all network traffic for detecting unauthorized activity, unusual activity andattempts to defeat system security (Contractor to propose and document what constitutes normal activity/traffic).
- A user authentication scheme consisting at least of a user identification and password shall be required for the user to request a connection to any network node.
- All unused ports (physical and logical) of all routers and switches shall be disabled.
- All unused services shall be disabled on request.

- In routers, only the specified/required IP addresses should be OPEN

6.6 CYBER SECURITY

The Bidder shall document and implement a Cyber Security Policy in line with CERT-In latest guidelines (http://www.cert-in.org.in) to secure the system and the Bidder shall keep updating the Security settings as per the requirements by CERT-In or any other Statutory Agency at time to time.

The following guidelines/strategies shall be taken care of by the Bidder for making the entire Control Centre immune to Cyber Attacks.

- All the Hardware, OS and application software shall be hardened.
- Vendor has to identify and list the entire network and other protocols that communicate with physical systems and limit what is not required.
- Similar list needs to be prepared and implemented for all the machines in WAMS system domains.
- Network partition through use of Firewall as required to maximize the security of WAMS System while facilitating access for data and information to all stake holders. Network Zoning shall be implemented as per the proposed architecture. However, the Bidder may suggest other methods of network architecture without compromising the security of the System.
- No user shall be allowed to access remote network zones other than the adjacent zone.
- All default user id & passwords shall be changed.
- All log in/log out and cable plug in/plug out shall also be logged in Central Syslog server (Centralized Management Console).
- Latest Cyber Security Guidelines of CERT-In specified at (http://www.cert-in.org.in) shall be followed.
- Prevent unauthorized users from reading or writing data or files, executing programs or performing operations without appropriate privileges.
- Document all user sign on procedure
- Auditing by third party during FAT and SAT
- Record all network traffic for detecting unauthorized activity, unusual activity and attempts to defeat system security (Bidder to propose and document what constitutes normal activity/traffic).
- A user authentication scheme consisting at least of a user identification and password shall be required for the user to request a connection to any network node.

6.7 DEVICE CONFIGURATION OF NETWORK EQUIPMENT'S

The device configuration of all the network equipment shall be as per the latest Cyber Security guidelines given by CERT-In. For the latest versions of these guidelines, the web site of CERT-In (http://www.cert-in.org.in) may be referred.

6.7.1 FIREWALL

As per the proposed network architecture. The firewalls should be properly configured to segregate networks into different segments. The following strategies shall be followed in general for secure configuration of firewalls.

- Clean-up rule
- Place a 'Deny any-Any' rule at the end of the rule base.
- Never create an 'Allow any-any' rule.
- Allow rules should be created only for required services.
- This will result in all traffic being disallowed, unless specifically allowed.
- Lockdown/stealth rule
- All traffic destined for the firewall itself should be disallowed.
- Anti-spoofing rule.
- Place anti-spoofing rule as per RFC 1918 and 2827.
- Enable DoS/DDoS features on Firewall
- Enable application level filtering of firewall

6.7.2 ROUTER

Necessary control should be applied on the router to stop unwanted traffic and attacks at the perimeter itself. In the secure configuration of a router, the following strategies should be considered.

i. Deploy proper access management and avoid remote administration.
ii. Enable secret password.
iii. Change default SNMP community string.
iv. ACLs (Access Control Lists) should include
    a. Apply egress/ingress filter
    b Filter all RFC 1918, 3330 dress pace and special/reserved address
    c. Permit the required services for the required IP addresses only deny everything else.
    d. Turn on logging to a central syslog server.
    e.

6.7.3 NETWORK MANAGEMENT SYSTEM CUM CENTRALISED MANAGEMENT CONSOLE (NMS-CUM-CMC)

A separate server shall be supplied to be used as Network management Server cum Centralized management console (NMS-cum-CMC) for integrated monitoring and configuration of the firewall and network elements.

The NMS cum CMC Server shall have the following Network Management capabilities:

- Security Management to protect systems and network from unauthorized access,manage

user access, authorizing rights and privileges

- Inventory Management to collect information about computers in the system suchas processors, memory, peripherals and processes running on computers
- Performance Management to monitor system and network performance asspecified
- Fault Management to recognize, log and identify fault on network and connectedmachines, nodes, devices.

The network management software shall be based on the secured version of Simple Network Management Protocol ver. 3.0 (SNMPv3) or higher. The NMS system shall have a simple browser based user interface to provide all the pertinent information aboutthe system. The NMS shall not impact the availability and performance of WAMS systemand shall load not more than 3% of any host CPU, 1% Network bandwidth and shall have secure communication.

The Network management system shall monitor the performance, resource usages and error statistics of all the servers, workstations, routers and LAN devices including for proposed Owner networks extension (up to 25 number of nodes) including the following:-

Utilisation (CPU and/or channel time being used as applicable) for Servers, Workstations, Storage Devices, Router, Switches, Data Links

Memory utilisation, Auxiliary memory I/O utilisation, of Servers and Other Machines Mass Storage Devices

The Network Management Software shall:

- Maintain performance, resource usage, & error statistics and present thisinformation via displays, periodic reports, and on-demand reports.
  Apart from real-time monitoring, the above information shall be collected andstored at user configurable periodicities i.e. 5 minutes to 60 minutes. The Network Management System (NMS) shall be capable of storing the above datafor a period of one year at a periodicity of 5 minutes.
- Maintain a graphical display for connectivity and status of servers and peripheraldevices for local area network.
- Issue alarms when error conditions or resource usage problems occur.
- The period over which the statistics are gathered shall be adjustable by the user,and the accumulated statistics shall be reset at the start of each period.
- The statistics shall be available for printout and display after each period and ondemand during the period.

The NMS cum CMC shall perform the following Security Management console functions:

- Create and deploys new policies
- For Centralized Logging of messages from all systems across the network as a Central Syslog server (in line with the Guidelines of CERT-In or any other Statutory Agency)

- Collect and archive audit log for post event analysis
- Maintain an Integrated Event Database
- Provide an integrated Reporting System.
- Getting Virus definition, signature, patches etc. update from internet and updatingthe system automatically.
- Keep latest copy of the definitions and configurations defined in each network device e.g. routes/configuration defined in Routers, policies defined in firewalls etc.

6.8 SOFTWARE UTILITIES

Some of the software utilities, which are required to be delivered along with the WAMS system, are described here. However, Bidder shall supply all software utilities used to develop and maintain WAMS software, whether or not specifically described by this Specification.

The software utilities shall operate on-line (in background mode) without jeopardizing other WAMS application functions those are running concurrently. Utility software shall be accessible from workstations, processor terminals and servers.

6.8.1 AUXILIARY MEMORY BACKUP UTILITY

Further a utility for taking image backup of Servers and workstations shall be provided.The utility shall take image backup daily automatically on NAS (Network Attached Storage). It shall keep minimum two set of image backup of all servers and one image backup of all the workstations. NAS shall have sufficient space to meet the requirementof three image backup of all the servers. Each day it will update image backup. Each day it will take image backup, when image backup is successful then it will delete the oldest image backup. It shall be possible to archive these image backup on magnetic tape drive. Bidder shall supply online agents for image backup of all the servers and workstations.

User shall be able to define the schedule of archival of backup data on tape drive. Utilityshall be able to archive data automatically on tape drive as per the user defined schedule.

The utility shall allow restoration of the servers/workstation from the image backup without requiring any other software. An image backup of the as built system of each ofthe Servers and workstations shall be provided by the Bidder on a portable hard disk. Any server restoration from image backup shall take less than 2 Hours. Minimum speed of restoration shall be 200 GByte /hour.

6.8.2 ON-LINE MONITORING DIAGNOSTICS

On-Line monitoring diagnostic programs shall be provided for verifying the availability of the backup equipment and for limited testing of devices without interfering with on-line operations of the WAMS system or the failover capability of the devices.

Redundant communication line interface equipment shall be tested by periodically retrieving data over these lines and checking for the ability to communicate with the redundant channel and for any errors.

Designated backup server(s) and associated auxiliary memories shall be automatically tested for proper operation to ensure they are ready if needed for a fail over contingency. Any failure to perform diagnostic functions correctly shall cause an alarm to be issued.

6.8.3 DOCUMENT MANAGEMENT SYSTEM

A full fledge Document Management System (DMS) shall be provided. DMS should store and make available the all documentation of the project. DMS should have the facility for version control, access control, archiving etc. All access to the document should be based on the privileges assigned to the user. Complete user management system should be in built in the DMS.

6.9 DATABASE DEVELOPMENT TOOLS

The Bidder shall provide all necessary software tools for the development and maintenance of the WAMS System databases at Control Center. The initial database shall be provided by the SLDC-OPTCL as available in the existing SCADA/EMS Systemdatabase.

This tool shall be capable of managing the entire system database. The database development tool shall facilitate IEC 61970 CIM data exchange of both incremental andfull system model. This tool shall contain database structure (format) definitions and all initialization data to support the generation of all relational and non-relational run-time databases required to implement the system's WAMS functions. The tool shall include consistent, coordinated procedures to manage and access the databases regardless of the location of the data or the residency of the database management functions.

This tool shall include definition of data fields, structure of application data sets using the global database, database population, correction of entry errors, Extensive reasonability, integrity, and referential integrity checks shall be made on user entries to detect errors at the time of entry. Invalid entries, such as entering an invalid data type or attempting to define contradictory characteristics for a database item, shall be detected and reported to the user in an error message. Help displays shall be availableto provide additional, detailed information to the user on request.

6.9.1 DATABASE MANAGEMENT

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

database maintenance.

Execution of the database manager in any server of the system shall not interfere with the on-line functions of the WAMS including the normal updating of each server's real- time database. In a primary server, database editing shall be limited to viewing functions, database documentation functions, and functions that change the contents but not the structure of the database. Editing the on-line database shall not affect the operation of the primary/backup configuration.

All newly defined points shall be initially presented to the user with default values for all parameters and characteristics where defaults are meaningful. It shall also be possibleto initialize a new database point description to an existing database point description. The user shall be guided to enter new data, confirm existing data, and change default values as desired.

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

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

- Add, modify, and delete telemetered, non-telemetered, or calculated databaseitems and data sources such as data links, and local I/O.
- Add, modify, and delete application program data
- Create a new database attribute or new database object
- Resize the entire database or a subset of the database
- Redefine the structure of any portion of the database.

A utility function shall be provided that creates, from the run-time database, a source filesuitable for submittal to the global database batch processing facility.

This utility shall create a new global database file, suitable for editing, that reflects any changes made to the run-time database since the last time the database was generated.

6.9.2 RUN-TIME DATABASE GENERATION AND MAINTENANCE

The database manager shall generate incremental database changes as well as run- time (loadable) databases from the global database. Based on the nature of the structure change, the database management software shall determine which portion of the database must be regenerated and which displays, reports, and software functionsmust be re-linked.

When errors that were not detected at data entry time are encountered during run-time database generation, these errors shall be flagged. The generation routines shall attempt to continue processing the database in an effort to detect all existing errors before terminating the generation

task. The feature for sorting/filtering the error based on type and severity level may be included. The error report should have the prompt forguidance for corrective action.

6.9.3 DATA RETENTION

The database generation process shall retain and utilize data from the current databasein the newly generated database, even when a newly generated database contains structure changes. Data to be retained across database generation cycles shall include, but not be limited to, quality codes, manual entries, tags, historical data, and tuning parameters.

6.9.4 DATABASE INTEGRATION (ON LINING)

Newly generated run-time databases shall only be placed on-line by user command. After an error-free database generation, the new database shall be integrated into the system by assigning it to an appropriate server. The previous run-time database of the server shall be archived such that it is available to replace the new database upon demand. The archived database shall be deleted only when directed by the user. Following the assignment of a new database to a server and on user demand, the database management software shall access each server to ensure that all databases are consistent. Inconsistencies shall be annunciated to the user.

6.9.5 ON-LINE DATABASE EDITING

Selected database management functions and changes to a run-time database shall be possible without requiring a database generation. These shall be limited to viewing functions, database documentation functions, and changes to the contents, but not the structure of the database. On-line changes shall be implemented in all applicable run- time databases without requiring any downtime of the system. Changes shall also be implemented in the global database to ensure that the changes are not lost if a databaseregeneration is performed. On-line database editing shall not affect the system'sreaction to hardware and software failures nor shall it require that the exchange of data among servers for backup purposes be suspended. The On-line editing of database and its backup to standby machine should not result into the failover of servers.

During online data base changes of user defined data or internal/any calculated data should not be affected. Last data value should be retained. It should not be zero during database online.

6.9.6 TRACKING DATABASE CHANGES

The database manager utility shall maintain Audit trail files for all changes made by all users including on-line database editing. The audit trails shall identify each change including date and time stamp for each change, and identify the user making the change. An audit trail of last 10,000 edit operations shall be maintained.

6.10 DISPLAY GENERATION AND MANAGEMENT

The Bidder shall provide necessary browser based software tools for the generation and management of displays.

The displays shall be generated and edited interactively using this display generation software delivered with the system. The display generator and management features specified in the following paragraphs shall be available at the workstation console.

All displays, symbols, segments, and user interaction fields shall be maintained in libraries. The size of any library and the number of libraries shall not be constrained by software. The display generator shall support the creation, editing, and deletion of libraries, including copying of elements within a library and copying of similar elements across libraries. A standard set of libraries and libraries of all display elements used in the delivered system shall be provided. All libraries shall have directories that list all elements contained in the library. These directories shall be displayable and printable on demand. All libraries shall include a library compression facility that consolidates unused space created by removal of old elements to allow efficient reuse by added elements.

Displays shall be generated in an interactive mode. The user shall be able to interactively:

a. Develop display elements
b. Link display elements to the database via symbolic point names
c. Establish display element dynamics via database linkages
d. Define linkages to other displays and programs
e. Combine elements and linkages into display layers
f. Combine display layers into displays.

Execution of the display generator functions shall not interfere with the on-line functions.

All work station, Remote Consoles and VPS display features and all user interface features defined in this Specification shall be supported by the display generator software. The display generator shall support the addition, deletion, and modification ofsegments, including the merging of one segment with another to create a new segment.Segment size shall not be limited. Segments shall be defined at an arbitrary scale factorselected by the user.

6.10.1 DYNAMIC TRANSFORMATION LINKAGES

Dynamic transformations shall be performed on symbols and display segments based upon dynamic linkages to database variables. All linkages to the database shall be defined via symbolic point names. Each symbol or segment stored in a library shall include its dynamic transformation linkages, although the specific point names shall be excluded. Dynamic transformation linkages shall support the dynamic data presentation.

6.10.2 DISPLAY GENERATION AND INTEGRATION

The displays shall be constructed from the display elements described above. The display definition shall allow displays to be sized to meet the requirements of the WAMS application for which they are used; displays shall not be limited by the size of the viewable area of the screen. The display generation software shall allow unbroken viewing of the display image being built as the user extends the size of the display beyond the screen size limits. Each display shall include the display coordinates definition that will permit a user to navigate successfully to the portion of the display thatis of interest.

It shall be possible for a user to build a new display starting with a blank screen, a DXFformatted file imported from another system, or an existing display. Graphic display shallconsist of multiple display layers. The definition of each layer shall include a range of scale factors over which the layer shall be visible. The display generator shall also support manual control of layer visibility, where the user of the display shall determine the layers on view. Each display may incorporate manually and automatically (by scale factor) displayed layers. The user shall also define the periodic update rate of the dynamic information on the display and any programs called before or after presentationof the display.

The display generator shall support the integration of new and edited displays into the active display library. During an edit session, the display generation software shall allowthe user to store and recall a partial display. To protect against loss of display work whena server fails, the current work shall be automatically saved every five minutes (user adjustable) to an auxiliary memory file.

The display generator shall verify that the display is complete and error-free before integrating the display into the active display library. It shall not be necessary to regenerate any display following a complete or partial system or database generation unless the database points linked to the display have been modified or deleted. The display generator should support various fonts, font-types (Hindi, regional languages etc). Menu based EDIT facilities (cut, copy, paste from same or other displays) should be present in the display generator.

6.10.3 IMPORT/EXPORT CADD DRAWINGS

The display generator shall support the import of drawings, including power system one- line diagrams, developed by Owner on Auto CAD. The display generator should have the capability to import the files from latest version of AUTOCAD including older versions for display generation. Further the drawings may also be used in the system as the static background for displays. The display generator shall provide the capability (through the display generation process), to add, delete, and modify the dynamic information supplied to the drawings using the specified features of the display generation and management software. As necessary, Owner will replace the static background by importing a new drawing from the CADD system and re-linking associated database elements. The display generator shall allow a user to update the dynamic information to

reflect any changes required by the updated drawing.

6.11 OTHER UTILITY SERVICES

The WAMS System shall include the following utility services in addition to the Document Management System (DMS).

a. On line access to user and system manuals for all software products (e.g., Operating System and Relational Database Software) and WAMS applications shall be provided with computer system.
b. Antivirus Software-All computers and firewalls shall be provided with the latest antivirus software as on date of supply. The antivirus software shall have the capability of having its virus definitions updated from time to time. The Bidder shall be responsible for the maintenance & update of the antivirus software.
c. Software Upgrade-The Bidder shall be responsible for the maintenance & update of the patches and signatures of Operating system, PDC system and NMS cum CMC server and Storage/Archiving System up to AMC period.

Automated patch management tools shall be provided to expedite the distributions of patches to the system. These tools should consider the possibility to use standardized configurations for IT resources.

6.12 USB PORT CONTROLLER UTILITY

The utility shall enable control on USB ports for disabling unauthorized usages. Its functional specifications shall be as follows:

a. It shall block USB devices based on device identity, port identity, devicetype (eg. allowing all keyboards, etc.)
b. A provision for listing acceptable devices (white-listing) shall also be provided.
c. It shall log all USB port access events.

A dedicated system shall be identified for exchanging data with WAMS system in a secure manner after scanning the file to be transferred.

6.13 DATA EXCHANGE UTILITIES

Facility of data export and import form and to WAMS system to external system shall beprovided as detailed below:-

Through OPC Server: A full OPC server compliant to the latest standard shall be provided in order to export real time data, alarms, historical data etc to the external system. OPC clients for WINDOWS and Linux shall also be supplied. If client software is based on the user system than

at least five user license for each shall be provided. Server should be licensed accordingly.

Through ODBC/JDBC: Capability of export of WAMS data to external system though ODBC/JDBC shall be provided. All system parameters in the real-time database including real time data, calculated data, application configuration parameters and application output shall be available through the ODBC interface. Limitation if any or pre-requisite on PC for use of this interface, shall be clearly defined. It shall be possible to export data to export data through SQL queries to external system.

Injection of external values: Suitable facility of injecting values periodically/on demand form external system to WAMS database should be provided. API along with utilities shall be supplied to facilitate this feature. It should be possible to use this API for developing the programs on Windows or Linux system using .NET or Java languages and macros.

7.0 CONFIGURATION CHARACTERISTICS

The ability of the WAMS system to perform their specified tasks under normal conditionsand under conditions of hardware and software failure is of paramount importance to SLDC-OPTCL. This section presents requirements for monitoring and managing the hardware and software configurations of these systems.

7.1 REDUNDANCY

The WAMS system envisages some functions as critical functions and others as non- critical functions as defined in the specifications. Every critical function must be supported by sufficient hardware and software redundancy to ensure that no single hardware or software failure will interrupt the availability of the functions for a period exceeding the automatic transfer time.

The non-critical functions may not be provided with hardware and software redundancy.

The redundancy requirement for hardware of WAMS system at control center shall be as follows:

- **LAN switches**: The System shall have dual LAN architecture for PDC LAN, Historian LAN and Remote Console LAN. All LANs shall be configured as redundant. All equipment shall have dual LAN connectivity.

- **Servers**: All the servers for critical applications shall be configured as redundant.

- **Workstation Consoles**: These shall be configured as non-redundant devices.

- **GPS based Time facility**: The time system shall be configured as redundant device.

- **Routers**: Routers shall have physical redundancy as well as channel redundancy i.e. redundant

channels of a remote destination shall be configured on different routers.

- **VPS Equipment**: VPS equipment shall be configured as non-redundant device with existing SCADA/EMS VPS equipment. VPS Hardware is not in the scope of bidder but Bidder shall do all interface activity with existing VPS system of SLDC, Odisha.

- **PMU communication and channel interfaces**: PMU communication interface equipment such as Routers shall be configured as redundant devices. PMU communication channels shall be switchable to the backup interface without processor failover.
- **Communication interfaces with other control center PDCs**: The communication interfaces with other control center, computer systems shall be configured as redundant.
- **Communication interface with Remote consoles**: The communication interfaces with Remote console shall be configured as non- redundant devices

7.2 SERVER AND PERIPHERAL DEVICE STATES

A server group is one or more servers that perform a subset of WAMS or other application functions in either a primary/backup manner or distributed manner (where the on-line functions performed by the server group are distributed among multiple primary servers). For example, one server group may be configured to perform all WAMS Functions, while other server groups perform Historian and Analytical functions.

Server and device states shall identify the operating condition of each Server and peripheral device of WAMS systems and shall be used to determine the system's reaction when restart and failover operations take place. Server and device states shall be assigned by failover functions, restart actions, and by user command.

7.3 SERVER STATES

Each Server shall be assigned to one of the following states:

1. **Primary:** A primary Server performs any or all of the on-line functions described in this Specification
2. **Backup:** A backup Server replaces a primary Server in the event of primary Server failure or upon user command. It shall communicate with the primary Server to maintain backup databases and monitor the state of the primary Server.
3. **Down:** A Server is down, when it is not communicating with the WAMS system and is not capable of participating in any system activity.

7.4 PERIPHERAL DEVICE STATES

Each peripheral device shall be assigned to one of the following states:

1. **Primary**: The primary peripheral device is logically attached to a primary Server or primary Server group. If the primary Server or primary Server group fails and its functions are reassigned to a backup Server or backup Server group, the peripheral device shall follow the reassigned functions.
2. **Backup**: A backup peripheral device is used to replace a primary peripheral device in the event of primary peripheral device failure. It shall communicate with the primary Server or primary Server group to maintain its readiness to beassigned as a primary device.
3. **Down:** A down device cannot be accessed by the WAMS system.

7.5 FUNCTIONAL REDUNDANCY

Every critical function must be supported by sufficient hardware redundancy to ensure that no single hardware or software failure will interrupt the availability of the functions for a period exceeding the automatic transfer time.
Replacement of faulty items of the system and its restoration shall not result in any loss of functionality or performance. The stand by elements of redundant system shall be fully monitored at all times.

Non-critical functions are those that support maintenance and development of database,application software and training of users. No hardware redundancy is envisaged for these functions.

7.6 SERVER AND DEVICE INTERCONNECTIONS

Redundant interconnections shall be provided among all Servers within a Server group,among all Server groups, and among all Servers (including Server groups) and all workstations located in control Centre. The interconnections shall support Servers and peripheral devices data exchange over both the LANs. Recovery from a single LAN or any other interconnections failure shall not require any failover.

7.7 BACKUP DATABASES

The system shall maintain backup copies of all databases without requiring any manual intervention, so that system operations may continue in the event of Server, device, or software failure. The backup databases shall be updated with the current contents of the primary databases such that all changes to a primary database are reflected in the backup database within 10 seconds of the change. The backup databases shall be maintained in such a manner as to be protected from corruption due to Server and device failure. Backup databases shall be preserved for system input power disruptions of any duration. The information maintained in the backup databases shall include:

a. Telemetered, calculated, and manually-entered values and their attributes, including quality codes, control inhibit state, and tag data
b. Data and associated attributes maintained by the Information Storage and Retrieval function

c. Alarm, event, and summary displays (such as off-normal, control inhibit, andalarm inhibit displays) or sufficient information to rebuild the displays in their entirety (including the time and date of the original data entries, not the time and date the display is newly created)
d. Application function execution, control, and adaptive parameters and input and output data, including power system analysis and scheduling save cases.

All Changes resulting from the addition or deletion of items in an existing database, structures and restructuring of databases shall be automatically backed up in the backup databases by the backup function.

7.8 ERROR DETECTION AND FAILURE DETERMINATION

All Servers, devices, on-line functions, and maintenance functions in system shall be monitored for fatal and recoverable errors. All errors shall be recorded by the system for review by maintenance personnel. Each type of error (e.g., Server failure, memory access violation, device reply time-out, or message checksum error) shall be recorded separately with a date and time tag.

Failure monitoring logic shall be distributed within the computing network and shall detect all failures that affect the availability of network resources or services. Failure monitoring functions shall be independent of application function and user modes. The failure monitoring and error detection function shall preferably provide event notification for 3rd party products e.g. SNMP messages.

7.8.1 SERVER ERRORS

All fatal and recoverable errors of all Servers operating in the primary and backup states shall be detected and recorded by the WAMS system. Server failure shall be detected and annunciated to the user within 10 seconds of the failure.

7.8.2 DEVICE ERRORS

All fatal and recoverable errors of all peripheral devices shall be detected and recorded. Each type of recoverable error shall be assigned a threshold by the programmer. Peripheral device failure shall be detected and annunciated within 10 seconds of the failure.

7.8.3 SOFTWARE ERRORS

Execution errors in on-line and maintenance functions that are not resolved by program logic internal to the function shall be considered as fatal software errors.

Fatal software errors shall result either in termination of the function or shall be handled as a fatal Server error. The action to be performed shall be defined by the programmer for each function. If

the function is to be terminated, future executions of the function shall also be inhibited until the function is again initiated by the programmer.

On the occurrence of each fatal software error, Server and operating system error codes and messages shall be recorded in the WAMS system.

7.9 SERVER REDUNDANCY AND CONFIGURATION MANAGEMENT

When a failure of a primary Server in a redundant group is detected, the computer system shall invoke the appropriate server failure recovery actions. Failure recovery is the capability of automatically transferring the functions (failover) from primary hardware resources to secondary hardware resources or restarting the server when a failure- monitoring function detects a failure. The failover shall be the preferred failure recovery approach and restart shall only be used when failover is not possible.

After an error threshold-induced automatic transfer, the former primary server shall remain in an inactive (down) state so that a post-mortem analysis can be performed. A manual restart shall be necessary to bring it to the active ready state.

After a transfer caused by a Server failure or power loss, the former primary server shall either reboot into the ready state automatically or wait for manual intervention, depending on Owner's configuration management set-up.

If all alternate Servers are unavailable when the operating Server fails, the system shall attempt to automatically restart operating Server a programmable number of times.

Failures of Servers operating in the backup states shall not initiate failover or restart actions. The WAMS system shall only change the state of failed processor to 'DOWN'.

When a failure of a primary Server in a non-redundant group is detected, the computer system shall invoke restart actions. Functions assigned to a failed Server in a non- redundant group may be lost until the failed Server is restored to service.

All Server failures shall be annunciated by alarms. The alarms shall identify the failed Server(s), all Server state changes, and the success or failure of any restart and failover operations. For any server crash, manual transfer or threshold-induced transfer a crashdump file shall be automatically generated for analysis using standard interactive support tools. All such system events and crash dump file shall be transferred to Historian subsystem automatically.

7.9.1 SERVER FAILOVER

A failover (transfer of critical functions) to an alternate Server shall occur, as a minimum, under any one of the following situations:

- Non-recoverable failure of a server performing a critical function
- User request for a transfer of servers
- Failure of a periodic function to execute on schedule.

In the event of server failover, the functions of the failed Server shall be restarted in a working/functioning Server. Immediately upon detection of a failure, the failed Server's state shall be changed to down state. All devices assigned to the failed Server shall bereassigned to its backup Server without any manual intervention.

The on-line functions of the failed Server, having execution periodicity less than or equal to 30 seconds, shall be assigned to its backup Server within 30 seconds of the failure except for Historian System. In case of failure of Historian System; the historical data shall be stored in the WAMS system till the failover of Historian System is completed toavoid data loss. This stored data shall be transferred to the Historian System automatically after restoration of Historian System.

The on-line functions of the failed Server, having execution periodicity greater than 30 seconds, which were in progress at the time of failover or were missed during the failover, shall be assigned to its backup Server within 120 seconds

7.9.2 RESTART

Restart involves the ability of any server to self-detect its non-recoverable errors and toattempt to restart the WAMS system functions.

The restart logic shall determine the desired state of the failed Server and the on-line function(s) to be initiated in this Server. The restart logic shall also preclude conflicts among Servers, such as assigning too few or too many Servers to the primary state and the erroneous duplication of functions in multiple Servers. All maintenance functions executing in the restarting Server shall be suspended to expedite the restart process.

Restart shall include initialization of the WAMS function(s) and internal parameters, updating of databases, establishing access to peripheral devices, and execution of the function(s). Databases may be updated from backup databases or from static initialization database copies stored on auxiliary memory depending on the nature of the restart. The use of the static initialization databases shall be restricted to user-invoked restarts. If insufficient peripheral devices are available to perform the on-line function(s), the restart logic shall generate an alarm requesting user intervention. Restart asdescribed above shall be completed within 30 seconds.

7.9.3 SERVER START-UP

A Server start-up shall be performed when commanded by a user and when Server input power is

interrupted and restored such that the operating environment of the Server is established prior to restarting the on-line functions. Establishment of the operating environment may include execution of self-diagnostics, reloading the operating system and system services, and connection to and verification of communications with all nodes on the control center computer system LAN. The server start up shall be completed within 5 minutes with all functions scheduled for execution.

7.9.4 SYSTEM POWER-ON START-UP

The WAMS system shall automatically restart itself when input power is interrupted andrestored. System start up shall include Server start up, initialization of all network devices, initialization of peripheral devices, initialization of all communications with datasources and other control center, resumption of all WAMS functions and notifications tothe users that startup has been completed. System power-on startup shall becompleted within 10 minutes.

7.9.5 SERVER REDUNDANCY

All the critical functions shall reside on redundant servers. One of the redundant Servers shall normally be assigned to the backup state and it may also participate in on-line activity as a primary Server for some functions as per the design of the bidder. It is Owner's intent that each control Centre computer system satisfies all of the performancerequirements of this Specification with one Server of each Server group assigned to thebackup or down state.

7.10 PERIPHERAL DEVICE REDUNDANCY AND CONFIGURATION MANAGEMENT

When failure of a redundant peripheral device is detected, the control center computer system shall automatically invoke the appropriate device failover actions so that on-linefunctions, which are using the failed device, are preserved. Failure of a server's dependent device like auxiliary memory, if any, may result in Server failover.

When failure of a non-redundant device is detected, the WAMS system shall not invoke Server failover or server restart actions. On-line functions using a failed, non-redundant device may be lost until the failed device is restored to service.

All device failures shall be annunciated by alarms. The alarm text shall identify the failed device(s), all device state changes, and the success or failure of any device failover operations.

7.10.1 DEVICE FAILOVER

The device failover shall result in an orderly transfer of operations to a backup device inthe event of failure of primary device. The device failover function may replace a failed device with an identical backup device or with a backup device that is different from thenormal device.

Device failover actions shall be completed and the backup device shall be operating within 30 seconds of detection of the device failure.

7.10.2 DEVICE REINSTATEMENT

Except for communications with PMUs and the data links to other control center computer systems, failed devices shall be reinstated by user command only. If the control center computer system has failed any PMU, other data source, or the communication channel (including the modem/controller) connecting the system to the PMU or data source, communications with the PMU data source shall be retried at a periodicity specified by the programmer. When reliable communications are re- established, as determined by a programmer-adjustable number of consecutive retries (initially three), the PMU, data source or communication shall be automatically returnedto Operation.

7.11 CONFIGURATION MANAGEMENT DISPLAYS

Each WAMS system shall include schematic and tabular displays for configuration management. The displays shall depict the state of each Server, peripheral device, andtheir interconnections, and include facilities for initiating user-commanded changes to the state and assignment of devices to Servers and user-commanded restarts, Server and device failover and Server start-ups. Displays to view and control the status of backup databases shall also be provided. Status of WAMS functions (Primary/ Backup)shall be displayed on the display.

DESIGN PARAMETERS FOR CONFIGURATION CHARACTERISTICS

DESCRIPTION	EXECUTIONRATE	RESPONSETIME
Server Errors and failure detection		5 seconds
Device error & failure detections		5 seconds
Server failover		
Function period < 30 secs.		20 seconds
Function period > 30 secs.		100 seconds
Server Start-Up		
Hot Start		5 minutes
Warm Start		10 minutes
Cold Start		15 minutes
Device Failover		30 seconds
Main & Back up control Centre		
Real-time data Update	1 seconds	40 milliseconds
Monitoring of each other's availability	1 minutes	41 milliseconds

8.0 INSPECTION & TESTING

8.1 QUALITY ASSURANCE PLAN

The bidder shall invariably furnish along with his offer the quality `assurance plan adopted is him/his sub-supplies in the process of manufacturing all major equipment/component. Precaution taken for ensuring usage of quality raw materials andsub-components shall be stated in the quality assurance plan.

The bidder should specifically express their consent to accept additions, revisions to their quality assurance plan to meet the SLDC-OPTCL's requirements if needed. The final quality assurance plan to be adopted, with mutual consent, shall be decided after discussion with successful bidder.

8.2 INSPECTION

All Equipment material & software for WAMS system shall be subject to both FAT & SAT. The purpose of acceptance testing is to determine compliance to this specification in every respect in regards to delivered & installed systems. Acceptance test shall comprise of both structured & unstructured test.

No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected, tested, and necessary dispatch instructions are issued in writing, except for the cases where waiver of inspection is granted by competent authority of the SLDC-OPTCL, and even in this case also written dispatch instructions will be issued. Any dispatches before the issue of Dispatch Instructions in writing will beliable for rejection and non-acceptance of the materials by the consignee.

The acceptance of any quantity of material shall in no way relieve the Bidder of any of his responsibilities for meeting all requirements of the Standards / Specification, and shall not prevent subsequent rejection if such material is later found to defective.

The SLDC-OPTCL reserves the right to insist for witnessing the acceptance routine testing of bought out items.

SLDC-OPTCL representatives shall be allowed access to the Contractor's facilities during system manufacturing and testing and to any facility where hardware or softwareis being produced. Office facilities, equipment, and documentation necessary to complete all inspections and to verify that the WAMS system is being produced and maintained in accordance with the Specification shall be provided to SLDC-OPTCL representatives by the Contractor.

SLDC-OPTCL representatives shall be allowed to review and verify the functional implementation of the WAMS System software informally in conjunction with scheduled project meetings at the Contractor's facilities. No test plans, procedures or reports are required to support these informal software demonstrations.

SLDC-OPTCL representatives shall be allowed to inspect the Contractor's hardware and software quality assurance standards, procedures, and records. Documents identified in the approved software quality assurance plan will be inspected to verify that the Contractor has performed the required quality assurance activities.

8.3 INSPECTION CERTIFICATE

The Contractor shall give the SLDC-OPTCL Inspector 15 day's written notice of any material being ready for testing. Such tests shall be to the Contractor's account. The SLDC-OPTCL Inspector, unless witnessing of the tests is waived, will attend such tests on the scheduled date for which SLDC-OPTCL Inspector has been so notified or on a mutually agreed alternative date.

The SLDC-OPTCL Inspector shall, within 15 days from the date of inspection as defined herein, give notice in writing to the Contractor of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall make the modifications that may be necessary to meet said objections. When the factory tests have been completed at the Contractor's or Subcontractor's works, the SLDC-OPTCL Inspector shall issue a certificate to this effect within 15 days after completion of tests but if the tests are not witnessed by the SLDC-OPTCL Inspector, the certificate shall be issued within 15 days of receipt of the Contractor's Test Certificate by the SLDC-OPTCL Inspector. The completion of these tests or the issue of the certificates shall not bind SLDC-OPTCL to accept the equipment should it, on further tests after erection, be found not to comply with the Contract.

In all cases where the Contract provides for tests, whether at the premises or works of the Contractor or of any Subcontractor, the Contractor except where otherwise specified shall provide free of charge items such as labour, materials, electricity, fuel, water stores, apparatus and instruments, as may be reasonably demanded by the SLDC-OPTCL Inspector or his authorized representative to carry out effectively such tests of the equipment in accordance with the Contract and shall provide facilities to the SLDC- OPTCL Inspector or his authorized representative to accomplish testing.

The inspection by SLDC-OPTCL and issue of Inspection Certificate thereon, shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Program forming a part of the Contract.

However, such inspection by SLDC-OPTCL representative shall not relieve the Contractor from the responsibility for furnishing material, software, and equipment to conform to the requirements of the Contract; nor invalidate any claim which SLDC- OPTCL may make because of defective or unsatisfactory material, software or equipment.

8.4 TEST PLANS AND TEST PROCEDURES

Test plans and test procedures shall be provided by the Contractor for all tests to ensure that each FAT and SAT is comprehensive and verifies the proper performance of the WAMS System elements under test. During the development of test plans and test procedures for the system, emphasis shall be placed on testing each conditional logic statement, checking error conditions, and documenting the simulation techniques used. The test plans and test procedures shall be modular to allow individual test segments to be repeated as necessary. They shall be subject to SLDC-OPTCL approval.

i. Test Plans

The test plans shall describe the overall test process, including the responsibilities of individuals and the documentation of the test results. The following shall be included in the test plans:

a. Test schedule on a day-by-day basis
b. Responsibilities of Contractor and SLDC-OPTCL personnel
c. Record-keeping assignments, procedures, and forms
d. Procedures for monitoring, correcting, and retesting variances
e. Procedures for controlling and documenting all changes made to the hardware and software after the start of testing
f. Block diagrams of the hardware test configuration, the external communication channels, and any test or simulation hardware.

ii. Test Procedures

The test procedures shall describe the individual tests segments and the steps comprising each segment, particularly the methods and processes to be followed. The test procedures shall include the following items:

a. Name of function to be tested
b. References to the functional, design, user, and any other documents describing the function.
c. List of test segments to be performed and the purpose of each test segment
d. Set-up conditions for each test segment, including descriptions of the test equipment
e. Descriptions, listings, and instructions for test software tools and displays if any.
f. Step-by-step descriptions of each test segment, including user actions for each test step
g. Expected results for each test segment, including pass/fail criteria
h. Descriptions of the techniques and scenarios to be used to simulate system field inputs and controlled equipment
i. Copies of any certified test data to be used in lieu of testing.

8.5 TEST RECORDS

Complete records of all factory and field acceptance test results shall be maintained by the Contractor. The records shall be keyed to the test procedures. The following items shall be

included in the test records:

a. Reference to appropriate test procedure
b. Date of test
c. Description of any test conditions, input data, or user actions differing from that described in the test procedure
d. Test results for each test segment including a pass/fail indication
e. Identification of Contractor's test engineer and SLDC-OPTCL's representative ifany.
f. Provision for comments by SLDC-OPTCL's representative
g. Copies of any variance reports generated
h. Copies of reports, display copies, and any other hardcopy generated as part of the test.

i. Reporting of Variances

Starting from the dry run test period, a variance report shall be prepared by Contractor personnel each time a deviation from the requirements of this Specification is detected in areas such as system functions, design parameters, performance, documentation, test plans, and test procedures. The report shall include a complete description of the variance, including:

a. Sequential identifying number assigned to the variance.
b. Date and time the variance was detected.
c. Appropriate references to the test procedures and this Specification.
d. Description of test conditions at the time the variance was detected.
e. Identification of Contractor and SLDC-OPTCL representatives.
f. Estimated date and time when variance is expected to be fixed.
g. Description of the corrective actions taken (to be completed as part of thevariance resolution process).
h. Dated signature lines for the SLDC-OPTCL and Contractor representatives tosignify reporting and correction of the variance.

Each variance shall be assigned to one of three classes defining the action to be takento resolve the variance:

a. **Class 1**: Testing will immediately stop and the Contractor will evaluate andcorrect the variance before testing is resumed
b. **Class 2**: Testing will continue and the variance will be evaluated and correctedby the Contractor at the end of the current session but prior to further testing
c. **Class 3:** Testing will continue and the variance will be evaluated and correctedat a mutually agreed upon time.

The class shall be assigned by the Contractor with SLDC-OPTCL approval.

Variance reports shall be available to SLDC-OPTCL for review and comment at all timesand shall be submitted by the Contractor to SLDC-OPTCL at the start of the availabilitytest. The Contractor shall maintain and periodically distribute a variance summary that lists for each variance the report number, a brief description of the variance, its class, and its current status (open or resolved). A variance summary shall also be submitted with the progress report.

ii. Resolution of Variances

All actions taken to correct variances shall be documented on the variance report by theContractor. Sufficient information shall be provided to enable a SLDC-OPTCL representative to determine the need for and extent of retesting, the need for testing interactions of the correction with any previously tested hardware or software, and the need for updating appropriate documentation. A variance shall be deemed resolved after retesting has been performed to the satisfaction of SLDC-OPTCL and the Contractor and SLDC-OPTCL representatives have acknowledged correction of the variance on the variance report.

8.6 TEST INITIATION

The following conditions must be satisfied before starting any test.

a. All test plans and procedures for the test shall be approved by SLDC-OPTCL.
b. All hardware and software engineering design change orders shall beincorporated into the system under test.
c. All relevant documentation including drawings, lists of deliverables, and software functional and design documents, and user manuals shall be approved by SLDC-OPTCL.
d. A complete regeneration of the software under test for which source code is beingsupplied shall be performed immediately prior to the start of factory testing.
e. All operating system parameters, files, and configuration information shall be saved to archive media so that the WAMS System operating environment can berecreated starting with an un-initialized system. The existence and completeness of this data shall be demonstrated to SLDC-OPTCL.
f. All database, display, and report definitions shall be saved to archive media so that the databases, displays, and reports can be recreated if necessary.
g. The image backup of all applications of WAMS system shall be taken on the archive media so that WAMS system software can be regenerated if necessary.
h. A complete dry run of each factory test (excluding the integrated system test) shall be conducted by the Contractor using the approved test plans and test procedures. Written certification that the dry run has been successfully completedshall be provided to SLDC-OPTCL at least one week prior to the start of each factory test. At SLDC-OPTCL's option, SLDC-OPTCL representatives will witness and participate in the dry run of any test.

8.7 TEST COMPLETION

A test shall be deemed to be successfully completed only when:

a. All variances have been resolved to the satisfaction of SLDC-OPTCL.
b. All test records have been transmitted to SLDC-OPTCL.
c. SLDC-OPTCL acknowledges, in writing, successful completion of the test.

8.8 TEST SUSPENSION

Any time SLDC-OPTCL representatives believe that the quantity or severity of variances warrants suspension of any or all testing, the test shall be halted, remedial work shall be performed, and the complete test shall be repeated. The repeat of the test shall be scheduled for a date and time agreed upon by both the Contractor and SLDC-OPTCL.

8.9 FACTORY ACCEPTANCE TEST REQUIREMENTS

The database, displays and the report formats developed by the contractor shall be demonstrated and verified by the SLDC-OPTCL before FAT.

The contractor shall also carry out testing of their IEEE C37.118.2011 part-1 & 2 with all amendments protocol implementation for successful integration by interfacing with existing PMUs before the FAT starts. The contractor shall also carry out testing of their IEC-60870-5-104 and ICCP protocol implementation for successful integration by interfacing with existing Control Center before the FAT starts. The database and the report formats developed by the contractor for Control Center shall be verified by the SLDC-OPTCL before factory testing.

All hardware and software associated with Control Centre shall be staged and completely tested with simulated data at the Contractor's facility. The MICC for all hardware shall be issued only after successful completion of FAT as per specification. At least two PMUs for each protocol shall be connected with Control Centre and the remaining PMUs shall be simulated in the factory test environment. The IEC-60870-5- 104 and ICCP data exchange shall also be simulated in the factory test environment.

The Contractor is responsible for conducting all factory tests. SLDC-OPTCL will witness all tests and will perform selected test procedures. Knowledgeable Contractor personnel shall be present at all times to assist SLDC-OPTCL representatives with factory testing as needed. SLDC-OPTCL will not accept un-witnessed test results of any hardware or software without previous written authorization.

Each of the factory tests described below (i.e. the hardware integration test, the functional performance test, and the integrated system test, unstructured tests) shall be carried out under factory test.

i. Hardware Integration Test

The hardware integration test shall confirm that the computer hardware conforms to this Specification and the Contractor-supplied hardware documentation. The hardwareintegration test shall be performed when the computer hardware has been installed in the Contractors factory. The operation of each item shall be verified as an integral part of the 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. Equipmentexpansion capability shall also be verified during the hardware integration test.

ii. Functional Performance Test

The functional performance test shall completely verify all features of the WAMS hardware and software. As a minimum, the following items shall be included in the functional performance test:

a. Inspection of all equipment for conformance to drawings/document and satisfactory construction and appearance
b. Testing of the proper functioning of all software, including test cases with normal and exception user-entered inputs and responses
c. Simulation of local error and failure conditions
d. Verification that ultimate expansion requirements are met.
e. Verification of data link interfaces with other Control Centre systems
f. Verification of PMU communication interfaces and data link interfaces with other control center computer systems.
g. Simulation of PMU and data link communication errors and channel failures, including incorrect check codes and random channel noise bursts
h. Testing of all user interface functions, including random tests to verify correct database linkages
i. Simulation of hardware failures and input power failures to verify the reaction of the system to server and device failure
j. Demonstration of all features of the database, display, and report generators and all other software maintenance features
k. Demonstration of the software utilities, libraries, and development tools.
l. Verification that the computer system meets or exceeds SLDC-OPTCL's performance requirements
m. Verification of the accuracy of hardware and software documentation via random tests
n. Testing of spare parts

iii. Integrated System Test

The integrated system test shall verify the stability of the WAMS hardware and softwareafter the functional performance test has been successfully completed. During the integrated system test,

all WAMS functions shall run concurrently and all Contractor- supplied equipment shall operate for a continuous **100-hour period**. This minimum level of activity may be augmented, at the discretion of SLDC-OPTCL, by other activities that represent normal day-to-day operation of the system as long as these activities are conducted in accordance with the training and documentation provided with the system.These other activities may include, but shall not be limited to, database, display, and report modifications, software development activities, configuration changes (including user-commanded server and device failovers), and the execution of any function described in this Specification.

The integrated system test shall assure SLDC-OPTCL that the computer system is freeof improper interactions between software and hardware while the system is operating as an integrated unit.

iv. Unstructured Testing

Periods of unstructured testing shall be allocated to allow SLDC-OPTCL representatives to verify proper operation of the WAMS System under conditions not specifically included in the approved test procedures. Unstructured testing shall be conducted in compliance with the following conditions:

a. A minimum of 25 percent of the actual test period shall be reserved for unstructured test of the system by SLDC-OPTCL representatives
b. The Contractor's test representative shall be present and the Contractor's other technical staff members shall be available for consultation with SLDC-OPTCL personnel during unstructured test periods
c. All simulation software, test cases, and other test facilities used during the structured portions of the factory tests shall be made available for SLDC-OPTCL's use during unstructured testing
d. Unstructured testing shall not begin prior to the start of the functional performancetest
e. Unstructured testing shall be allowed at SLDC-OPTCL's discretion both at the end of a structured test segment and after completion of the functional performance test.

8.10 SITE ACCEPTANCE TESTS

The Contractor's maintenance records shall be reviewed prior to field (also referred as site) testing to identify all hardware and software modified, repaired, or replacedbetween the completion of factory tests and the start of field testing. Interfaces to all communications circuits shall be established by the Contractor and the proper operationof these circuits shall be verified.

For the purpose of interpreting the requirements for test plans, test procedures, test records, test initiation, and test completion, field testing shall be considered a single testaccomplished for each computer system in three phases:

a. The field installation test,
b. Pre-field performance test, and

c. The field performance test.

i. Field Installation Test

The field installation test shall provide verification that computer system is operationally equivalent to the system that successfully completed factory testing. The responsibility for the conduct of the field installation test shall rest with the Contractor. SLDC-OPTCLwill witness all tests and will perform selected test procedures. Knowledgeable/Experienced Contractor representatives shall be present at all times to assist SLDC-OPTCL representatives with the testing.

The field installation test shall consist of the functional performance test to confirm operation of basic functions such as data acquisition, user interface, and the support and utility functions. All hardware shall be tested by running diagnostics. The exact content of the field installation test shall be determined jointly by the Contractor and SLDC-OPTCL.

ii. Pre-Field Performance Test

After the field installation test, the Contractor shall:

a. Verify the operation of PMU, datalinks and remote consoles
b. Correct and update the database, reports, and displays
c. Install and test SLDC-OPTCL/owner-developed software if any and
d. Establish connectivity with WAMS system and other IT application provided by SLDC-OPTCL/owner. The Contractor shall be responsible for providing and installing corrections for all variances found during this period prior to the start of the field performance test. Further the contractor shall also train the dispatchers before field performance test starts.

iii. Field Performance Test

After the completion of activities, the Contractor shall conduct the field performance testto verify those parts of the functional performance test that were not fully tested as part of the field installation test. All variances found during this period shall be fixed by the Contractor or otherwise resolved to SLDC-OPTCL's satisfaction prior to the start of theavailability test.

The field performance test shall concentrate on areas of WAMS operations that were simulated or only partially tested in the factory (e.g., system timing and loading while communicating with a full complement of PMUs and data links and system reaction to actual field measurements and field conditions). The validity of factory test results determined by calculation or extrapolation shall be examined. The Contractor shall be required to repeat selected portions of the field installation test during the field performance test if SLDC-OPTCL believes that previously tested functions have since been modified and are not operating in accordance with the Specification. Provisions forunstructured testing by SLDC-OPTCL personnel shall be provided.

8.11 AVAILABILITY TEST

After field performance test, a **1000-hour** availability test shall be conducted on supplied systems under normal day-to-day operating conditions. The test shall verify the reliability and integrity of the database, displays, report and all communication interfaces and, under these conditions, verify system availability for **99.95%.** Further each server and device and PMUs if applicable shall meet a minimum availability of **98% individually**.

In case of PMUs, if applicable, downtime of individual PMUs are to be excluded from system availability calculations, however, **minimum 75% PMUs** shall be reporting for test to continue, unless there is a communication constraint.

8.12 TEST RESPONSIBILITIES

SLDC-OPTCL will be responsible for conducting the availability test. The test shall consist of normal WAMS functions without special test equipment or procedures. Test records defined in the availability test plan and procedures will be maintained by SLDC-OPTCL personnel. SLDC-OPTCL/Owner will operate and maintain the system according to procedures described in the approved Contractor documentation. WAMS System maintenance on an on-call basis shall be provided by the Contractor during the availability test period. When on-site maintenance support is needed, qualified Contractor personnel shall arrive at the site within maximum four (4) hours of notification and shall keep SLDC-OPTCL/Owner fully informed of the progress in problem resolution.

The contractor shall maintain an inventory of spare parts, which may be required to achieve the specified availability. These spares shall be in addition to the mandatory spares. All spare parts used during the availability test shall be drawn from contractor's inventory.

During the availability test period, SLDC-OPTCL reserves the right to modify the databases, displays, reports, and application software. Such modifications will be described to the Contractor at least **48 hours** in advance of implementation to allow their impact on the availability test to be assessed, except where such changes are necessary to maintain control of the power system.

9.0 DOWNTIME

Downtime occurs whenever the criteria for successful operation defined specification are not satisfied. Downtime shall be measured from the start of diagnostic procedures until full service is restored. In the event of multiple failures, the total elapsed time for repair of all problems (regardless of the number of maintenance personnel available) shall be counted as downtime. For on-site response the delay in response time **(more than four hours)** shall be added to downtime.

10.0 HOLD-TIME

During the availability test, certain contingencies may occur that are beyond the control of either SLDC-OPTCL or the Contractor. These contingencies may prevent successful operation of the system, but are not necessarily valid for the purpose of measuring WAMS System availability. Such periods of unsuccessful operation may be declared "hold-time" by mutual agreement of SLDC-OPTCL and the Contractor. Specific instances of hold-time contingencies are:

a. **Scheduled Shutdown:** During scheduled shutdowns, or if an equipment failure occurs while its backup device is scheduled out-of-service, the resulting system outage shall be hold-time, provided that service can be restored according to Contractor-specified procedures within 30 minutes.

b. **Power Interruption and Environmental Excursion**: Loss of power or manual shutdown in the event of loss of environmental control shall be considered hold-time. If the system is operated during periods of power or environmental conditions beyond those specified, any resultant downtime shall also be considered hold-time.

c. **Intermittent Failure**: Periods during which an intermittent, recurring software or hardware failure is experienced will be considered hold-time, provided that the Contractor is engaged in remedial action and normal functions can be restored by Contractor-defined procedures whenever the failure occurs. Instead of accounting for the actual intermittent downtime, one hour of downtime shall be counted for each 120 hours of otherwise successful operation while the problempersists.

d. **Failure of SLDC-OPTCL's Software**: Time during which the system is down due to failure of software written and independently produced by SLDC-OPTCL shall be considered hold-time. If a failure in such software cannot be overcome by Contractor- defined procedures, execution of the failed program will be suspended. Programs developed by SLDC-OPTCL personnel under Contractorsupervision are specifically excluded from this provision.

e. **Service Response Time**: A maximum four (4) hours of hold time will be allowed for the Contractor to respond to each call for maintenance support. The time between detection of a failure and the start of diagnostic procedures shall also be considered hold-time when performed by SLDC-OPTCL's personnel.

f. **Corrected Design Defect**: Hold-time may be declared by mutual agreement to ensure against similar future occurrences if a failure occurs due to a defect in system design for which the Contractor defines and implements correctivemeasures. In such a case, hold-time shall be allowed in increments of 120 hoursto allow verification of the corrective action.

11.0 TEST DURATION AND CRITERIA FOR ACCEPTANCE

After the elapse of **1000 hours** of cumulative test time, the availability shall be calculated considering the downtime recorded. Should availability falls short of specified percentage, the contractor may either (a) Continue the test by moving the starting time of the test forward and continuing the test until the consecutive subject to maximum of 75 days, Or (b) the contractor

may restart the test for 1000 hours, however, more than two such restart shall not be allowed.

To establish that all failures have been satisfactorily repaired prior to the end of the availability test, no downtime, intermittent (hold time) failures, or more than one uncommanded fail over shall have occurred within 240 hours of the test's conclusion.

The successful completion of the availability test will lead to Operational Acceptance of the system.

12.0 CRITERIA FOR SUCCESSFUL OPERATION

The system shall be designed to meet the total system availability of **99.95%.** That is, the ratio of total operational time minus downtime to total operational time shall be equal to or greater than **0.9995**. Total operational time shall not include the hold time. The system shall be considered available as long as all functions defined under specification are available. Further each server and device and PMUs shall meet a minimum availability **of 98%** individually.

13.0 CONTRACTOR'S MAINTENANCE RESPONSIBILITY TILL OPERATIONAL ACCEPTANCE

During this period, the Contractor shall make available resident Project Manager, hardware & software specialists, who shall be available upon notification by the SLDC-OPTCL about any problem(s) that may exist. The contractor's specialists shall be required to respond to the SLDC-OPTCL notification in line with the provisions of technical specifications. The contractor shall replace or repair all defective parts and shall have prime responsibility for keeping the system operational.

14.0 PACKING AND TRANSPORT

All equipment/material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The contractor shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. `FRAGILE' `HANDLE WITH CARE', `USE NO HOOK' etc. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.

Wherever necessary proper arrangement for attaching slings for lifting shall be provided and all packages clearly marked with gross weight, signs showing `UP' and `DOWN' sides of boxes, contents of each package, order no. and date, name of the plant/SS/ of which the material in the package forms part of and any handling and unpacking instructions considered necessary. Any material found short inside the intact packing cases shall be supplied by the manufacturer/supplier without any extra cost.

Bidder shall ascertain, prior to shipment, from concerned authorities, the transport limitations like weight and maximum allowable package size for transportation. Fragile material such as PMU cases, Instruments and other glass material shall be carefully covered with shock absorbing protective materials, such as thermos cool, silica gel or equivalent moisture absorbent material in small cotton bags shall be placed inside the packing wherever necessary. Each consignment shall be accompanied by a detailed packing list containing the following information.

a. Purchase order reference
b. Name of consignee
c. Details of consignment
d. Destination
e. Total weight of consignment
f. Handling and unpacking instructions.
g. Bill of materials indicating contents of each package
h. Sign showing upper/lower side of the crate

15.0 APPENDIX-I, PART: A (BOQ)

BOQ FOR WAMS PROJECT IN OPTCL

Bill of Quantity for WAMS at Main Control Centre SLDC			
Sl.No.	**Name of the Item**	**Unit**	**Quantity**
A	**SOFTWARE**		
1	Software for Real Time PDC & Analytical Applications		
a	Super PDC Software	Lot	1
b	Analytical Applications-Oscillation Monitoring System(OMS)	Lot	1
c	Programming Development System(PDS) Software	Lot	1
d	Software for remote Consoles	Lot	1
2	Software for Historian & Data Archiving		
a	Data Historian Software	Lot	1
b	Software for NAS	Lot	1
3	Software for Infrastructure Management		
a	Network Management System & Centralized Management System	Lot	1
b	Patch Management software	Lot	1
c	Identity Server Software	Lot	1
d	Anti-Virus Software for all Machines in the control centre.	Lot	1
B	**HARDWARE**		
4	Hardware for Real Time PDC & Analytical Applications	Set	2

a	Super PDC (The PDCs shall be sized to collect the data directly from PMUs and indirectly from other PDCs)		
b	Time System (GPS Receiver)		
c	Analytical Application Server		
d	Any other Hardware required for Real Time PDC & Analytical Applications.		
e	Programming Development System (PDS) Server		
f	70" SXGA+ LED Lit video Wall`	Cubes	4
5	Hardware for Historian & Data Archiving		
a	Storage Area Network (SAN) based Storage or any other specialized Storage Solution of Minimum 500 TB data storage Capacity of RAID 10 or better configuration for storing PMU Data for One yea	No.	1
b	Data Historian Server	No.	2
c	Network Attached Storage (NAS) System of Minimum 6TB of RAID 10 or better configuration	No.	1
d	Any other Hardware required for Historian & Data Archiving	No.	1
6	Hardware for Infrastructure Management	Set	2
a	NMS Server cum Centralized Management Console		
b	Patch management Server		
c	Identity Server		
d	Any other Hardware required for Infrastructure Management		
7	Workstation Consoles		
a	Workstation Console integrated with dual Touch-screen Monitors for PDC Application	No.	2
b	Workstation Console integrated with dual Touch-screen Monitors for Programming Development System	No.	1
8	Remote Consoles		
a	Remote Consoles, equivalent to Work station console.	No.	2
9	Networking Hardware		
a	Firewall with NIPS with Minimum 8 x 10Gbps Fiber optic ports and 2 x 1Gbps Ethernet ports	No.	4
b	WAN Router for Communicating with Super PDCs ,PMUs, SCADA, Remote PDC at RLDCs/NTAMC and Remote Consoles (Minimum 4 x 10 Gbps Fiber Optic Ports and 8 x 1 Gbps Ethernet ports)	No.	8
c	WAN router at Remote Console end (Minimum 2x10Gbps Fiber optic ports and 4x 1Gbps Ethernet ports)	No.	2
d	LAN Switch (Layer 3) with minimum 8x10 Gbps Fiber Optic Ports and 8 x 1 Gbps Ethernet Ports for the following LANs		
	PDC LAN	No.	2
	Historian LAN	No.	2
	Infrastructure Management LAN	No.	2
	LAN for Remote Consoles	No.	2
	Analytical Applications LAN	No.	2
10	Color Laser Printer	No.	1

11	Miscellaneous Items	Lot	1
a	Armored Fiber Optic Cable and associated termination for connecting PMU panels located in different control room of a station.		
b	Any additional item (Hardware and Software) required to meet the specification requirement.		
c	Any other additional item e.g Server Rack, Computer desk, Power supply cable and networking cable.		
C	**SERVICES**		
1	Integration of WAMS System at Super PDC with following units/applications:		
a	Integration of WAMS system at Main SLDCs with existing SCADA/EMS System of Main SLDC.		
b	Integration of existing PMUs & PDCs installed under URTDSM scheme.		
c			
d	Cyber Security Audit by Cert-IN certified Auditors during FAT.		
e	Cyber Security Audit by Cert-IN certified Auditors during SAT.		
f	Integration of WAMS system with Video Projection System.		
D	**TRAINING**		
	Training for SLDC- Man days @15 * 6 persons	Man days	90
E	**ANNUAL MAINTENANCE CONTRACT (AMC)**		
a	Annual Maintenance Contract (AMC) of Complete System Supplied for Initial Period	Lot	1
b	Annual Maintenance Contract (AMC) of Complete system supplied for subsequent 6 years, after completion of initial period of AMC.	Lot	1
c	Annual Cyber Security Audit by Cert-IN certified Auditors during AMC Period.	Lot	1
d	Pre-deployment testing & Installation of Patches/Updates released during the AMC period for all Software Products (developed & supplied by the Contractor and also all 3rd party Software) supplied under this Project	Lot	1
F	**Additional Services during Maintenance period**		
a	Integration of PMUs with SLDC during the AMC period (10 PMUs per year)	Lot	1
b	Services for migration from IPv4 to IPv6 for all equipment control center wise.	Lot	1
Bill of Quantity for PMUs under WAMS Project in OPTCL			
A	**SOFTWARE**		
1	PMU configuration software	Lot	67
B	HARDWARE		
1	PMUs		
a	Minimum No. of PMUs to be delivered at substations/Power plants at locations as identified in Phasors List at Appendix-A.	No.	67
b	Panel for mounting PMUs (complete with all necessary accessories,	Lot	As per

	cables etc. as per specification) along with identified analog channels / modules		Phasor list given at Appendix-A
c	Substation Grade Layer-3 LAN Switches with minimum 4 x 10/100 Mbps Ethernet ports and 2 x 1 Gbps Ethernet ports	Lot	
d	PMU HUB switch (1 no. per each S/S having multiple PMUs)	Lot	
e	Time System (GPS receiver)	No.	21
f	PMU configuration tool (Laptop)	No.	2
B	**TRAINING**		
	Training (For 5Persons @ 3mandays)	Man days	15
C	**Annual Maintenance Contract**		
a	Annual Maintenance Contract (AMC) of Complete System Supplied for Initial Period		
b	Annual Maintenance Contract (AMC) of Complete system supplied for subsequent 6 years, after completion of initial period of AMC.		
Bill of Quantity for Mandatory Spares for WAMS Project			
A	**Following Spares @ 10% of the supplied quantity or minimum one no of each type (whichever is higher) shall be provided for every Control Center. For similar BOQ items with different configurations, items of highest configuration shall be supplied as spares, provided that the highest configuration device shall be able to replace the lower configuration device.**		
a	Servers		
b	LAN Switches		
c	WAN Routers		
	Workstation Console integrated with dual Touch-screen Monitors		
	GPS Receivers at Control Center		
B	**Spares for Historian Solution**		
C	**Spares for Substation Equipment**		
a	10% of the PMUs of each configuration supplied		
b	10% of the Substation grade L-3 LAN switches of each type		
c	10% of the GPS Receivers supplied		

16.0 APPENDIX-I, PART: B (GTP)

16.1 SERVERS

Analytical Application Server, PDC, PDS, Historian, NMS cum CMC, Identity, Patch Management Servers - (Please fill for each server as per BOQ)

Sl.No.	Description of the Features	Minimum quantity of the features required in each non redundant set of the category.			Offered by the Contractor in each category
		Real Time	Historian &	Infrastructur	

		PDC & Analytics	Data Archiving	e Management	
1	Application				
2	Manufacturer				
3	Model No.				
4	Country of Origin				
5	No. of CPUs & Cores & Clock Frequency	2*8 Min 2.2GHZ	1*12 Min 2.2GHZ	1*12 Min 2.2GHZ	
6	RAM Required	128GB	64GB	48Gb	
7	Internal Auxiliary Memory	500GB delivered , expandable up to 1TB	500GB delivered , expandable up to 1TB	500GB delivered , expandable up to 1TB	
8	Internal optical drive	DVD (R+W)	DVD (R+W)	DVD (R+W)	
9	Interface Ports	1 Gbps dual Ethernet ports (Minimum) in each server			
10	Power Supply	Dual AC Power Supply			
11	User Interface	Through a common TFT monitor, keyboard & mouse connected through KVM Switch in a server rack.			
12	Mounting	Rack Mountable.			

16.2 WORKSTTION CONSOLES AND REMOTE WORKSTATION CONSOLES

Sl.No.	Description of the Features	Minimum Quantity of the features	Offer by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of Origin		
4	Specint & Specfp	As per the base runtime requirements of SPEC CPU 2006 Benchmarking Standards.	
5	RAM	32 GB delivered, expandable upto 256 GB	
6	Internal Auxiliary memory	320GB delivered, expandable upto 1 TB	
7	Internal Optical Drive	DVD (R+W)	
8	Speakers	Two external speakers	
9	Interface Ports	1 Gbps dual Ethernet ports in each workstation, USB ports.	
10	Power Supply	AC Power Supply	
11	Mounting	Desktop Mounting	

16.3 COLOR TOUCH SCREEN MONITORS

Touch Screen Monitor for Work Stations and Remote Consoles

Sl.No	Description of the Features	Minimum Quantity of the features	Offer by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of Origin		
4	Diagonal Viewable size	At least 22”	
5	Color Support	16.7 million	
6	On screen Control	Required	
7	Touch screen feature	Multi touch/ Optical Touch	
8	Response Time	Maximum 15 milliseconds	
9	Tilt, Swivel	Yes	
10	Aspect Ratio	16:9	
11	HD Resolution	1920*1080	

16.4 COLOR LASER PRINTER

Sl.No.	Description of the Features	Minimum Quantity of the features	Offer by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of Origin		
4	Functions		
5	Paper Size	A3,A4	
6	Print Speed	30 Color pages/minute of A4 size & 15 Color pages/minute of A3 size.	
7	Print resolution	600 * 600dpi	
8	Paper Weight	75-200 GSM	
9	First Page out time	10 sec for A4 Black & White, 15 sec for A4 Colour	
10	Duty cycle	100000 pages per month	
11	Paper handling capacity	Minimum 500 sheets of input trays & 200 sheets of output tray.	
12	Automatic Duplex printing	Yes	
13	Landscape and portrait orientation	Yes	
14	Interface	1 Gbps Dual Ethernet port at all Control Centers	

16.5 INDUSTRIAL GRADE LAYER-3 LAN SWITCH

Sl. No.	Description of	Minimum Quantity of the features	Offer by the

	the Features		Contractor
1	Manufacturer		
2	Model No.		
3	Country of Origin		
4	Performance	Minimum 5 Gbps Switching Capacity	
5	Functions	Data Exchange between PMU and PDC	
6	Layer-2 & Layer-3 features required	Static Routing for IPv4 and IPv6	
		RIP for IPv4 (RIPv1/v2) and IPv6 (RIPng)	
		OSPF for IPv4 (OSPFv2) and IPv6 (OSPFv3)	
		Border Gateway Protocol 4 with support for IPv6 addressing wherever applicable.	
		Policy-based routing	
		IPv6 tunneling to allow IPv6 packets to traverse IPv4- only networks by encapsulating the IPv6 packet into a standard IPv4 packet.	
		Dynamic Host Configuration Protocol (DHCP) client, Relay and server.	
		Support for Multicast VLAN	
		Support for Jumbo frames	
		Should provide for 32K MAC Address Table	
		Should have facilities such as IPv6 to IPv4 tunneling, DHCPv6, ICMPv6	
7	Features to support	Support IEEE 802.3u: Auto-negotiation on TP, IEEE 802.3x, 802.1p: flow control and prioritization, IEEE 802.1Q: VLANs, maximum 32 VLANs, IEEE 8021.1d, 802.1w: Spanning Tree, Rapid Spanning Tree including RSTP 2004 extensions providing subsecond hop on rings, IEEE 802.1p: DiffServ, traffic prioritization for routed IP flows/ports Shall support Multicast and Unicast.	
8	Network Management	• Console port for configuration of software features • Shall able to manage the switch through Command-line interface, Web browser, SNMP, etc.	
9	Security	**a**. Access Control Lists for both IPv4 and IPv6 for filtering traffic to prevent unauthorized users from accessing the network	
		b. Port-based rate limiting and access control list (ACL) based rate limiting	
		c. IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port	
		d. Media access control (MAC) authentication to provide simple authentication based on a user's	

		MAC address	
		e. Dynamic Host Configuration Protocol (DHCP) snooping to prevent unauthorized DHCP servers	
		f. Port security and port isolation	
10	Speed configurability at each port	WAN ports optional 64kbps to 2Mbps	
11	Interface ports	As per BoQ The BOQ requirement is the minimum in every switch at Substations. The no. of ports in LAN switches at Substations shall be optimized as per the Phasors list given at Appendix-H of Part-B and additional 50% expansion ports shall also be provided in the LAN switch.	
12	Mounting	Rack mountable	
13	Environmental Compliance	IEC61850-3 and IEEE1613 (Electric Utility Substation),EMS-IEC61000, EMI: FCC part15 A	
14	Operating temp	- 10 to 75C° , no fans	

16.6 WAN ROUTER AT CONTROL CENTERS

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Functions	High performance Routing for data exchange between data centres, remote VDUs.	
5	Routing Capability	Layer -2 & Layer-3 routing & Dynamic discovery of routing	
6	Processing capacity	Minimum 2Mpps	
7	Features to support	QoS, MPLS, Security, Broadband, Multiservice, Voice, IP to IP Gateway	
8	Routing protocols	IS-IS, OSPF, BGP**, ARP, IPCP, IP Forwarding, VLAN & MPLS etc. ** wherever applicable	
9	Network protocols	TCP/IP, IPv6, OSI, Telnet, UDP, DHCP	
10	Network management	Using SNMP Protocol	

11	Minimum Inbuilt software firewall features	a. Data encryption supported DES (56BITS) 3des (168 bits) and hashing algorithm like MD5 and SHA-1 b. Filtering of packets based on Source address, Destination address, Protocoltype, User, Port number, URL c. Filtering of Protocols such as FTP, SMTP, HTTP, SNMP, UDP, ICMP, RPC, DNS, DHCP, ARP d. Minimum 100 IPSec VPN tunnels support e. Detailed system logging	
12	Speed configurability at each port	All ports shall be configurable from 64kbps to 2Mbps	
13	Interface ports	**As per BOQ** There shall be 50% spare ports in every router over above the BOQ specified quantity of ports.	
14	Mounting	Rack mountable	

16.7 PHASOR MEASUREMENT UNIT (PMU)

The supplied Phasor Measurement Units (PMUs) shall be compliant to IEEE 37.118 Standard:

Sl.No.	Description of the Features	Minimum Quantity of the features	Offer by the Contractor
1	Device	Phasor Measurement Unit	
2	Manufacturer		
3	Model No.		
4	Country of origin		
INPUTS			
5	Minimum Analog Channel	No of PMUs shall be optimised as per section 2.2.1 of Part-B, Technical Specifications.	
6	Minimum Digital Channels	No of PMUs shall be optimised as per section 2.2.1 of Part-B, Technical Specifications.	
7	CT core	Capable for Metering Core	
8	Auxiliary Power Supply Source	220 V DC or 110V DC or 48V DC (+10%, -15%) power supply source	
9	Communication ports	One Ethernet port of 10/100 Base Tx and oneoptical fiber port of 100 Mbps	
10	Interface ports for Time synchronization	IRIG-B interface port for either a standard or high-accuracy demodulated IRIG-B time-synchronization input signal or Ethernet port on IEEE 1588v2.0	
11	Communication Protocols	Both Multicast and Unicast	
MEASUREMENT OUTPUT			
12	Performance Class	M class	
13	Test Compliance asper IEEE 37.118	Bidder to fill the values as per test conducted inthe lab for each individual values both in steadystate and Dynamic State as per IEEE C37.118 Standard	
14	Environmental Condition During testing	Bidder to fill the environmental condition duringtesting for each test.	
15	Reporting rates (Frame per second)	25 and communication port wise	

ENVIRONMENTAL CONDITION			
16	Temperature	-10 to 50 degree Celsius	
17	Humidity	10% to 95%	
18	Configuration tool		
19	HMI facility	Yes	
20	Remote configuration Change	Yes	

16.8 GPS BASED TIME FACILITY

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Time stability of internal time base	Minimum 1 ppm	
5	Propagation delay compensation	Yes	
6	Include an offset to permit correction to local time	Yes	
7	Reverting to internal time base upon loss of signal from UTC source	Yes	
8	Resynchronization Delay	Not more than 5 Minutes	
9	Accuracy of resynchronization	< 1.5 Micro Sec	
10	Interfaces	Minimum one Ethernet port or One IRIG-B port asapplicable.	

16.9 FIREWALL

Features/Characteristics required for Firewalls:

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Data encryption support	3DES (168 bits), AES 128-, 192-, 256- bit and hashing algorithm like MD5 , SHA-1, IKE, PKI (X.509) and IKEv2 with EAP	

5	Support Active-Active mode	Yes	
6	High Availability & Load balancing	Yes	
7	Support NAT, PAT & Policy based NAT/PAT, Mapped IP (MIP), Virtual IP(VIP) & MIP/VIP grouping	Yes	
8	IP address assignment features	PPPoE, DHCP	
9	Support VoIP protocols	H.323, SIP, MGCP, SCCP	
10	IPv6 features	Syn Cookie, Syn-proxy DoS attack detection, SIP, RSTP, Sun-RPC, ALG's, RIPng, BGP4 ** ,DHCPv6 Relay, IPv4 to IPv6 translations & Encapsulations ** wherever applicable	
11	System management	Using web UI, Command Line interface (console/telnet/SSH).	
12	Filtering of packets basedon Source address, destination address, protocol type, user, port number, URL.	Yes	
13	Filtering of protocols	FTP, SMTP, HTTP, HTTPS, SNMP, UDP, ICMP, RPC, DNS, DHCP, ARP, TCP, POP3	
14	Authentication protocols	RADIUS, LDAP and PKI methods	
15	Dynamic routing protocols	RIP v2, OSPF, & BGP** ** wherever applicable	
16	DoS & DDoS prevention	Yes	
17	TCP reassemble for fragmented packet protection	Yes	
18	Brute Force attack mitigation	Yes	
19	SYN cookie protection	Yes	
20	Zone based IP spoofing	Yes	
21	Malformed packet protection	Yes	
22	DNS guard features	Yes	
23	Content filtering	JAVA & ActiveX blocking	
24	Antivirus, anti-worm, anti-spam and anti-spyware protection	Yes	
25	System Logging & monitoring	Syslog, Email, SNMP and VPN Tunnel Monitor.	
26	Stateful packet inspection	Yes	
27	Assign zones to virtual & physical interfaces	Yes	

Sizing Parameters for Firewall:

Sl.No.	Description of the Features	Minimum Quantity of the features required in Firewall	Offered bythe Contractor
1	Manufacturer		
2	Model No.		
3	No. of users	Unlimited	
4	Minimum number ofconcurrent sessions	500	
5	Minimum new sessions persecond processing	500	
6	Minimum Firewall + IPS throughput	1.5 Gbps ** ** For continuous traffic (Phasor Streaming from PMU/PDC to hierarchical nodes), firewall loading shall not exceed 30% of throughput capacity with all firewall functions ONat any Control Center".	
7	Minimum 3DES/AES VPN throughput	350 Mbps	
8	No of VLANs	200	
9	Minimum IPSec VPN peers	200	
10	Minimum number interfaceports	As per BOQ	

16.10 LAN SWITCH AT CONTROL CENTERS

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Functions	For connecting all servers & peripheral devices on Local Area Network (LAN).	

5	Conform to standards	ISO8802 or IEEE 802 Series Standards	
6	Switching capability	Layer-3 switching & VLAN	
7	Interface ports	10 Gbps Fibre Optic Ports for connecting on Dual fibre optic LAN at NLDCs, RLDCs & NTAMC – As per BOQ 1 Gbps Ethernet ports at SLDCs – As per BOQ	
8	Cable standard	Cat 6 or higher bandwidth cable	
9	Mounting	Rack mountable	

16.11 PANELS

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Functions	For mounting or placement of equipment	
5	Mounting	Floor mounted with front & rear access to hardware and wiring	
6	Cable entry	Bottom	
7	Internal lighting lamp	Yes, with door interlock	
8	230V AC, 15/5 A Internal power socket with switch	Yes	
9	All material used in the panelare flame retardant	Yes	
10	All Louvers provided with suitable wire mesh	Yes	

16.12 SAN (STORAGE AREA NETWORK) BASED STORAGE OR ANY OTHER SPECIALIZED STORAGE SOLUTION FOR STORING PMU DATA

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Capacity	Minimum usable capacity as specified in BOQ	
5	Spare HDD	Critical spares as identified in the BOQ for spares (**Appendix-F**)	

6	Expandability	50% spare slots	
7	RAID level	RAID 10 or better	
8	SAN Type and Interface ports	iSCSI / Ethernet/Fiber optic ports as applicable	
9	Snapshot feature with license	Yes	
10	Hard Drives speed	10000 or more rpm if applicable based on Historian Solution	
11	Hot swappable Hard Drives	Yes	
12	Dual Power Supply	Yes	

16.13 NETWORK ATTACHED STORAGE (NAS)

Sl.No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Capacity	Minimum usable capacity asspecified in BOQ	
5	Spare HDD	Critical spares as identified in the BOQ for spares(**Appendix-F**)	
6	Expandability	50% Spare Slots	
7	RAID level	10 or better	
8	Hard Drives speed	10000 or more rpm	
9	Hot swappable Hard Drives	Yes	

16.14 KVM FOR SERVERS

Sl.No.	Description of the Features	Minimum Quantity of the features	Offer by the Contractor
1	Manufacturer		
2	Model No.		
3	Country of origin		
4	Components	Rack mountable Monitor, Keyboard, mouse along with KVM Switch	
Monitor features:			
5	Diagonal Viewable size of monitor	Minimum 15”	
6	Colour support	16.7 million	
7	On screen control	Required	
8	Aspect ratio	16:9 or 4:3	

17.0 APPENDIX I, PART: C

Sl. No.	KV S/S	Name of Station	No. of Fdrs.	Name of Feeder	Min. of PMUs to be delivered at Locations	3-Phase Voltage Phasors(Vr, Vy, Vb)	3-Phase Current Phasors (Ir,Iy,Ib)	Positive sequence voltage & current	Digital Inputs (Dis)	Frequency	ROCOF	Analog Values (MW & MVAR)	Sub Stn Having SAS with bay kiosk
				No. of Signals →		3	3	2	4	1	1	2	
1	220	Jayanagar	4	Jeypore pg-1 Jeypore pg-4 Laxmipur		12	12	8	16	1	1	8	
	132			Machkund PH									
2	220	Indravati ph	2	Theruvali-1 Jayapatna		6	6	4	8	1	1	4	
3	220	Theruvali	2	Kashipur Laxmipur		6	6	4	8	1	1	4	
4	220	Bhanjanagar	3	Narasinghpur Nayagarh Aska		9	9	6	12	1	1	6	
5	220	Narerndrapur	2	Theruvali-1 TATA Steel		6	6	4	8	1	1	4	
6	220	Atri	2	Narasinghpur-1 Pandiavil-1		6	6	4	8	1	1	4	
7	220	Paradeep	2	Dubnw-1		6	6	4	8	1	1	4	
	400			Dubnw									

8	400	New Duburi	8	Meramundali-1 & 2 Mendhasal Baripada PG TATA-1 & 2 Paradeep (Future)		24	24	16	32	1	1	16	
	220			Duburi old									
9	220	Balasore	2	Baripada PG Bhadrak		6	6	4	8	1	1	4	
10	220	Mendhasal	6	Atri Infocity Line Chandaka Line Chandaka B Bhanjanagar Nayagarh		18	18	12	24	1	1	12	
11	220	Meramundali	4	TATA-1 Nalco-1 Narasinghpur Bhanjanagar		12	12	8	16	1	1	8	
12	220	Bidanasi	2	Mendhasal-1 Cuttack-1		6	6	4	8	1	1	4	
13	220	Joda	4	JSPL Line Jamshedpur Line		6	6	8	16	1	1	8	
	400			Kaniha (Future) Rourkela PG(Future)									
14	220	Tarkera	3	Bisra PG-1 Rengali-SY Deogarh		9	9	6	12	1	1	6	
15	220	Barkote	2	Bonai Deogarh		6	6	4	8	1	1	4	
16	400	IB Stage-2	2	Jharsuguda PG-1 Lapanga-1		6	6	4	8	1	1	4	
17	400	Lapanga	4	Reactor (80MV) Meramundali-1&		12	12	8	16	1	1	8	
	220			Katapalli									
18	132	Burla PH	4	Lapanga-1		12	12	8	16	1	1	8	

				Katapalli-1 Chiplima Sambalpur									
19	220	New Bolangir	3	Bolangir PG Line Kesinga Baragarh New		9	9	6	12	1	1	6	
20	400	Meramundali -B	4	GMR , Meram-A									
	220			Goda, Duburi OLD									
21	220	Pratapsasan	2	Pandiabil		6	6	4	8	1	1	4	
	132			RanasinghPur									

PART-I

SECTION–VI

AMC
SCHEDULE OF ANNUAL MAINTENANCE CONTRACT OF WAMS PROJECT (SOFTWARE AND HARDWARE) FOR STATE LOAD DESPATCH CENTER, OPTCL, ODISHA.

1.0 ANNUAL MAINTENANCE CONTRACT (AMC)

1. The scope of work under maintenance & support services shall include a comprehensive maintenance of all the hardware & software provided by the contractor for the Development of Wide Area Monitoring System Project. System along with future integration and support services for meeting the future expansion requirement envisaged under this project. The maintenance practices to be followed shall be as per ISO Standard. The essence of the maintenance services is to provide maintenance support for the designated hardware and software, with the goal of meeting the availability as set in availability criteria.

2. The period of maintenance support shall be the one-year Warranty (Defect Liability) period commencing from Operational Acceptance and five-year Maintenance period thereafter. The SLDC-OPTCL may extend the duration of maintenance period for up to 2 years based on the same rates in the contract and at the same terms and conditions.

3. The AMC include total support for integrated solution provided with man power at SLDC, Maintenance, repairing, replacement of all PMU, PDC, Control centre Hardware with all accessories and all other associated work for successful working of total integrated solution provided.

4. For all third party equipment (Hardware & Software) Contractor shall have back to back support along with supply of spare with appropriate response time from OEM/OEM Authorized representatives. Contractor shall be responsible for coordination with the OEM for all matter related to that equipment. But the Contractor shall be responsible for meeting the overall response times and availability requirements specified in the Specification.

5. The preventive maintenance activity is the activities to be performed by the Contractor to keep the system running at optimum level by diagnosis and rectification of all hardware and software failures, emergency response and would broadly include

    a. Total solution availability must be equal or greater than **99.95%** as per availability section.
    b. Repair / replacement of defective equipment mounted in PMU Panel. The Contractor shall be responsible for repair/replacement of all the hardware including consumables required for the systems.
    c. Preventive and routine maintenance of PMUs with GPS, Testing of PMUs if required and repair or replacement of the same, PMU firmware upgrade, PDC system, all hardware with security system, emergency response & troubleshooting etc.
    d. Integration of new & spare equipment (PMU, GPS, Switch, Router etc.)

e. Preventive and routine maintenance of PMUs with GPS, Testing of PMUs if required and repair or replacement of the same.
f. The Experienced Technical person is required at SLDC at all working days during normal business working hours and in case of holiday and other time he must be available during emergency. He should be capable of handling all maintenance required and in case of more expertise there should be immediate help from bidder arranged.
g. The Performance testing of PMUs ones in five year as routine testing.
h. The maintenance activity done by bidder person in the presence of SLDC representative during normal business hours on all working days and in emergency support should be available at any time.
i. Configuration of the replaced hardware and software, periodic routine checking as part of a preventive maintenance program which would include checking functionality of hardware and software.
j. Monitoring the performance of the system and doing necessary tuning for optimum performance to accommodate any changes such as addition of newElements.
k. Providing all necessary assistance to SLDC-OPTCL for addition and modification of database of PMUs & during spare feeder integration activity.
l. Take PMU Backup at regular interval
m. Restoration of the PMUs upon its failure and to restore the functioning of the various systems at the different substations
n. Any specific work required by SLDC in respect of provided solution.

6. The Contractor shall provide experienced engineer who has an experience and skill to maintain the entire supply system to the desired level of availability as and when require during annual maintenance requirement. The timings for Emergency Support would be 24 hours a day, 7 days a week throughout the year.

7. Manpower:

The support personnel so deployed at site shall be qualified personnel having at least three year of experience in the relevant field. The contractor shall submit the CV's from customers for support personnel to SLDC-OPTCL for approval before deployment for AMC works. The SLDC-OPTCL can ask the Contractor to replace the personnel deployed for maintenance support if his performance is not found to be satisfactory.

Deputation of MAN POWER	Duration for Support
One Engineer at SLDC-OPTCL	1+ 5 Year of AMC

Table 1.1

8. Bidder shall visit the site of S/S @ 3 to4 locations per quarterly and total 21 locations biannually for preventive maintenance of PMU installed at substations.

9. During Site visit of substation for preventive maintenance activity bidder shall submit complete maintenance report of location, format shall be provided by SLDC-OPTCL.

10. Contractor shall maintain minimum spare of field item during site visit for onsite maintenance purpose.

11. Field preventive maintenance shall include all the part/material supply under section-1 of technical specification.

12. Contractor and its personal have to follow all rules and regulations of SLDC- OPTCLpremises during maintenance activity.

13. Monitoring:

The operation and performance of the various systems under AMC shall be monitored on a fortnightly basis, the contractor shall review the following, analyze the results, andsubmit report to Owner. The contractor shall conduct at least the following monitoring, for the all Control Centres.

a. Log Monitoring

- System logs for a selected day
- System history log
- Aggregate data collection
- Events Collection

During monitoring if any defect/ abnormality is found, the contractor shall undertake corrective maintenance for the same.

b. Resource Monitoring

Resource Monitoring services comprises checking the system's major node resources, gather log data, analyze results, and advise SLDC-OPTCL on the appropriate actions to be taken and undertake any agreed upon actions. The NMS system shall be able to continuously collect the following information:

- CPU loading (Peak and Average)
- Memory utilization (Peak and Average)
- Disk utilization (Peak and Average)
- LAN utilization (Peak and Average)
- Operating system resource utilization reports
- System error log

The bidder shall submit the procedures details to meet the above along with the offer.

14. Cyber security System monitoring:

The Contractor shall also be responsible for monitoring of the cyber security system. The logs of the system shall be analyzed for exceptions and the possible incident of intrusion/trespass shall be informed to the Owner.

The monitoring shall encompass the various cyber security devices installed at Control Centre and Substations such as firewalls, Intrusion prevention system (both network based and host based), routers etc. The Centralized Monitoring Console (CMC) shall monitor and continuously

collect the above logs.

The Cyber security system shall also be subjected to Annual Security Audit from CERT-In listed auditors at the cost of the Contractor. Contractor shall implement the recommendations/remedial actions suggested by the Auditor after audit.

15. Patch Management:

The contractor shall also be responsible for providing updates/patches for the software products supplied under the project. All other patches of third party product like Operating System and Anti-virus shall be tested by the Contractor prior to installing in the SLDC-OPTCL network. Other products like Firewalls shall also be provided with secure patch management. A secure patch management and deployment system is to be established which shall be provided with single point of Internet connectivity. All thepatches shall be downloaded through this single point of connection.

The Contractor shall provide a mechanism for patch management so that it is known that what patches have been applied, what all patches are pending but available with us and what is the recent release of patches for the various products. Any patch shall be applied only with express permission of the SLDC-OPTCL representative.

16. Integration of new equipment:

All future services, protocol emulations and configuration support for integration of PMUs with GPS, PDCs, Control Centre integration with OPC Services, Web services and CIM import and export utility for off-line applications shall be the responsibility of contractor and shall be part of the maintenance charges. The integration services to beprovided by the bidder will include the PMU/PDC configuration, addition of New PMU/PDC and its integration with other PDCs, addition of interface for Analytical real time & off-line Applications, OPC Clients etc.

17. Physical maintenance:

The contractor shall undertake physical maintenance of all equipment/modules under the scope of this contract. The physical maintenance shall include cleaning, dusting, inspection of equipment for loose connections, damage to insulation, pest infections etc.as follows:

Activities shall include but not limited to:

a. Online diagnostics for servers and workstations - once every 3 months.
b. Connection test of LAN cables for identifying potential loose contacts in machines, switches and routers - once every 3 months.
c. Physical hardware checks to ensure proper working of cooling fans etc. – Once every 3 months.
d. Physical inspection to check the machines and the panels for rat droppings,lizards or other vermin - once every 3 months.
e. Cleaning and blowing for removal of dust from Servers and Workstations and CFE panels - once every 3 months.

Equipment shutdown for preventive maintenance shall be deemed as available forcalculation of availability.

18. Training course during AMC Period:
    - Training to SLDC Executives once in a year for every year of AMC.
        a. PMU, GPS
        b. PDC & Control center Hardware & Software

2.0 SYSTEM AVAILABILITY

2.1 INTRODUCTION

This section describes the system availability calculation during the maintenance (AMC) period.

2.2 AVAILABILITY CALCULATION FORMULA:

Availability of whole system is highly desirable and bidder has to maintain this during warranty and AMC period (1 year warranty + 5 year AMC contract). This availability criterion applicable to each equipment individually of system as well as whole system. Availability will be calculated on quarterly basis.

The system availability calculation formula shall be as under:

% System availability should be greater than or equal to 99.95%

% System Availability = ((Tt- To)/Tt)*100

Where Tt= Total System hrs.

To=Total System Outage hrs.

(System means all PMUs, Router, GPS, Control center hardware and all partssupplied under this project individually or as a whole)

% System Availability should > 99.95% if not the penalty will be imposed based onfollowing formula.

Penalty (in rupees) = 10 %*(AMC contract value (in rupees)/month)*(%Availabilitydeviation)

If % Availability deviation > 10% then following formula will be imposed.

Penalty (in rupees) = 20 %*(AMC contract value (in rupees)/month)*(%Availabilitydeviation)

Where % Availability deviation = 99.95% - %System Availability

2.3 AVAILABILITY REQUIREMENT

The availability of PMU equipment and its associated equipment shall be measuredas above

and shall be 99.95%.

Not with-standing the computation of availability of PMU as specified above. The prompt restoration of faulty equipment/part of the network is also of equal importance and any delay in restoration of the system shall be governed as per theprovisions of the contract.

Sr. No.	Systems	System availability requirements
1	WAMS Project (PMU, GPS, PDC, Servers, Storage systems, Network equipment, & Cyber security system etc.)	**99.95 %**

Table No: 8.0

2.4 DOWNTIME

The maintenance shall have to be planned in such a way that downtime if required, shall have to be kept below 66 minutes/quarter If the downtime crosses this limit a penalty as stated above will be imposed.

The communication link PMU to PDC will be established and maintained by SLDC-OPTCL. The downtime due to any non-availability of communication link will not be calculated for the purpose of these availability criteria. However it will be responsibility of the bidder to establish with due justification that non availability is exclusively due to communication link. The decision of SLDC-OPTCL in this regardwill be final and binding to bidder.

2.5 EVENT REPORT FORM

Event Report No:_____Date:_____

Station:_____

Affected Path: _____

Fault Description: _____

A) Event Start time Date_____Time_____
B) Reporting time Date_____Time_____

REPORT:

i) Failure within contractor system
Yes_____ No_____
ii) Entrance to site and room for rectification date_____time_____
iii) Rectification start time by contractor date_____time_____
iv) Fault fixed _____

Total Outage time (in hrs) _____

The format may change/revised as per the requirement of the OPTCL.

(Sign.) (Sign.)
- -

CONTRACTOR SLDC-OPTCL

3.0 TRAINING & DOCUMENTATION

3.1 TRAINING

The successful bidder shall be required to provide facility for training, at no extra cost to the SLDC/ALDC/OPTCL's engineers to be nominated by the SLDC-OPTCL at his works/ site as per GCC Clause no:

The programme of the training shall be mutually discussed and finalized by the SLDC- OPTCL with Bidder.

All necessary training material shall be provided by the Bidder. Each trainee shall receive individual copies of all technical manuals and all other documents used for training class materials, including the documents provided to the trainees as well as class handouts, shall become the property of SLDC-OPTCL. SLDC-OPTCL reserves the right to copy such materials, but for in-house training and use only.

The schedule, location, detailed contents and batches for training for each course shall be finalized during detail engineering.

For training at site, the SLDC-OPTCL will provide Conference room however any specific training manual/test paper /exercise and stationary shall be provided by the Contractor

3.2 TRAINING REQUIREMENT FOR PROJECT

SLDC-OPTCL training course requirements are described below in terms of the contents of each course to be provided. Training shall be provided on supplied PMU / PDC hardware, Server system, analytical and application software course, database and display building, the operator training course.

i. Maintenance Of PMU With GPS

The PMU with GPS course shall be primarily a hands-on course. The course shall be designed to train SLDC-OPTCL personnel in how to check PMU hardware status, network architecture at site, GPS module along with antenna placement, connection details, fault logs, reports and configure alarms, events, etc. for the supplied system at site / remote location.

Course objectives shall include:

a. How to identify LED / LCD status of hardware supplied.
b. How to check interconnection connections for GPS, network devices etc.
c. How to check GPS antenna placement.

d. How to ensure healthy communication.
e. How to check connection from field measuring devices (CT/PT/CVTs) to PMU.
f. How to generate the database or backup at site.
g. How to maintain and routine check list for PMU, GPS, PDC and networkingdevice.
h. Brief of network architecture, used protocols, details of cables/connectors.
i. How to maintain healthy operating environment for field devices, like ambience temperature, equipment or panel Earthing etc.
j. Introduction with LED / LCD status of PMUs for fault acknowledgement, warningsetc.
k. Diagnostics for isolation of failure/fault in PMU, earthing, system interface cabinet(SIC), Cabling, meters.

On course completion, all participants shall be able to operate, configure and maintain WAMS devices installed at remote locations, and shall be able to prepare the necessary Reports, fault logs. Shall be able to trace hardware malfunction, identify communicationfailure, or any unusual behavior shown by system installed at remote. All participants shall also be able to troubleshoot minor fault issues like remote fault acknowledgement,loose connections, communication errors etc.

ii. PMU Course

The Bidder shall provide a PMU course that covers the following subjects as a minimum:

a. Interface, interaction and operation of all PMU functional as well as physicalblocks e.g. CPU/AI /DI/power supply/Communication interface etc.
b. Detail training on various module inside of PMUs, PT/CT Cards, Phasor calculation methodology.
c. Detail courses on PMUs measurements as per IEEE Standard C37.118.1-2011 & C37.118.2-2011 & all amendments.
d. Operational procedures for various modes of operation, including diagnostictests and interpretation of the associated test results.
e. Implementing and maintaining multiple communication ports, as if required.
f. Terminating Input data to PMU from field devices.
g. Converting PMU data from one protocol to a different protocol, as per requirement.
h. Taking backup of PMU data.
i. Introduction with LED / LCD status of PMUs for fault acknowledgement,warnings etc.
j. Diagnostics for isolation of failure/fault in PMU, earthing, system interfacecabinet (SIC), Cabling, meters.
k. Configuring all options on PMU protocol interface with PDC.

iii. Computer System Hardware, Software & Historian Course

The training course shall be designed to give SLDC-OPTCL personnel sufficientknowledge of the overall design and operation of the system so that they can correct theproblems, 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. Preventive maintenance techniques and diagnostic procedures for each element of the Servers & Workstation console system, e.g., PDCs, Servers, processors, auxiliary memories, LANs, routers, firewall, User account login, IPS, IDS and printers.

b. **System Expansion**: Techniques and procedures to expand and add equipment such as memory in server, communication channels, router ports, work stations and control Centre. This shall also include adding New PMUs and PDCs.

c. **System Configuration:** Procedures of configuring Router ports, VLANs, Firewall Policy definitions.

d. **System Maintenance:** Basics of operation and maintenance of the redundant hardware configuration fail over hardware, failure of control centres configuration control panels and fail over switches. Maintenance of protective devices and power supplies.

e. **Storage System:** Basics of Storage Technology, understanding the various hardware storage options, configuration of storage/archiving of the PMU data, retrieval of stored PMU data from the storage system and use the Historical Data for analytical studies, trending and report preparation etc. and also operation & maintenance of storage architecture, Maintaining backup of data from Servers / PDCs and archiving and as well as retrieving of data from the remote control center in case of failure at the local storage system.

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 SLDC-OPTCL equipment, or on similarly configuredsystems.

g. **System Administration**: An introduction to software architecture, Effect of tuning/configuration parameters of OS software, System Software, Application Software, Network software, database software, firewall, antivirus etc. on the performance of the system, Administration of Database (both real-time andRDBMS, security).

h. **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.

i. **System Initialization and Failover:** From cold warm setup Including design, theory of operation and practice

j. **Diagnostics:** Including the execution of diagnostic procedures and the interpretation of diagnostic outputs,

k. **Software Documentation:** Orientation in the organization and use of system software documentation.

l. **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.

m. Cyber security

iv. Visualization / Analytical Software Course

The Contractor shall provide a comprehensive visualization / Analytical softwarecourses covering all aspects of its application & functionalities. The training shall include:

a. **Overview:** Block diagrams of the application software and data flows. Programming standards and program interface conventions. Shall include complete overview of visualization / Analytical software, like observing alarms, getting familiar with used color coding, indications, icons, different pages of visualization / analytical software, generation of trends, observing andacknowledging alarms or pop-up window etc.

b. **Application Functions**: Functional capabilities, configuration, and associated maintenance and expansion techniques, Report generation, postpartum analysis etc.

c. **Software & Protocol Administration**: Techniques and conventions to be used for the preparation and integration of new software functions including Application Program Interface (API) interfaces. It shall also include the configuration/modification of software to integrate a new PMU, PDC and Control Centre. This shall also include configuration of system for IEEE C37.118.1, IEEEC37.118.2, IEC 60870-5-101, IEC 60870-5-104, ICCP, Security (IEC 62351), CIM (IEC 61970), OPC and other Standards specified in the Specification.

d. **Software Documentation:** Orientation in the organization and use of functionaland detailed design documentation and of programmer and user manuals.

e. Cyber security related features of application e.g. user authentication, encryptionetc.

v. Network Management System Course

The NMS training shall familiarize the SLDC-OPTCL's maintenance personnel with the concepts and techniques for configuring, programming, maintaining, and troubleshooting the Contractor supplied NMS and its associated database and services.

The Contractor shall train the SLDC-OPTCL's personnel who will operate the communications network, in the functional capabilities of the networking equipment. Each course shall provide a thorough understanding of the general design concepts, features, and user interface requirements for local and remote monitoring of the equipment, as well as procedures for restoring service after equipment and power failures. Each course shall include hands-on training using the actual hardware and software being delivered to the SLDC-OPTCL.

Training aids for each course shall include the Operator's User Manual for each type of equipment. Operator training that is a standard part of the maintenance training will be

applicable. The minimal NMS Training requirements are:

- Features of the software being supplied
- System configuration procedures, including operating system & database parameterization and buffer sizes.
- Concepts and techniques for creating, modifying, and saving database, displays, and reports
- Creation and Modification for display and reports for Channel monitoring of PMU links and PDC Communications with other PDCs as well as PMUslocated at Substations.

vi. Cyber Security Course

The Contractor shall provide a comprehensive training on 'Cyber Security' to the system administrators of the SLDC-OPTCL. The training shall familiarize the SLDC-OPTCL's personnel with the basic understanding of network architecture, cyber security concepts, possible threats & vulnerabilities of the system, effective configuration of the network control elements and recovery management. The training on Cyber Security shall coverthe following concepts.

- Access controls
- Device configuration
- Anti-virus/patch management Password management
- Knowledge on remote administration Incidence response
- Disaster recovery
- Awareness of Cyber security standards Event log/Syslog analysis
- Firewall policy definitions
- Security Certificate and management

3.3 DOCUMENTATION

i. The bidder shall furnish as a part of their offer, complete set in duplicate of technical literature/catalog & manuals (one no. shall invariably the original one and not Photo copy), and one set of typical schematic drawings in respect of all the schemes, offered by them.

ii. After issue of detailed purchase order & site survey of all PMU placement locations, control center, the successful bidder shall submit within six weeks, foursets of complete drawings along with detailed bill of material for approval to the Director, SLDC, OPTCL, Mancheswar Rly, colony, Bhubaneswar , Odisha,.

iii. The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approvalof the SLDC-OPTCL. All manufacturing work which is not as per the approval shall be at the supplier's risk.

iv. Before dispatch of equipment to various Locations/consignees, the supplier shallfurnish sets of final drawings, including bill of materials and wiring schedules andalso sets of technical literature and commissioning manuals in suitable files. These shall be 5 sets per sub-station and shall be furnished as below.

- 1 sets per PMU panel shall be sent to concerned sub-station.
- 1 sets per PMU panel shall be sent to consignee before the dispatch ofequipment.
- 2 sets per PMU panel shall be sent to SLDC-OPTCL.
- 1 set shall be provided inside the panel.

All drawings shall be of A-3 size. (297mmX420 mm) Final Drawing Technicalliterature and commissioning manuals shall be printed and not Photo copy.

v. Supplier shall also furnish one complete set of reproducible of the relevant drawings. These shall be furnished to Director, SLDC, OPTCL, Mancheswar Rly, colony, Bhubaneswar, Odisha, immediately after the final inspection of various equipment, before dispatch.

vi. The bidder should provide detailed documentation of the overall system in five set in soft as well as hard copy to make owner self-sufficient to understand total solution. The documentation mainly covers:

- Document Plan
- Document identification plan
- System Description Documents (Overview)
- Functional Description Document
- Hardware Design Document
- Data Requirement sheets
- Software Design Document
- Data base Documents
- Drawings/Documents for manufacturing/Assembly of the equipment/system
- Drawings/Documents for installation of the equipment/system atsite
- Software description/design documents for each module
- Factory acceptance Test Document
- Manuals for each equipment
- System Configuration Parameter Details
- Site acceptance test documents
- Training documents
- System Administrator Documents
- User guide for Dispatcher
- Software Licenses
- Type test reports
- Inventory of the hardware
- Panel General and Internal Arrangement drawing indicatingmodules,

components location etc.

- Installation drawing.
- Schematic drawing.
- External cable laying & termination schedule details
- Communication Channel Plan
- Firewall and security setup check list
- User manuals/guides, O&M manuals and manufacturer's catalogues for all the hardware & software supplied
- Data Requirement Sheet (DRS) of all items
- PMU / PDC installation and Layout, GA, BOQ, schematics andinternal wiring drawings for each PMU / PDC site
- PMU / PDC to C&R panels/ field device cabling details for eachPMU / PDC site

vii. The bidder should provide detailed documentation to SLDC in printed form/soft copy in addition to the above whenever required by SLDC during AMC period on any aspect of the total solution.

PART-II

SECTION-VII

BID PRICE SCHEDULE (BPS)

PART – II
SECTION-VII: BID PRICE SCHEDULE (BPS)

BID PROPOSAL SHEET

Bidder's Proposal Reference No. and Date:
Bidder's Name & Address :
Contact Person :
Designation :
Telephone No. : Mobile No. :
Fax No. E-mail :

To

The Chief Load Despatcher, SLDC,
ODISHA Power Transmission Corporation Ltd.,
Janpath, Bhubaneshwar.

Sub: Proposal for Survey, Design, Development, Supply, Installation, Testing, Commissioning & Annual Maintenance Contract of PMU based Wide Area Measurement system in SLDC, OPTCL network.

Ref.: 1. NOTICE INVITING TENDER (NIT) NO ……..
2. TENDER DOCUMENT REFERENCE NO……....
3. PACKAGE/Works: No……...

Dear Sir,

1. We, the undersigned Bidder having visited the Official e-Tender Portal of OPTCL of OPTCL and having read and examined in detail the Tender Documents [e-NIT, Free View Documents (.pdf) and Bid Forms(in XLS formats)] including specifications of the package referred above, do here by propose to engineer and supply including all types of test at manufacturer's works, ocean shipment, marine insurance, custom clearance, port clearance and handling, inland transportation, inland transit insurance, delivery to site, loading & unloading, storage, insurance during storage and inside site transportation and erect and commission of the materials/Equipment supplied under this contract including installation, performance testing and handing over to OPTCL of the complete Construction of works on EPC/Turnkey contract basis.

We, agree to the following major terms and conditions of the tender:

2.0 PRICES AND VALIDITY

2.1 We declare that the prices quoted in our proposal are in accordance with your "Instructions to Tenderers" and as per the bid form (in .XLS formats) available in the Official tender Portal of OPTCL.

2.2 The Input Tax Credit (ITC) available on inward supply of goods or services, or both, as the case may be for the contract has been fairly estimated and the benefit of the same has been fully adjusted while quoting the bid price.
All the basic prices (taxable value) of the price schedule are FIRM during the period of the contract (except for statutory variations in GST rates) in line with your bid documents.

2.3 All the prices and other terms and conditions of this proposal are valid for a period of 240 Days from the date of opening of the Technical (Part-I) bids.

2.4 The prices and the price components in line with the requirements of the bid documents Section-VII of the Part-II (Price Schedules) are keyed-In and uploaded in the Official e-Tender Portal of OPTCL.

2.5 We hereby declare that our bid prices cover entire scope of the work to complete the work in accordance with Bid Documents.

2.6 We hereby declare that prices left blank or indicating "nil/zero/0/dash/-/Not Applicable/NA/any other notation other than price" in the Schedules will be deemed to have been included in the prices of other items/total quoted Bid Price.

2.7 If there is a discrepancy between unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and total price shall be corrected. If there is a discrepancy in the quantity mentioned by the bidder from the quantity mentioned in the tender the tendered quantity (BOQ) will prevail.

2.8 We do not anticipate any change in Ownership of company/firm. If at all and there would be a change in Ownership, we undertake that our obligation under the contract in case we become successful bidder, shall stand.

3.0 TAXES & DUTIES

3.1 We declare that towards the supply of goods & services by us, we will quote basic prices (taxable value) inclusive of Packing, Forwarding and Freight & Insurance excluding GST for each of the items quoted. Alongside the basic price(taxable value) quoted by us for each item, CGST plus OGST, or IGST, as the case may be, will also be quoted, which will be added to quoted basic price(taxable value) to indicate quoted final value. Tax Invoice shall constitute basic price, CGST plus OGST, or IGST, as the case may be, and such other details which are stipulated in CGST and OGST Rules, 2017. No transaction between OPTCL and our vendors shall be recognized and the input credit on the supply of goods & services by our vendors shall be considered in the basic price (taxable value) quoted to OPTCL.

3.2 However, any statutory variation in GST on package supply (and not on individual goods and services components) supplied by us during the contract period is to OPTCL's account.

3.3 As regards the Income Tax, surcharge on Income Tax, statutory payments and other corporate taxes, we will be responsible for such payments to the concerned authorities.

3.4 The statutory deduction of taxes and duties at source as applicable, related to these works, shall be made by OPTCL from our bills for which we cannot claim any reimbursement. TDS so deducted by OPTCL shall be deposited by them with the relevant tax Authorities & TDS certificates shall be issued by OPTCL wherever so required under the respective law.

4.0 DEVIATIONS

4.1 We hereby declare that work shall be performed strictly in accordance with the Technical Specifications & Commercial Terms and conditions specified in the Bidding Documents except for the deviation detailed out exhaustively in the following sheet.

a. Technical Deviations Attach 12.pdf
b. Commercial Deviations Attach 13.pdf

Further, we confirm that any deviations found elsewhere in our proposal, other than those stated in above deviation sheet, shall not be given effect to. Deviation on account of better specification may be acceptable to OPTCL, without any cost implication to OPTCL.

However, we understand that any deviations with respect to the Technical Specifications & Commercial Terms and conditions specified in the Bidding Documents not acceptable to OPTCL may render my bid non-responsive.

4.2 We have read the following major provisions of the ITB & GTCC and confirm that the specified stipulations of these provisions are acceptable to us irrespective of whatever has been stated to the contrary anywhere-else in our proposal.

a. Terms of Payment
b. Bid Security Declaration in lieu of Bid Security (EMD)
c. Contract Performance Bank Guarantee (CPBG)
d. Price Reduction
e. Price Basis & Payments
f. Guarantee Period
g. Contract Completion Period
h. We further confirm that any deviations to the above clauses at Sl.No. (a) through found anywhere in our bid proposal implicit or explicit shall stand unconditionally withdrawn, without any cost implications whatsoever to OPTCL.

5.0 TENDER COST, TENDER PROCESSING FEES AND BID SECURITY

5.1 We have scanned and uploaded the Demand Draft(s)/Bank Guarantee as applicable towards Tender Cost, Proof of Deposit of Tender Processing Fees. We have also submitted the above in original in a separate sealed envelope super scribing the Package/works No…., Bid ref. No. and Name.

5.2 The details of the above Demand Draft(s)/Bank Guarantee/ Proof of Deposit of Tender Processing Fees are as follows:

Particulars	DD/BG No. & Date	Amount (In Rs.)	Issuing Bank
Tender Cost			
Tender Processing fees			

6.0 QUALIFICATION DATA

6.1 We confirm having uploaded(attachment.pdf)/keyed-in (Schedules) against the Technical and Financial qualification requirement on your official tender portal as per qualifying criteria specified in the Instruction to Bidders, Part-I.

6.2 In case, you require any further information in this regard, before evaluation of our bid, we agree to furnish the original in time to your satisfaction.

6.3 We declare that the documentary evidence in support of the above qualifying requirement and the information filled by us in this regard are correct to the best of our knowledge and belief. We undertake that if any of these documentary evidence/information are found incorrect, our bid shall be liable for rejection, and in the event we emerge successful in the bidding process and are awarded the package/works, we will be liable for all consequential damages apart from termination of the contract.

7.0 OTHER STATUTORY DOCUMENTS

We have also uploaded (as an attachment .pdf) all the statutory documents mentioned in the ITB in support of the qualifying criteria.

8.0 BID CAPACITY

We confirm that we have uploaded (documents attachemnt.pdf)/Keyed-in the schedules to meet our bid capacity criteria. We undertake to abide by the bid capacity and award criteria assessed by OPTCL as per the following bid capacity qualification, if found successful in the bidding process.

9.0 INSTALLATION OF CONTRACT

9.1 We understand that in case of award, the contract to be entered into shall be treated as single contract. Supply portion of the contract consisting of development, Design, engineering, manufacturing, testing & inspection at manufacturer's works, packing, forwarding and transportation of equipment and materials, special tools & tackles and spares etc. from manufacturing works to project site including transit insurance as per Bidding documents. The Installation portion of the contract will relate to unloading, handing at site, storage, storage-cum-insurance and preservation at site, development of software module, erection, Installation, testing, commissioning including all associated Mechanical, Electrical, and Construction of all associated Structural & architectural works etc. as specified in bidding documents**.**

9.2 We further agree that if the contract is awarded to us it will be on single source responsibility basis and breach in any portion or part of one contract shall be construed as a breach of the other contract as well, which will confer on you the right to terminate the other contract, at our risk and cost.

10.0 WORK COMPLETION SCHEDULE

10.1 If this proposal is accepted by you, we agree to submit engineering data, provide services and complete the entire works from time to time in accordance with schedules uploaded in the tender portal of OPTCL in line with the ITB and acceptable to SLDC, OPTCL.

10.2 We fully understand that the time schedule stipulated in the proposal is the essence of the contract, if awarded. To this effect work completion schedule indicating key mile stones have been uploaded in the tender portal.

10.3 We undertake to complete the works in a phased manner as per the work schedule agreed to SLDC, OPTCL.

10.4 SLDC, OPTCL however reserves the right to re-schedule the completion period, if required.

11.0 CONTRACT PERFORMANCE BANK GUARANTEE

We agree that if our proposal is accepted, we shall provide an irrevocable Contract Performance Bank Guarantee (from list of Banks mentioned in the annexure to this documents) in non-judicial stamp paper of appropriate value (as per the prescribed format) within 30 (thirty) days from the date LOA issued, in favour of the Power System, OPTC Ltd. Bhubaneswar. The Bank Guarantee amount shall be specified in the tender. The bank guarantee shall be valid for 02 months over and above work completion period plus Guarantee Period. If the work completion period gets extended the Contract Performance Bank guarantee shall be extended accordingly.

12.0 PERFORMANCE GUARANTEE

12.1 We Certify that all the material supplied under this contract are new and guaranteed to cover the guarantee period and shall conform to high standards of software developments, engineering and shall be capable of performing in continuous commercial operation in a manner acceptable to SLDC, OPTCL.

12.2 We declare that the ratings and the performance figures/parameters of the software/equipment/ plant furnished & installed by us are guaranteed in line with the GTP and Technical Specifications of Part-I to cover the entire guarantee period.

12.3 We also undertake to take up the rectification/repair/replacement of software/materials or works, if any, during the defect liability period.

13.0 SELF DECLARATION FORM

13.1 I/We, the undersigned do hereby declare that, I/We have never been blacklisted and / or there were no debarring actions against us for any default in executing the Turnkey Contract or in the performance of the contract entrusted to us in any of the Electricity Transmission Utilities of India.

13.2 In the event of any such information pertaining to the aforesaid matter found at any given point of time either during the course of the contract or at the bidding stage, my bid / contract shall be liable for rejection/ cancellation / termination without any notice at the sole discretion of OPTCL.

14.0 CHECK LIST

We confirm having enclosed a check list duly keyed-in Schedule of this proposal and confirm **that** all necessary data/information have been provided in our proposal as required in the bidding documents.

15.0 ACKNOWLEDGEMENT OF DISCLAIMER

15.1 We undertake that we have conducted our own estimation and analysis and checked the accuracy, reliability and completeness of the information contained in the bid Document (Tender Notification, Free view Documents and Bid Forms) uploaded in the e-tendering portal and obtained independent advice from appropriate sources in our own interest for the purpose of bidding.

15.2 We understand that SLDC, OPTCL is not responsible for the e-Tender Portal of OPTCL being temporarily unavailable due to any technical issue at any point of time. In that event SLDC, OPTCL will not be liable or responsible for any damages or expenses arising from any difficulty, error, imperfection or inaccuracy with this e-Tender Portal of OPTCL.

15.3 We agree to follow the time table of e-tendering process and get the activities of e-tendering processes done well in advance so as to avoid any inconvenience.

15.4 We undertake that in case of technical error/ failure of e-Tender Portal of OPTCL, we shall not challenge it by way of appeal, arbitration and in the Court of Law.

16.0 DECLARATION

16.1 We, hereby declare that only the persons or firms interested in this proposal as principals are named herein and that no other person or firm other than those mentioned herein have any interest in this proposal or in the contract to be entered into if we are awarded the contract, and that this proposal is made without any connection with any other person, firm or party submitted a proposal and that this proposal is in all respect for and in good faith, without collusion or fraud.

16.2 Further, We hereby declare that we have gone through and understood the bid documents (including schedules in XLS available in the e-tender portal) in detail and tender portal instructions for the purpose of participating in the bidding process and enclose herewith attachments (in .pdf) uploaded and Schedules (in XLS) Keyed-in both in line with the original document.

Dated this ……..……day of ……**20……** at…….

Thanking you, we remain,

Yours faithfully,

Date :
Place :
(Designation)……...
(Common Seal)……
Business Address:
Country of Incorporation :(States or Provinces to be indicated) (Name & Address of the Principal Office)

(**Signature**)
(Printed Name)……

Enclosure:

A. Soft Form of Documents (Scanned Copy):

Sl. No.	Description	.Pdf file reference
1	DD towards Tender Cost, and Documentary proof of payment of Tender Processing Fees through e-payment mode.	BPS_Attach 1.pdf
2	Power of Attorney /notarized copy for signing the bid document.	BPS_Attach 2.pdf
3	Following documents/Credential in support of meeting Technical Qualifying requirement: i. Work Orders/LOA (including detailed bill of quantity for supply & erection works) ii. Commissioning Certificate/ Handing Over and Taking Over Certificate/Client Certified copies of completion certificate in respect of the work orders furnished as above. iii. Performance Certificate in respect of the work orders furnished as above.	BPS_Attach 3.pdf
4	Scanned copy of Documents/credential in support of meeting the Financial QR: i. Audited Annual Accounts (Financial Statement of Statutory Auditor and approved by BOD) for last 03(Three) years. FY:2020-21,2021-22,2022-23 MAAT Schedule (Fin-1) ii. Liquid Assets and Un-Utilized Credit Facility Schedule (Fin-2) iii. Net Worth Schedule (Fin-3) iv. Bidder's Bid Capacity Schedule (Highest Project related Annual Turn Over (Fin-4) v. Total Order Value of SLDC, OPTCL, GRIDCO work in Hand (if any) (Fin-5)	BPS_Attach 4.Pdf
5	Scanned copies of Statutory Documents; i. Certificate of Incorporation. ii. IT PAN. iii. IT Return of last three years. iv. GST Registration Certificate. v. EPF Registration Certificate etc.	BPS_Attach 5.pdf
6	Covering Letter of Bid Proposal Sheet (BPS) duly signed by the authorized signatory of the Bidder(s). Note: The enclosed Schedules specified in the BPS are in the .XLS format and Attachment (in.pdf), the same shall be keyed-in/ uploaded by the Bidder in the tender portal separately.	BPS_Attach 6.pdf
7	Any Other relevant documents (As per requirement of the tender)	BPS_Attach 7.pdf

B. Schedules (XLS format) in the e-Tender Portal of OPTCL :

Sl. No.	Particulars	Schedules in XLS format
1	Bidders' information	Schedule-I
2	Acceptance of Important Condition of the Contract	Schedule-II
3	Check List	Schedule-III
4	Documents to Qualifying requirement	Schedule-IV
5	Financial qualification	Schedule-V
6	Outright Rejection Criteria	Schedule-VI
7	Documents to Accompany Bids	Schedule- VII

Table 14 Bidder's Information Sheet

SCHEDULE-I in XLS Format		
BIDDER's INFORMATION SHEET		
SLDC, ODISHA POWER TRANSMISSION CORPORATION LIMITED		
NOTICE INVITING TENDER-NIT NO	. …….	
TENDER SPECIFICATION NO.	……..	
NAME OF THE WORKS	Proposal for Survey, Design, Development, Supply, Installation, Testing, Commissioning & Annual Maintenance Contract of PMU based WAMS in SLDC, OPTCL Network on EPC/Turnkey Contract.	
NAME OF THE BIDDER		
THE BIDDERS ARE REQUIRED TO FURNISH THE FOLLOWING DETAILS AS PER THE FORMATGIVEN BELOW WHICH IS A MANDATORY REQUIREMENT FOR EVALUATION OF BIDS.		
Sl.No.	**DETAILS**	**TO BE FILLED IN BY THE BIDDER**
1	BIDDER'S NAME	
2	BIDDER'S SITE NAME (Name of the BUSINESS PLACE)	
3	ADDRESS	
4	CITY	
5	STATE	
6	COUNTRY	
7	PIN CODE	
8	PHONE NO.	
9	FAX NO.	
10	GST REGISTRATION NO.	
11	PAN NO.	
12	TAN NO.	
13	CONTACT PERSON'S NAME	
14	POSITION / DEPARTMENT OF CONTACT PERSON	
15	CONTACT PERSON'S E MAIL ID	
16	CONTACT PERSON'S PHONE NO.AND MOBILE NO.	
17	CONTACT PERSON'S FAX NO.	
18	BANK A/C PARTICULARS OF THEBIDDER FOR EFT PAYMENT	

SCHEDULE-II in XLS Format

ACCEPTANCE OF IMPORTANT CONDITIONS OF THE CONTRACT		
	With reference to bid proposal being submitted to SLDC, OPTCL against NOTICE INVITING TENDER-NIT NO. ……. TENDER SPECIFICATION NO-…….Works –……..., we herebyconfirm that we have read the provisions of the following clauses and that notwithstanding anything stated elsewhere to the contrary, we agree that the stipulations of these clauses areacceptable to us except those declared as "not agreed".	
	NAME OF THE BIDDER	
	Bid Proposal Ref. No. …. Dated…	
	Bidder's Address:	
Sl. No	**Terms & Conditions**	**Declaration (Indicate Agreed / NotAgreed)**
1	Whether the bidder agrees to all the Terms & Conditions of the contract for this tender?	
2	Documentary proof of Registration with Tender Wizard (hardcopy)	
3	Whether submitted the tender processing fee on or before the date and time of opening of technical bid?	
4	Whether the tenderer has submitted the bid in electronic mode only?	
5	Whether **validity of** the **bid** mentioned for a minimum period of **180** days from the date of opening of tender?	
6	Whether the tender has been submitted in two parts as specified?	
7	Whether the schedule of prices have been filled up fully. Incomplete submission of this schedule will make the tender liable for rejection.	
8	Whether the tenderer has quoted '**FIRM**' price only	
9	Whether agreed to Implementation Schedule of the tender?	
10	Please confirm you agree to all clauses specified in the RFP and subsequent corrigendums & addendums.	
11	Please confirm submission of tender using all Forms and Documents as per tender.	
12	Technical proposal along with all Forms & Supporting documents	
13	Please confirm submission of Price proposal	
14	Please confirm you would submit all the required bank guarantee as per the clause provided if you are selected as the successful bidder	
15	Please confirm that all services have been included in the price proposal and is complete in all respects without any deviation/ missing items	
16	Please confirm that you have not submitted any alternate proposal	
17	Please confirm that you have noted the SLA guidelines and price reduction clauses applicable as specified in the RFP	
18	Please confirm you have responded to all the Scope of Work	
19	Please confirm you have agreed to Terms of Payment	
Note:	Any deviation to the above clauses at Sl. No. (a) through (s) found anywhere in our bid proposal, implicit or explicit, shall stand unconditionally withdrawn, without any cost implication whatsoever to SLDC, OPTCL	

SCHEDULE-III in XLS Format

CHECK LIST
(ATTACHMENT TO BID PROPOSAL SHEET AND KEYED-IN SCHEDULES)

SLDC, ODISHA POWER TRANSMISSION CORPORATION LIMITED(OPTCL)	
NAME OF THE BIDDER	
Bid Proposal No. / Date	

The following attachments (files in PDF format) and schedules in .XLS are attached to bid proposal sheetand Keyed –In (Mandatory)

Sl. No.	**Description**	**File name**	**(Indicate YES/NO)**
1	Declaration form (ANNEXURE-I)	Attach 1.pdf	
2	Black listing (ANNEXURE-II)	Attach 2.pdf	
3	Schedule of Quantity and Delivery (ANNEXURE-III)	Attach 3.pdf	
4	Abstract of price component [to accompany Part-II of this specification] (ANNEXURE-IV)	Attach 4. Pdf	
5	Schedule of prices to accompany Part-II (ANNEXURE-V)	Attach 5.pdf	
6	Bank Guarantee form for earnest money deposit (ANNEXURE-VI)	Attach 6.pdf	
7	Composite Bank Guarantee form for security deposit, payment, and performance (ANNEXURE-VII)	Attach 7.pdf	
8	Chart showing particulars of E.M.D. (ANNEXURE-VIII)	Attach 8.pdf	
9	Data on Experience.(ANNEXURE-IX)	Attach 9.pdf	
10	Schedule of spare parts.(ANNEXURE-X)	Attach 10.pdf	
11	Schedule of Installations (ANNEXURE-XI)	Attach 11.pdf	

12	Schedule of deviations (Technical) (ANNEXURE-XII A)	Attach 12.pdf	
13	Schedule of deviations (Commercial) (ANNEXURE-XII B	Attach 13.pdf	
14	Litigation /Arbitration (ANNEXURE-XIII)	Attach 14.pdf	
15	Delivery Schedule (ANNEXURE-XIV)	Attach 15.pdf	
16	Change Request Format (ANNEXURE-XV)	Attach 16.pdf	
17	Bank Certificate (ANNEXURE-XVI)	Attach 17.pdf	
18	Abstract of GTCC (ANNEXURE-XVII)	Attach 18.pdf	
19	Reverse Auction Process Compliance Form (ANNEXURE-XVIII)	Attach 19.pdf	
20	Bidders information	Schedule-I	
21	Acceptance of Important Condition of the Contract	Schedule-II	
22	Check List	Schedule-III	
23	Documents to Qualifying requirements	Schedule-IV	
24	Financial Qualification	Schedule-V	
25	Outright Rejection Criteria	Schedule-VI	
26	Documents to Accompany Bids	Schedule-VII	

SCHEDULE-IV in XLS Format

SLDC, ODISHA POWER TRANSMISSION CORPORATION LIMITED		
(Qualifying Requirement Data Applicable for Bidders Seeking Qualification under Clause 40, Section-II Part-1 of e-Bid Documents.)		
To The Chief Load DespatcherSLDC, OPTCL Dear Sir, Tender Notice No… .....…. -" Proposal for Survey, Design, Development, Supply, Installation, Testing, Commissioning & Annual Maintenance Contract of PMU based WAMS in SLDC, OPTCL Network on EPC/Turnkey Contract. The details of which are given below:		
NAME OF THE BIDDER		
Bid Proposal No. / Dated		
Sl.No.	**Description**	**Indicate the .pdf file(s)**
Technical Qualification:		
1	Section-II, 40.1(i): The Bidder" means any eligible FARM orCOMPANY registered under Company act 1956 (Amended in 2013) or Limited Liability Partnership (LLP) registered under the LLP Act, 2008 and should have been in operation in India, whose primary business is software development and implementation and must have relevant experience in Data Centre Hardware and software installation as on the date of bid opening and will have their registered offices in India.	
2	Section-II, 40.2(i): The Bidder or its parent company shall be original Manufacturer of Phasor Measurement Unit based on industry recognized standards.	
3	Section-II, 40.1(ii): The Bidder or its parent company shall have developed commissioned and running of at least two projects in RLDC / NLDC / Grid India / RPC / STU /CTU/ SLDC with minimum cumulative project cost INR 10 Cr (with GST) in India in which installation of PMU, installation of control Centre hardware, data received and handled at Control Centre PDC with data archiving and visualization software for system operator/utility successfully in the last five (5) years ending the date of submission of bid and handled at Control Centre PDC with data archiving and visualization software for system operator/utility successfully.	

4	Section-II, 40.1(iii): The Bidders should have CMMI – Level III maturity at the time of participation in the tender and the appraisal document and certificate will beenclosed with the bid.	
5	Section-II, 40.1(iv): Bidders shall have a valid ISO 9001:2000 or above and ISO 27001.	
6	Section-II, 40.1(v): Bidders must provide third party Safety Certification ("S" mark) Scheme of electronic sector promoted by STQC certification services, Standardization Testing and Quality Certification directorate, Ministry of Electronics and Information Technology, Govt. of India.	
7	Section-II,40.1.1: CODES, STANDARDS & REGULATIONS: The design, manufacture, erection and testing of the equipment and material to be supplied shall comply with latest revisions of relevant Indian Standards or equivalent IEC, IEEE standards.	
8	Section-II, 40.1.2: MAJOR DOCUMENTS & DRAWINGS REQUIRED FOR APPROVAL: All the drawings are to be submitted by the successful bidder and got approved from SLDC before execution.	
9	Section-II, 40.2(iii): There shall be at least one SCADA/WAMS system developed by bidder or its parent company which handles the data from RTU/PMU with visualization should be in service for minimum one year from the date of technical bid opening.	
10	Section-II,40.2(iv): The bidder should have full-fledged set-up in India with necessary infrastructure, resources and capacity of approximately 30 (Thirty) trained technical persons to deliver the Project and sales service thereafter the support paper to demonstrate this qualifying requirement must be furnished with bid.	

SCHEDULE- V

SLDC, ODISHA POWER TRANSMISSION CORPORATION LIMITED		
(Qualifying Requirement Data Applicable for Bidders Seeking Qualification under Clause 31, Section-II part-1 of e-Bid Documents		
To The Chief Load Despatcher SLDC, OPTCL Dear Sir, Tender Notice No .....…. -" Proposal for Survey, Design, Development, Supply, Installation, Testing, Commissioning & Annual Maintenance Contract of PMU based WAMS in SLDC, OPTCL Network on EPC/Turnkey Contract.The details of which are given below:		
NAME OF THE BIDDER		
Bid Proposal No. / Dated		
Sl.No.	**Description**	**(Indicate the .pdf file(s) and Schedules to be referred)**
Financial Qualification:		
1	Clause-31.1: The minimum average annual turnover of WAMS development Projects, in last three years (FY 2020-21, FY2021-22, FY 2022-2023) will be minimum INR 15.80 crores	
2	Clause-31.2 : LIQUID ASSETS AND ACCESS TO CREDIT FACILITY: Bidder shall be financially sound and stable. The liquid assetsas per the Audited Accounts at the end of the last Financial Year and unutilized credit facility available from bank duly certified by the Bank atthe end of the month preceding to the date of submission of the tender together as indicated in the following format should not be less than 15% of estimated cost of the tender (Rs 3.2 Crore).	
	Clause-31.2: LIQUID ASSETS AND UNUTILISED CREDIT FACILITY: (FIN-2)	
	1. LIQUID ASSETS: AS ON 31.03. 2023 a. Cash in Hand b. Cash at Bank c. Fixed Deposits Total Liquid Assets Note: Liquid Asset: The liquid Assets as per the last Audited Accounts prior to the year of Tender shall be considered.	

	2. Un-Utilized credit Facility at the end of the month preceding to thedate of bid submission a. Cash Credits b. Letter of Credits c. Bank Guarantee d. Others **Total un-utilized Credit Facilities:** **Total of Liquid Assets and unutilized Credit Facilities(1+2)** Note: Un-Utilized Credit Facility: The latest unutilized credit facility as per the Banker's Certificate at the end of Month preceding to the Month of Tender shall be considered	
3	**Clause-31.3: NET WORTH:** Net worth of bidder as per the audited financial results shall be positive on the last day of the preceding financial year. Net Worth means the sum total of the paid-up share capital and free reserves (excluding reserves created out of the revaluation of assets, write back of depreciation provisions and amalgamation) net of P&L A/C (Dr. balance) and miscellaneous expenses to the extent not adjusted or writtenoff. NET WORTH: **FIN-3** (AS ON 31.03.2023) a. Paid-up share capital b. Free Reserves excluding the reserves created out of the following: i. Revaluation of assets. ii. Write Back of depreciation Provisions. iii. Amalgamation c. Less P & L A/C (Dr.Balance) d. Less, Miscellaneous expenses to the extent not written off. **Total:** Note: Clause-31.3 The bidder has to furnish the certificate from the charted Accountants certifying the FIN-3 Schedule.	
4	Clause-31.4: Bidders Bid Capacity: The Bidder's bid capacity will be limited to 300% of the Annual turnover of the Company (excluding its sister companies) of one year out of preceding three Financial Years. Bidder's Bid Capacity Schedule: **FIN-4** (a) For Financial Year- 2020-21 (b) For Financial Year- 2021-22 (c) For Financial Year -2022-23 Highest works Contract related Annual Turn Over Note: 1. Clause-31.4 The bidder has to furnish the year wise turnover of the Company (excluding its sister companies) certificated by the Chartered Accountants based on Audited Account.	

SCHEDULE- VI

STATE LOAD DISPATCH CENTER, ODISHA POWER TRANSMISSION CORPORATION LIMITED			
Outright Rejection Criteria - Schedule VI			
Tender Notice No.		SLDC-01/2023-24	
Tender Specification No.		SLDC-01/2023-24	
NAME OF THE WORK		Proposal for Survey, Design, Development, Supply, Installation, Testing, and Commissioning & Annual Maintenance Contract of PMU based WAMS in SLDC, OPTCL Network on EPC/Turnkey Contract.	
NAME OF THE BIDDER			
Sl. No.	**Criteria for Outright Rejection**	**Details to be filled bythe bidder**	**Name of the attachment (eg. Tendercost.pdf, etc.)**
1	Documentary proof of submission Tender Cost, payment of Tender Processing Fees through e-payment mode.		
2	Power of Attorney (Authorized Signatory) notarized copy for signing the bid document in hard copy.		

SCHEDULE- VII

STATE LOAD DISPATCH CENTER, ODISHA POWER TRANSMISSION CORPORATION LIMITED		
Documents to Accompany Bids - Schedule VII		
Tender Notice No.		SLDC-01/2023-24
Tender Specification No.		SLDC-01/2023-24
Name Of The Work		Proposal for Survey, Design, Development, Supply, Installation, Testing, Commissioning & Annual Maintenance Contract of PMU based WAMS in SLDC, OPTCL Network on EPC/Turnkey Contract.
Name Of The Bidder		
Sl. No.	**Description**	**Name of the attachment (Eg. Bid_Form.pdf, EMD.pdf, etc)**
1	Documentary proof of submission Tender Cost, payment of Tender Processing Fees through e-paymentmode.	
2	Documents against the eligibility Criteria: Firm'sFinancial and Manpower Strength	
3	Documents against the eligibility Criteria: Past Performance & Relevant Project Experience	
4	Documents against the eligibility Criteria: Criteria onDomain Expertise	
5	Techno commercial Proposal as per Bid document - Supplier Response Format along with all the requiredduly filled forms as prescribed	
6	Techno-Commercial Deviation Schedule as per theFormat-Annexure- XII.	
7	Undertaking on Acceptance of Importance Terms &Condition	
8	Duly filled, signed Bidding Forms in the formatspecified in Bid document.	
9	Price Proposal	
10	Any Other Documents	

PRICE BID

1. PRICE

(i) Bidders are required to quote their price(s) for goods and services offered indicating they are 'FIRM'.

(ii) The prices quoted will be FOR Destination only at the consignee's site/store inclusive of packing, forwarding, Freight, Insurance and GST. In addition, the break-up of FORDestination price will be given as per schedule of Prices in Annexure-XVI of Section –
II. The Bidders has to certify in the price bid that any implication of lower Tax and Input Tax Credit benefit as per anti-profiteering and other provisions under GST Laws,have been fully passed on to the Purchaser, while quoting the tender prices.

2. INSURANCE

Insurance of materials/equipment, covered by the Specification will be done by the Suppliers with their own Insurance Company unless otherwise stated. The responsibility of delivery of the materials/ equipment at destination stores/site 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 will undertake free replacement of equipment / materials damaged or lost which will be reported by the Consignee within 30 days of receipt of the equipment /materials at Destination without awaiting for the settlement of their claimswith the carriers and underwriters.

3. CERTIFICATE FOR EXEMPTION FROM GOODS AND SERVICES TAX

Offers with exemption from Goods and Services Tax will be accompanied with authenticated proof of such exemption. Authenticated proof for this clause will mean Photostat copy of exemption certificates, attested by Gazette Officers of State or Central Government.

4. PROPER FILLING UP OF THE PRICE SCHEDULE

The tenderer should fill up the price schedule properly and in full. The tender may be rejected if the schedule of price is submitted in incomplete form.

5. NATURE OF PRICE INDICATED IN SPECIFICATION WILL BE FINAL

The nature of price indicated in the Clause-13, Section – I of PART –I of the Specification will be final and binding.