

ANDHRAPRADESH POWER GENERATION CORPORATION LIMITED

Vidyut Soudha, Vijayawada-520004



Ap e-procurement tender Specification No.996986/CE(HPC&HP)/APGENCO/SCADA-USPH/2026

(Two Part Bid)

Design, Engineering, Manufacture, Testing, Packing & forwarding, delivery at site stores, Loading & Unloading, Supply, Dismantling of the existing system, Erection, Testing & Commissioning of DCS based Supervisory Control and Data Acquisition (SCADA) system and Field Instruments for complete Power House, Common auxiliaries equipment and Switchyard of Upper Sileru Power House (USPH-4X 60 MW) and Supply, Erection, Testing & Commissioning of Vibration Monitoring System for USPH.

Summary sheet, Instructions to bidders, General, Financial Terms and Conditions, Technical Specification and schedules

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**Sd/-
Superintending Engineer
Hydel-II/APGENCO**

CONTENTS

Contents

NOTICE INVITING TENDER	4
Check list	7
SECTION-1- IMPORTANT INSTRUCTIONS TO BIDDERS.....	8
SECTION-2-	13
GENERAL PURCHASE CONDITIONS (GENERAL)	13
SECTION-3-GENERAL PURCHASE CONDITIONS (FINANCIAL)	16
Section -4	19
Technical Specification.....	19
Schedule-1.....	51
Guaranteed Technical Parameters for SCADA system	51
Schedule –2.....	55
Proforma Of Guarantee For Equipment Performance	55
Schedule – 3	56
Schedule Of General Terms And Conditions.....	56
Schedule - 4.....	58
Schedule Of Deviations From The Specification.....	58
Schedule-5.....	59
Bidder's Undertaking.....	59
Schedule - 6.....	60
Proforma for Back Up Guarantee of Performance & SAS	60
SCHEDULE – 7	61
List of Recommended Spares for SCADA system	61
Schedule-8.....	62
Proforma of letter of transmittal.....	62
Schedule –9	63
Consent Form.....	63
Schedule – A.....	64
Proforma of Summary Price Proposal	64
GUIDE-LINES FOR SUBMISSION OF BANK GUARANTEE.....	65
ANNEXURE – I (EMD).....	66
PROFORMA OF BANK GUARANTEE FOR THE EARNEST MONEY DEPOSIT (EMD)	66

ANNEXURE – 2 (PEMD).....	66
PROFORMA OF BANK GUARANTEE FOR THE PERMANENT EARNEST MONEY DEPOSIT (PEMD).....	67
ANNEXURE-2(i)	68
FORM OF INSURANCE SURETY BOND FOR BID SECURITY	68
ANNEXURE-3 (SD)	70
PROFORMA OF BANK GUARANTEE FOR THE SECURITY DEPOSIT (SD).....	70
ANNEXURE – 4 (PBG)	71
PROFORMA OF BANK GUARANTEE FOR THE PERFORMANCE (PBG).....	71
ANNEXURE-5	73
FORM OF INSURANCE SURETY BOND(Security deposit)	73
ANNEXURE-6	75
FORM OF INSURANCE SURETY BOND(Performance)	75
ANNEXURE-7	77
MANUFACTURING QUALITY PLAN	77
ANNEXURE-8	78
FIELD QUALITY PLAN	78

ANDHRA PRADESH POWER GENERATION CORPORATION LIMITED

Vidyut Soudha: Vijayawada-520004

NOTICE INVITING TENDER

1.	Company Name	Andhra Pradesh Power Generation Corporation Limited
2.	Circle/Division Name	Chief Engineer /HPC & Hydel Projects /APGENCO Vidyut Soudha, Gunadala, Vijayawada-520004.
3.	Tender Notice No.	Ap e-procurement tender Specification No.996986/CE(HPC&HP)/APGENCO/SCADA-USPH/2026
4.	Name of Work	Design, Engineering, Manufacture, Testing, Packing & forwarding, delivery at site stores, Loading & Unloading, Supply, Dismantling of the existing system, Erection, Testing & Commissioning of DCS based Supervisory Control and Data Acquisition (SCADA) system and Field Instruments for complete Power House, Common auxiliaries equipment and Switchyard of Upper Sileru Power House (USPH-4X 60 MW) and Supply, Erection, Testing & Commissioning of Vibration Monitoring System for USPH.
5.	Estimated Contract Value	NA
6.	Delivery Period	a). <u>Material:</u> The materials shall be delivered within Eight months from the date of drawing approval. However, the delivery period shall include delivery and acceptance of the material in good condition at site. Drawings shall be furnished within 30 days from the date of acceptance of P.O and got approved within 2 months from the date of acceptance of P.O. b). <u>Erection, Testing & Commissioning:</u> Erection, Testing & Commissioning of the respective LCU (unit /common Auxiliaries& Switchyard) including all materials should be completed within 45 days from the date of intimation of readiness of the site Including field instruments and vibration monitoring system (USPH). Unit line clears for Two or more units can be availed either in sequence or simultaneously on mutual agreement of contractor and Engineer in charge in concurrence with APSLDC.
7	Tender Type	Open tenders through online APGENCO e-procurement platform. Two part type: Part-I: Pre-qualification Bid Part-II : Price bid
8	Tender Transaction Fee	All the participant bidders shall pay online, a non-refundable TRANSACTION FEE, to M/s. APTS LTD, through "Payment Gateway Service on AP e-procurement platform". The amount payable is 0.03% of the Quoted Value/Estimated Value, with a cap of Rs.10,000/- plus applicable GST up to Rs.50.0 crores and Rs.25,000/- plus applicable GST above Rs.50.0 crore. The Electronic Payment Gateway accepts all Master and Visa Credit Cards issued by any bank and Direct Debit facility/Net banking of select Banks such as ICICI Bank, HDFC, Axis Bank etc, to facilitate the transaction. Service tax, Bank Charges for Credit Card Transactions etc, will be applicable
9	Corpus Fund or AP e-procurement Fund	The successful bidder has to pay AP e-procurement fund, 0.04% of Quoted Value/ Estimated Value, with a cap of Rs.10,000/- plus applicable GST up to Rs.50.0 crores and Rs.25,000/- plus applicable GST above Rs.50.0 crore on AP e-procurement platform, before entering into agreement/ issue of purchase orders. The amount shall be paid in favour of the Managing Director, APTS. There shall not be any charge towards AP e-procurement fund in case of works, goods and services with Quoted Value upto Rs.10 lakhs.

10	Tender Category	Composite
11.	Bid Security (EMD)	Rs.1,00,000.00 + 2% on quoted value The bid security can be paid in any of the following forms: i) Full amount in the form of DD/BC/NEFT/RTGS, drawn in favour of ‘Pay Officer, APGENCO, Vidyut Soudha, payable at Vijayawada. OR Rs.1,00,000/- in the form of DD/BC/NEFT/RTGS drawn in favour of ‘Pay Officer, APGENCO, Vidyut Soudha payable at Vijayawada and balance amount in the form of Bank Guarantee from any Govt. Banks/Nationalized Banks/Scheduled banks/ Public sector Banks only in the prescribed form (Annexure-1). ii) PEMD Holders: Rs.1 Lakh in the form of NEFT/RTGS/ DD and balance amount of (Rs. 2% of Quoted value – Amount of PEMD approved) in the form of NEFT/RTGS/ DD/ BC or Bank Guarantee from any Govt. Banks/ Nationalized Banks/ Public Sector Banks/ Scheduled banks in the prescribed form (Annexure-2). iii) Rs.1,00,000/- in the form of DD/BC/NEFT/RTGS drawn in favour of ‘Pay Officer, APGENCO, Vidyut Soudha payable at Vijayawada and balance amount in the form of Insurance Surety Bonds issued as per IRDAI guidelines in the prescribed form (Annexure-2(i)). APGENCO Bank Details for NEFT/ RTGS BENEFICIARY NAME AS PER ACCOUNT: A P POWER GENERATION CORPN BANK NAME:STATE BANK OF INDIA, BANK A/C NO:52077965022 TYPE: CURRENT ACCOUNT, BANK BRANCH NAME & ADDRESS: SPECIALISED MIS CORPORATE BRANCH, VIJAYAWADA(16576), D. NO: 48-10-20,VEERAMACHINENI RESIDENCY, NTR HEALTH UNIVERSITY, SERVICE ROAD, GUNADALA, VIJAYAWADA 520004, MICR CODE OR BANK / BR CODE:5200020441 RTGS/NEFT/IFSC CODE: SBIN0016576.
12.	Bid Validity	180 days from the date of opening of the PQ/Tech Bid
13.	Bid Start Date & Time	05-10-2026 @11:00 Hrs.
14.	Pre bid meeting Date & Time	25-10-2026@11:00 Hrs.
15.	Bid Submission Closing Date &Time.	16-11-2026 @ 15.00 Hrs.
16.	Bid Submission	Online through AP e-procurement platform
17.	Pre Qualification/ Tech. Bid Opening Date.	17-11-2026 @ 15.00 Hrs.
18.	Price Bid Opening Date & Time (Tentative)	30-11-2026 @ 15.00 Hrs
19.	Eligibility Criteria	1) A. <u>If the Original Equipment Manufacturer is tendering:</u> - a. The Bidder shall be Original Equipment manufacturer (OEM) having manufacturing unit in India and shall have an experience of at least 5(Five) years in Design, Manufacture, Supply, Erection, Testing & Commissioning of SCADA/ PLC in India. Documentary Proof of Original Equipment Manufacturing and proof of five years’ experience (work orders

		/Purchase orders etc.,) shall be submitted along with the Bid. b. The Bidder shall Design, Manufacture, Supply, Erection, Testing & Commissioning of SCADA/PLC having redundant Hot standby processors and minimum 100 Nos. of I/Os for at least two Power Generating Stations in India (Preferably Govt/PSU), which are working satisfactorily for at least ONE year as on the date of bid submission. The Satisfactory performance certificates (not older than 10 years) issued by the end users along with Purchase Order copies shall be uploaded. Bidder should enclose relevant documents which substantiate the details of redundant hot standby processors and minimum 100 Nos. IOs for the projects for which performance certificates are provided. (or) B. If the Agent/Trading Company is tendering:- a. The Bidder shall have an experience of at least 5(Five)years in Supply, Erection, Testing & Commissioning of SCADA/PLC in India. Proof of five years' experience as above (work orders /Purchase orders etc.,) shall be submitted along with the Bid. b. The Bidder either himself or OEM from which backup guarantee is being furnished shall Supply, Erection, Testing & Commissioning of SCADA/PLC having redundant Hot standby processors and minimum 100 Nos. of I/Os for at least two Power Generating Stations in India (Preferably Govt/PSU), which are working satisfactorily for at least ONE year as on the date of bid submission. The Satisfactory performance certificates issued by the end users along with Purchase Order copies shall be uploaded. Bidder should enclose relevant documents which substantiate the details of redundant Hot standby processors and minimum 100 Nos. IOs for the projects for which performance certificates are provided. In such case (B) the bidder should submit a full Backup guarantee issued by the SCADA/ PLC OEM having manufacturing unit in India as per the proforma in schedule-6 for a. Complete and satisfactory commissioning & performance of the equipment and service after sales (SAS). b. Supply of spare parts and services for a period not less than 10 years from the date of Commissioning. c. Bidder has to submit OEM Performance certificates along with copies of work orders/purchase orders as mentioned above. 1. The bidder should have an annual turnover of not less than Rs. 615 Lakhs for at least TWO years during the last '5' years. The bidder should enclose copies of the audited financial statements of the last '5' years so as to prove the financial capacity of the bidder to execute the order.
20	Officer Inviting Bids & Place of Opening of Bids	Superintending Engineer, Hydrel-II, APGENCO, 4 th Floor, Vidyut Soudha, Gunadala, Vijayawada-520004, Andhra Pradesh.
21	Contact Details	Phone: 0866 – 2526802/304/309/323. Email: se-hpc2@apgenco.gov.in (or) hpc.eme3@apgenco.gov.in
22	Procedure for bid submission	Through AP e-procurement platform, i.e., i.e., https://tender.apecurement.gov.in
23	Evaluation of Bids	Overall (L1) excluding cost of recommended spares.

Note: Ensure that all the documents are uploaded as per the CHECK LIST.

Sd/-
Superintending Engineer
Hydel-II/APGENCO

Check list

I. The following documents pertaining to Pre-Qualification & Technical bid should be uploaded:

- 1) EMD: DD/BG/PEMD as per item.no.11 of NIT.
- 2) Payment of Transaction Fee and Corpus Fund or AP E-Procurement Fund as per Item No. 8&9.
- 3) Proof of Experience – Minimum Two Satisfactory Performance Certificates along with the copies of Purchase orders.
- 4) Proof of Financial capacity - Annual Turnover Certificates (with authentication of Chartered Accountant) along with Balance Sheets (Financial statements) for last Five financial years.
- 5) Proof of Technical Capability –The Guaranteed Technical particulars along with full technical details and other relevant documents of the equipment to be supplied.
- 6) Registration Certificates: Copies of documents relating to the Registration of the firm, Registration as Electrical Licensed Contractor, Partnership deed, Articles of Association.
- 7) Income Tax Registration: Copy of PAN.
- 8) GST Registration: Copy of GST registration.
- 9) Schedules: Filled in Schedules 1 to 9 (formats enclosed in the tender) duly signed and stamped
- 10) Miscellaneous documents: Any other documents/issues related to PQ/Technical matters.

II. Copies of the following Price Bid documents shall be uploaded:

- 1) Price Summary Proposal sheet duly indicating GST, Packing & Forwarding, Freight, Transit Insurance charges as per Schedule-A.
- 2) Any other items/issues related to Price bid/ Price of items which could not be quoted in the Price Bid can also be uploaded.

NOTE: 1) Uploading of Documents in the respective folder of AP e-platform will only be considered. Any wrong attachments will lead to disqualification of the bid.

2) Hard copies shall be submitted by the successful bidder (L1) for verification by the Competent Authority when required.

SECTION-1- IMPORTANT INSTRUCTIONS TO BIDDERS

The instructions given below must be read very carefully, as failure in compliance with any of these may render the offer liable for rejection. If a bidder has any doubt about the meaning of any stipulation therein, General Purchase Conditions, specification of materials or any other enclosed document, he should immediately obtain the clarification/ information in writing from the executive who has issued these documents.

1.1. Procedure for Submission of Bids:

- a) The bidders shall register on the AP e-procurement market place of Govt. of India, i.e., on www.apecprocurement.gov.in or <https://tender.apecprocurement.gov.in> and submit their bids online. On registration on the AP e-procurement market place, they will be provided with a user ID and password through which they can submit their bids on line. Only those Bidders, who are registered on the AP e-procurement Platform, are eligible to participate. For any queries on registration and online bid submission, on AP e-procurement platform, the bidders may contact HELP DESK of the Service Provider on www.apecprocurement.gov.in. Offline bids will not be entertained by the Tender Inviting Authority, for the tenders published in AP e-procurement platform. Any offline bid submission clause in the tender document could be neglected.
- b) The guidelines for the bidders participating in AP e-procurement tender are detailed in the website www.apecprocurement.gov.in.
- c) The Bids/Schedules should be in the prescribed form that can be downloaded free of cost from the website <https://tender.apecprocurement.gov.in>.
- d) The dates stipulated in the Bid notice are firm and under any circumstances they will not be relaxed unless officially extended.
- e) Digital Certificate Authentication:
 - i) The bidder shall authenticate the bid with his Digital Certificate for submitting the bid electronically on AP e-procurement platform. Bids not authenticated by Digital Certificate of the bidder will not be accepted on the AP e-procurement platform.
 - ii) For obtaining Digital Signature Certificate, all the bidders are requested go through Guidelines to bidders for participating in AP e-procurements tenders which is available in the AP e-procurement website.
- f) The tenderer should read and understand clearly the general instructions and terms and conditions of the tender document before uploading of documents and submission of the tender. The Bidder is also requested to down load the training Kit, along with above tender document and use the same to acquaint with the procedure. Any offline submission of the bid will be rejected and action will be taken against the bidder according to the norms of AP e-procurement website.
- g) The bids shall be submitted online. All the documents to be submitted as soft copies shall be signed & stamped, scanned and uploaded in Zip format. Those documents which shall be submitted as hard copies shall be signed, stamped and sent to reach the tender inviting authority after written request from the tender inviting authority. List of the documents to be submitted in hard copies/soft copies is given in Check List.
- h) Any downloading soft copy of the tender documents from the web site is at the sole risk and responsibility of the bidder. APGENCO will not be responsible for any delay/difficulty/ inaccessibility of the downloading facility for any reason whatsoever.
- i) Amendments/Addendum, if any will also be posted on website for downloading. APGENCO will not hold any responsibility of amendments being or not being kept tracked from time to time by the bidders.
- j) The dates stipulated in the Bid notice are firm and under any circumstances they will not be relaxed unless officially extended.
- k) The Bid Opening Authority will not consider any documents uploaded after opening date and time.
- l) Payment of Transaction Fee:

All the participant bidders shall pay online, a non-refundable TRANSACTION FEE, to M/s.APTS LTD, through "Payment Gateway Service on AP e-procurement platform". The amount payable is 0.03% of the Quoted Value/Estimated Value, with a cap of Rs.10,000/- plus applicable GST up to Rs.50.0 crores and Rs.25,000/- plus applicable GST above Rs.50.0 crore. The Electronic Payment Gateway accepts all Master and Visa Credit Cards issued by any bank and Direct Debit facility/Net banking of select Banks such as ICICI Bank, HDFC, Axis Bank etc, to facilitate the transaction. Service tax, Bank Charges for Credit Card Transactions etc, will be applicable.
- m) Corpus Fund or AP e-procurement Fund:

The successful bidder has to pay AP e-procurement fund, 0.04% of Quoted Value/ Estimated Value, with a cap of Rs.10,000/- plus applicable GST up to Rs.50.0 crores and Rs.25,000/- plus applicable GST above Rs.50.0 crore on AP e-procurement platform, before entering into agreement/ issue of purchase orders. The amount shall be paid in

favour of the Managing Director, APTS. There shall not be any charge towards AP e-procurement fund in case of works, goods and services with Quoted Value upto Rs.10 lakhs.

1.2. **EVALUATION OF BIDS:**

- a) Bids will be processed in two stages (two part bid). In the first stage, the "Bid" under e-procurement package will be opened to assess whether the Bidder qualifies and whether his offer is technically acceptable and substantially responsive. The Purchaser will examine the Bids to determine whether they are complete, whether required sureties have been furnished, whether the documents have been properly signed, whether relevant hard copies have been furnished and whether the Bids are generally in order. The bids of only such Bidders whose bids are technically and commercially in accordance with the specification will be considered for second stage of Price Bid opening/evaluation. The on-line system will not open the price-bids of tenderers who are not qualified in Technical/PQ.
- b) A responsive Bid is the one which accepts and fulfils all the terms and conditions of this specifications and documents, supported by the necessary sureties, and are complete in respect of details as requested in the Bid document.
- i) The responsive Bids received will be evaluated by the Purchaser to ascertain the lowest evaluated Bid for complete works covered under these specifications and documents.
- ii) The purchaser is the final authority in deciding the above and his decision cannot be contended.
- c) If the due date for opening of the tenders happens to be a Public holiday, the opening of the tenders will be done on the next working day at the same time and venue as specified originally for opening. APGENCO reserves the right to amend or modify the tender and its conditions.
- d) The Bids will be opened at the time and date specified in the tender notice by the Superintending Engineer or his authorized assistant in the presence of the bidders or their authorized representatives with valid authorization, who may desire to be present.
- e) The tenders which contain the full information and which comply with the requirements regarding technical and financial qualifications, experience and equipment will be considered.
- f) The AP e-procurement website market place provides an online self-service registration facility to such of the Bidders who are already registered with the respective participating departments for supply of specified goods and services.
- g) Intending bidders can contact the O/o. the Superintending Engineer, Hydrel-II, APGENCO, 4th Floor, Vidyut Soudha, Vijayawada - 520004 for any clarification/information on any working day during working hours. Phone: 0866 – 2526802/2526323/2526309/2526304.
- h) APGENCO reserves the right to respond to any e-mail received by it through their website. APGENCO does not warrant the privacy and/or security of e-mails during internet transmission.
- i) APGENCO reserves the right, without prejudice to other rights under terms and conditions of the NIT and tender documents or other remedies available to cancel tenders without assigning any reasons and will not entertain any correspondence in the matter. APGENCO accepts no liability whatsoever and will not be liable for any loss or damage arising directly or indirectly (including special, incidental or consequential loss or damage) from use of AP e-procurement website or from cancellation of tenders.

1.3. **Earnest Money Deposit (EMD):** Offers must accompany EMD as per summary sheet, [S.No.11 of NIT.](#)

1.4. The EMD shall be forfeited, if

- i) Bidder withdraws the bid before expiry of its validity.
- ii) Successful bidder does not accept the order/LOI or fails to enter in to a contract within validity period of offer.
- iii) Successful bidder fails to furnish Security Deposit within 30 days from the date of issue of P.O/ LOI.
- iv) The offer is disqualified for the reasons outlined in *clause 1.7.*

1.5. **Permanent/ Standing EMD Holders:** The bidder may deposit with APGENCO, the permanent fixed deposit of **Rs.5,00,000/-** (Rupees Five Lakhs only) as EMD in the form of DD/Pay order/ Banker's cheque. In case of BG, it shall be valid for a period of three years constituting the said sum as security for the compliance with the obligation undertaken in the offer submitted by the bidder. No interest will be payable on such amount. Such bidder shall be entitled to have them considered without payment of EMD up to Rs.5 Lakhs with each tender separately. They need to furnish **the Registration Certificate Number** and shall also furnish a copy of certificate along with the offer.

- 1.6. The fact of having enclosed the EMD, in requisite forms as indicated **(1.3)**, or bidder holding permanent EMD **(1.5)**, shall be clearly mentioned in their offer, failing which their offer will not be considered for evaluation whatsoever.
- 1.7. Post tender rebates or deviation in quoted prices and/or conditions or any other such offers which will give a benefit to the bidder will not only be rejected outright but also the **original offer will itself get disqualified** on this account, and bidders EMD shall be forfeited.
- 1.8. Bidders may note that due date and time of opening the bids shall be adhered to and accordingly, if they wish to witness the bid opening, they should bring necessary authorization letter from the organization.
- 1.9. Standard printed conditions of the bidder if uploaded with their offer will not be accepted.
- 1.10. **Validity of offers:** The offer shall be valid for period of **180 days** from the date of opening of bids. The period of validity cannot be counted from any other date other than the date of opening the bids. During this period bidder shall not be permitted to withdraw or vary their offers, once made and if they do so, the EMD shall be forfeited.
- 1.11. **Income Tax Certificate:** The bidder shall submit along with their offers, the latest valid Income Tax returns for at least two years during the last three years.
- 1.12. **Past Experience:** The list of consumers, to whom the bidder had supplied identical materials in the past along with P.O details and performance report, if any, shall be furnished.
- 1.13. **Acceptance of APGENCO Payment Terms:** The bidders will be loaded in price evaluation @ 1.25% of landed cost per month for deviation in payment terms.
- 1.14. **Price Basis:** Kindly quote FIRM & F.O.R. destination prices. Otherwise, if the quoted rates are Ex-works, Loading @ 2% towards packing and forwarding and 3% towards freight charges will be done.
- 1.15. **Transit Insurance:** Bidder shall quote FOR Destination prices inclusive of transit insurance charge till such time material is unloaded at Project site including 30 days' storage period. All the damaged parts during transit or otherwise, if any, are to be made good or replaced with good ones by the bidder/ supplier irrespective of the settlement of claims with insurance company.
- 1.16. **Goods & Services Tax:** Kindly indicate clearly as to whether the offered prices are inclusive or exclusive of GST. The rate applicable shall be shown separately. GST will be paid to the seller at the rate which it is liable to be assessed/actually assessed on the date of supply. In case the bidder stipulates GST extra as applicable at the time of dispatch and specifies the present rate of GST (in numeric percentage or NIL), the offer shall be evaluated considering rate of GST for the product as per rate of Govt. of India or as evident from bids received from other bidder. However, liability of APGENCO shall be restricted to actual GST paid at the time of dispatch subject to production of Tax Invoice.
- 1.17. **Cost Compensation for Deviation:** Deviations specifically declared by the bidders in respective deviation schedules of bid proposal sheets only will be taken into account for the purpose of evaluation. The bidders are required to declare the prices for the withdrawal of the deviations declared by them in the deviation schedules. Such prices declared by bidders for the withdrawal of the deviations in the deviation schedule shall be added to the bid prices to compensate for these deviations. In case prices for the withdrawal of deviations not furnished by the bidder, the APGENCO shall convert such deviations into Rupee value and add to the bid price to compensate for these. In determining the Rupee value of the deviations, the APGENCO will use parameters consistent with those specified in the specification and documents and / or other information as necessary and available with APGENCO. In case the bidder refuses to withdraw, the EMD of bidder shall be forfeited. Bidder may note that deviation variations and additional condition etc. found elsewhere in the bid other than those stated in the Deviation schedules, save those pertaining to any rebates, shall not be given effect to in evaluation and it will be assumed that the bidder complies with all the conditions of bidding documents. In case bidder refuses to withdraw, without any cost to APGENCO, those deviations, which the bidder did not state in the deviation schedules, the EMD of the bidder may be forfeited.
- 1.18. Offer should strictly be in conformity with technical specifications/drawings/samples as stipulated in this tender. In case no deviations are indicated, it shall be taken for granted that item(s) has / have been offered strictly as per the requirements.
- 1.19. **Delivery Period:**
- a) **Material:** The materials shall be delivered **within Eight months** from the date of approval of drawings. However, the delivery period shall include delivery and acceptance of the material in good condition at site. **Drawings shall**

be furnished within 30 days from the date of acceptance of P.O and got approved within 2 months from the date of acceptance of P.O.

- b) **Erection, Testing & Commissioning:** Erection, Testing & Commissioning of the respective LCU (unit /common Auxiliaries& Switchyard) including all materials should be completed **within 45 days in full shape** from the date of intimation of readiness of the site Including filed instruments and vibration monitoring system (USPH).

Unit line clears for Two or more units can be availed either in sequence or simultaneously on mutual agreement of contractor and Engineer in charge in concurrence with APSLDC.

2. Delivery Schedule

The material shall be offered for inspection, 15days in advance to depute APGENCO representative and the material shall be delivered within 15 days from the date of issue of dispatch clearance. The offered delivery period shall be based on delivery schedule indicated in the tender. In case of any deviation, the bidder shall offer his best, realistic and firm delivery, which shall be specific and guaranteed.

- 2.1. It is not binding on APGENCO to accept the lowest or any bid. The corporation reserves the right to revise the quantities at the time of placing order. The quoted rates, terms and conditions shall apply. APGENCO further reserves the right to accept or reject any/all bids without assigning any reasons thereof.
- 2.2. Bidders are requested to fill in the enclosed proforma (**Schedule-3**) for Terms and conditions and submit the same in duplicate along with their offer.
- 2.3. Make/Brand of items offered shall be specified. It shall be appreciated if one copy of detailed descriptive literature/pamphlets shall be enclosed along with the offer which may help technical evaluation.
- 2.4. Test certificates of the offered materials shall be furnished from any Govt. recognized test house;
- 2.5. If the bidder is on DGS&D Rate contract for item(s) covered enquiry. A copy of the same shall be enclosed along with the offer.
- 2.6. **Amendment of Bidding Documents:**
- a) At any time prior to the due date & time 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 amendment through e –platform.
- b) In order to allow prospective Bidders reasonable time to make the amendment into account in preparing their bids, the Purchaser may, at his discretion, extend the due date & time for the submission of bids.
- 2.7. **Language of Bids:** The Bid prepared by the Bidder and all correspondence and documents relating to the bid exchanged by the Bidder and the Purchaser, shall be written in English language only.
- 2.8. **Documents Comprising Online Bid:**
List of all documents which shall be submitted as softcopies/ hardcopies are given in the **Check List**. The documents which shall be submitted as softcopies shall be signed, stamped and scanned and uploaded during bid submission. **The documents which shall be furnished as hardcopies shall be signed, stamped and sent as and when requested by the tender inviting Authority by the successful bidder.**
- 2.9. **Articles of Association:**
- a) All Bids must be accompanied by duly authenticated copies of the documents defining the constitution of the company, power of attorney and other relevant documents, and any bid submitted by a partnership firm must be accompanied by duly authenticated extracts from the partnership deed or other documents, so as to show by which person and in what manner contracts may be entered into by or on behalf of the company, partnership for the due execution of such contracts and responsibilities.
- b) The said documents must be legalized by the local authorities at the place of issue. Such documents should indicate current address of the firm and full name and current address of all partners of the firm.
- c) Any Bid not containing these documents, or if such documents are incomplete, or do not conform to the aforesaid forms, may at the discretion of the Purchaser be excluded from the judicature.
- 2.10. The Purchaser may, at his discretion, extend the due date & time for the submission of bids through online corrigendum. However, all rights and obligations of the Purchaser and Bidders previously subject to the due date & time will thereafter be subject to the due date & time as extended.
- 2.11. **Date of Commencement of Contract:**

The date of issue of LOI/PO is the date of commencement of contract. The contractor will have to complete all the formalities like submission of Security Deposit etc. within 30days of issue of LOI/PO. Any delays in complying with the above formalities will be to the account of the contractor.

2.12. Authentication of Bidding:

- a) If the tender is made by an individual, it shall be signed by the individual above his full name and current address.
- b) If the tender is made by a proprietary firm it shall be signed by the proprietor above, his full name and the full name of his firm with its current address.
- c) If the tender is made by a firm in partnership, it shall be signed by all the partners of the firm above their full names and current address, or by a partner holding the power of attorney for signing the tender in which case a certified copy of the power of attorney shall accompany the tender. A certified copy of the partnership deed, current address of the firm and the full names and the current addresses of all the partners of the firm shall also accompany the tender.
- d) If the tender is made by limited company or a limited corporation, it shall be signed by a duly authorized person holding the power of attorney for signing the tender in which case a certified copy of the power of attorney shall accompany the tender. Such limited company or corporation may be required to furnish satisfactory evidence of its existence before Contract is awarded.
- e) If the tender is made by group of firms, the sponsoring firm shall submit complete information pertaining to each firm in the group and state along with the bid as to which of the firms shall have the responsibility for tendering and for completion of the Contract document and furnish evidence admissible in law in respect of the authority assigned to such firm on behalf of the group of firms for tendering and for completion of the Contract document. The full information and satisfactory evidence pertaining to the participation of each member of the group of firms in the tender shall be furnished along with the tender.
- f) The documents or information as required by paras “(a) to (e)” herein above must be uploaded by the tenderer.
- g) All witnesses and sureties shall be persons of status and probity and their full names, occupations and addresses’ shall be stated below their signatures.
- h) All signatures in the tender documents uploaded shall be dated.

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SECTION-2-GENERAL PURCHASE CONDITIONS (GENERAL)

The following terms and expressions herein used shall have the meaning as indicated therein:

- 2.1 **Supplier/ Vendors:** Shall mean the individual; firm or company whether incorporated or otherwise in whose name this purchase order is addressed and shall include its permitted assigns and successors.
Purchaser/ corporation: Shall mean Andhra Pradesh Power Generation Corporation Limited., (A Government of A.P. Undertaking), a company incorporated in India under Companies Act 1956, having its Registered Office at Vidut Soudha, Gunadala, Vijayawada –520004, Andhra Pradesh.
- 2.2 **Reference:** This purchase order number must appear on all the correspondence, packing slips, invoices, drawings or any other document or paper connected with this purchase order.
- 2.3 **Specifications and drawings:** Any information or details which are included in the specification but not indicated in the drawings and vice-versa shall have the same effect and meaning as if included for and shown both in the specifications and drawings. In case of any dispute between the specifications and drawings, the decision of the Corporation or its authorized representative shall be final and binding.
- 2.4 **Additions/ Alteration/ Modifications:** The Corporation reserves the right to make additions/ alterations/ modifications to the quantity of items in the purchase order. The supplier shall supply such quantities also at the same rate as originally agreed to and incorporated in the purchase order. The variation shall, however, be limited to +/- 20% of the ordered quantity.
- 2.5 **Waiver:** Any waiver by the authority or any breach of the terms & conditions of the purchase order shall not constitute any right for subsequent waiver of any other terms and conditions.
- 2.6 **Subletting and Assignment:** The supplier shall not, save with prior consent in writing of the Corporation, sublet, transfer or assign this order or any part thereof or interest therein or benefit or advantage thereof in any manner, whatsoever. Provided nevertheless that any such consent shall not relieve the supplier from any obligation, duty or responsibilities under the contract.
- 2.7 **Information Provided by the Corporation:** All drawings, Data and documentation that are given to the suppliers by the Corporation for the execution of the order are the property of the Corporation and shall be returned back when demanded. Except for the purpose of executing the order of the Corporation, supplier shall ensure that the above documents are not used for any other purpose. The supplier shall further ensure that the information given by the Corporation is not disclosed to any person, firm, body, corporate and / or authority and make every effort that the above information is kept confidential. All such information shall remain the absolute property of the Corporation.
- 2.8 **Name Plate:** Equipment should be provided with name plate giving full details of manufacture, capacity and other details as specified in the relevant IS or other specification stipulated. The purchase order number, date and year of supply and the words “APGENCO” must be etched on the name plate.
- 2.9 **Interchangeability:** All similar materials and removable parts of similar equipment shall be interchangeable with each other. A specific confirmation of this should be furnished along with the invoices for the supplies.
- 2.10 **Materials & Workmanship:** Supplier shall fully guarantee the equipment and component supplied against the purchase order shall be new and first quality, according to the specifications and shall be free from defects (even concealed faults, deficiency in design, materials and workmanship).
- 2.11 **Spare Parts, Oil & Lubricants:** Whenever applicable, the supplier shall furnish to the Corporation, item-wise price list of spares required for two-year operation & Maintenance of the equipment. The supplier shall also furnish necessary instructions and drawings to identify the spare part numbers and their locations as well as on interchangeability chart. The supplier shall recommend the quality of oils & lubricants required to be used for uninterrupted operation (at least for one year) of the equipment supplied against this order.
- 2.12 **Supplier's liability:** Supplier hereby accepts full responsibility and indemnifies the Corporation and shall hold the Corporation harmless from all acts of omission and commission on the part of the supplier, his agents, his subcontractors and employees in execution of the purchase order. The supplier also agrees to defend and hereby undertakes to indemnify the Corporation and also hold it harmless from any and all claims for injury to or death of

any and all persons including but not limited to employees and for damage to the property arising out of or in connection with the performance of the work under the purchase order.

2.13 **Access to supplier's Premises:** The Corporation and /or its authorized representative shall be provided access to suppliers and / or his sub-contractor's premises, at any time during the pendency of the purchase order, for expediting the supplies, inspection, checking etc.

2.14 **Modifications:** This purchase order constitute entire agreement between the parties hereto. Any modification to this order shall become binding only upon the same being confirmed in writing duly signed by both the parties.

2.15 **Inspection/checking/ testing:** All materials/ equipment to be supplied against this purchase order shall be subject to inspection/checking/testing by the Corporation or its authorized Quality department representative at all stages and places, before, during and after the manufacture. All these tests shall be carried out in presence of authorized Quality department representative of the Corporation. Supplier shall notify the corporation for the inspection of materials/ equipment when they are ready, giving at least 15days notice. If upon receipt at our stores, the materials / equipment does not meet the specifications, they shall be rejected and returned to the supplier for repair/ modification etc., or for replacement. In such cases all expenses including to-and-fro freight, re-packing charges, transit insurance etc., shall be to the account of supplier.

Inspection by the authorized Quality department representative of the Corporation or failure of the Corporation to inspect the material/ equipment shall not relieve the supplier of any responsibility or liability under this purchase order in respect of such materials /equipment not be interpreted in any way to imply acceptance thereof by the Corporation.

Note: Accommodation and local conveyance shall be provided by the suppliers for the APGENCO/Third party representatives during inspection.

2.16 **Packing and Marking:** All materials/equipment shall be securely packed to the requirement of transportation by Rail/Road/Sea transport. All exposed services/ connections/ protrusions shall be properly protected. All unexposed part shall be packed with due care and the packages should bear the words '**Handle with Care**'. The packing requirements of Rail/ Road transport shall be complied with so as to obtain clear Railway/ Lorry Receipt i.e. without any qualifying remarks.

All packages and unpacked materials shall be marked with the name of the Consignor, Consignee, Purchase Order No., gross and net weight, sign of handling, if any, with indelible paint in English at least at two places. In case of bundles, metallic plates marked with the above details shall be tagged with such bundles.

2.17 **Dispatch of materials: The equipment & material shall be dispatched only after issuance of MDCC from the corporate Quality Department.** The supplier is responsible for the safe delivery of the goods in good condition at destination stores. The supplier should acquaint himself of the conditions obtaining for handling and transport of the goods to destination and shall include and provide for security and protective packing of the goods so as to avoid damage in transit. After packing the materials / equipment those shall be dispatched strictly as per the provision of purchase order. In case any change in the mode of transportation and/or transporter has to be done, the same shall be done only after obtaining prior approval in writing. Normally the goods shall be dispatched through our approved transporter only. All formalities related to allotment of wagons, loading permission from railways shall be completed by the supplier. The supplier shall communicate immediately the dispatch details to the consignee as specified in the purchase order. The original despatch documents shall be forwarded immediately, failing which the supplier shall be responsible for any delay in payment and consequential payments of demurrages and wharfages to the transporter.

2.18 **Demurrage/wharfage:**

a) Dispatch of materials not through authorized/reputed transporter.

b) Late receipt of invoice or due to violation of any other clause(s) of the purchase order will be to supplier's account. Supplier shall also be responsible for all such payments due to late receipt of RR/LR and other documents.

2.19 **Acceptance of order:** The Purchase orders shall be sent to supplier in duplicate and he shall return one copy along with enclosures, duly signed and stamped, **within 15 days** in token of having received and accepted the order.

2.20 **Jurisdiction:** All and any dispute or difference arising out of or touching this order shall be decided only by the courts or Tribunals situated in Vijayawada. For the purpose of any legal obstruction, the material, spares etc., should be deemed to pass into company's ownership only at the destination stores where they are delivered and accepted.

- 2.21 **Guarantee Period:** The equipment shall be guaranteed for satisfactory operation for a period of 24 months from the date of receipt at stores in good condition 18 months from the date of commissioning which is earlier. If during the period of guarantee any of the material found defective and / or fail in test or operation, such materials shall be repaired or replaced by the supplier free of cost to APGENCO irrespective of their reimbursements from the insurance company within reasonable time which shall in no circumstances be more than 15 days or such other reasonable time as APGENCO may deem proper to afford, **failing which the cost of the failed units will be deducted from subsequent bills/ Bank Guarantees.**
- 2.22 **Quality Assurance Plan:**
The Tenderer shall within 10 days of drawing approval submit the following information to the purchaser.
- a) Manufacturing Quality Plan (MQP). [As per Annexure-7](#)
 - b) Field quality plan (FQP). [As per Annexure-8](#)
 - c) The names of sub-suppliers selected (sub supplier /sub-contractor assessment & approval by quality department).
 - d) Inspection and testing schedules.
 - e) The Tenderer shall submit the routine test certificates / compliance certificates of bought out accessories for raw material at the time of routine testing if required by the quality department and ensure that the quality assurance requirements of specification are followed by the contractor/sub-contractor.
- [The Equipment& Materials shall be dispatched only after issuance of MDCC from the corporate Quality Department.](#)**
- 2.23 **Drawings:** The detailed drawings and bill of materials shall be furnished within **30 days** from the date of acceptance of PO and got approved by APGENCO within **02 months** from the date of PO before manufacturing.

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SECTION-3-GENERAL PURCHASE CONDITIONS (FINANCIAL)

- 3.1. Prices:** Price(s) mentioned in the purchase order shall be firm and not subject to escalation on any account, till the order is executed in full and its subsequent amendments accepted by the supplier even though the completion/execution of order may take longer time than delivery period incorporated and accepted in purchase order.
- 3.2. Taxes and Levies:** Taxes and other levies payable shall be shown separately in the invoice. These shall be to the account of Corporation, unless otherwise mentioned in the purchase order.
- 3.3. Variations in Statutory Levies:** Any variation, upward or down ward, in statutory levies or new levy is introduced after opening of the bids/ placement of order under this purchase order shall be to the account of the Corporation, unless otherwise mentioned in the P.O., provided that in cases where delivery schedule is not adhered to by the supplier and there are upward variation/revision after the agreed delivery date, the bidder/supplier shall bear the impact of such increased levies and if there is downward variation/revision, the corporation shall be given advantage to that extent.
- 3.4.** All royalties for patent or charges for the use or infringement thereof that may be involved in the construction or use of any equipment shall be included in the bid price. The bidder /supplier shall protect the Corporation against any and all claims arising on account of the use thereof the Corporation agreeing to furnish the supplier any appropriate information or assistance.
- 3.5. Security Deposit (SD):**
- a) The successful bidder shall furnish the Security Deposit equal to 2.5% value of purchase order within **ONE month** from the date of issue of Purchase order (if the value of order is above Rs.2Lakhs) for proper fulfilment of **full execution of supplies, ETC** thereof. The amount of security deposit shall be forfeited to the extent of financial loss suffered by the Corporation, if supplier fails to execute the order and fulfil its terms and conditions.
 - b) Security deposit may be furnished in the shape of Demand Draft drawn on any Govt. Banks/Nationalized Banks/Public Sector Banks/Scheduled banks, payable to APGENCO or bank guarantee in lieu of cash in prescribed proforma as per [Annexure-3](#) (Bank Guarantee shall be accepted only if amount of SD is above Rs.10,000/-) or Insurance surety bonds duly endorsed in favour of APGENCO as per [Annexure-5](#).
 - c) The Bank guarantee shall be valid for a period up to delivery period (i.e., Supply & ETC) with a claim period of 06 months over and above the delivery period (Supply & ETC) and the validity of the Bank Guarantee shall be extended suitably in case of delay in supply/ ETC of material.
 - d) If the BG validity is not sufficient, the SD amount will be deducted from your bills during processing of the same.
 - e) The Security deposit shall be returned back to the supplier as soon as order is fully executed and there is nothing outstanding either against this purchase order or any other purchase order placed by the corporation on the supplier.
- 3.6. Terms of payment:**
The standard payment terms shall be:
- 1. **MATERIAL PORTION:**
 - i) **Within the Contractual delivery period:** 80% of the all-inclusive price of the materials shall be paid within 30 days on presentation of the contractor's invoice after receipt and acceptance of the material in good condition at site against furnishing of Bank Guarantee for 10% value of the contract covering the guarantee period on presentation of the contractor's commercial invoice. Balance 20% payment shall be paid within 30days after successful commissioning of the equipment in full shape.
 - ii) **Beyond the contractual delivery period:** 75% of all inclusive price of the materials shall be paid within 30 days on presentation of the contractor's invoice after receipt and acceptance of the material in good condition at site against furnishing of Bank Guarantee for 10% value of the contract covering the guarantee period. Balance 25% payment shall be paid within 30days after successful commissioning of the equipment in full shape subject to effective performance of the contract and settlement of liquidated damages etc.
 - 2. **ERECTION, TESTING AND COMMISSIONING:**
 - i) **Within the Contractual delivery period:** 100% payment of the all-inclusive price shall be paid within 30 days after successful completion of Erection, Testing and Commissioning of the equipment's in full shape on presentation of the contractor's invoice.

- ii) **Beyond the contractual delivery period:** 100% payment of the all-inclusive price shall be paid within 30 days after completion of Erection, testing and commissioning of the equipment in full shape on presentation of the contractor's invoice subject to settlement of liquidated damages etc.

Note:

- No interest charges will be paid in case the payment is delayed for any reason.
- Payments shall be made through SBI e-payment system.
- APGENCO has implemented SBI e-payment system for arranging payments towards Supply of Material and Services.
- Bidder is requested to furnish the Consent form ([Schedule-9](#)) for arranging e-payments against subject Purchase Order duly signed by Authorized Signatory.
- A cancelled cheque shall also invariably be enclosed along with consent letter for checking the details furnished.
- Further, the following is informed:
- Any request for change of Bank Account will not be entertained during the currency of the Contract.
- Any request for issue of Cheque or other mode of payment will not be entertained during the currency of the Contract after implementation of automated System.

If the supplier has received any over payments by mistake or if any amounts are due to the Corporation due to any other reasons, when it is not possible to recover such amount under the contract resulting out of this order, the Corporation reserves the right to collect the same from any other amounts and/or Bank Guarantee given by the supplier due to or with the Corporation.

- When the supplier does not at any time fulfill his obligations in replacing/rectifying etc. of the damages/defective materials in part or whole, promptly to the satisfaction of the corporation's officers, the corporation reserves the right not to accept the bills against subsequent dispatches made by the supplier and under these circumstance only the supplier will be responsible for any demurrage, wharfage or damages occurring to the consignments so dispatched.

3.7. Liquidated damages/ failure and termination:

- 3.7.1. In the event of any delay in the supplies of ordered materials/ delay beyond the stipulated date of delivery/ delivery schedule, the Corporation reserves the right to recover from the supplier a sum equivalent to 0.5% of the value of delayed materials/ equipment for each week of delay and part thereof subject to a maximum of 5% of the total value of the order.
- 3.7.2. Alternatively, the Corporation may resort to purchase the materials/equipment from elsewhere at the sole risk of the supplier and cost of such supplies shall be passed on to the supplier or recover all such extra cost incurred by the Corporation in procuring the materials by above procedure.
- 3.7.3. Alternatively, the Corporation may cancel the purchase Order completely or partly without prejudice to its right under the alternatives mentioned above.
- 3.7.4. In case of recourse to alternative 3.7.2 and 3.7.3 above, the Corporation shall have the right to repurchase the materials which is readily available in the market to meet the urgency of requirements caused by supplier's failure to comply with the scheduled delivery period irrespective of the fact whether the materials /equipment are similar not.

- 3.8. Performance Bank Guarantee:** The supplier shall ensure that all materials/ equipment under this purchase order shall conform to Corporation's requirements and specifications. An additional security in the form of Performance Bank Guarantee is essential for satisfactory performance of the equipment over a period of time. In view of this, the suppliers of equipment/ instruments/ machinery shall be required to furnish a Bank Guarantee (10% of order Value) against any manufacturing defects/ poor workmanship/ poor performance valid for a period up to Guarantee period with a claim period of 6months over and above the guarantee period. In case any deficiencies are found during guarantee period, the same shall be repaired/rectified/replaced at free of cost. BG shall be from any Govt. Banks/Nationalized Banks/Public Sector Banks/Scheduled banks in the prescribed proforma ([Annexure-4](#)) (or) in the form of performance insurance surety bond in the prescribed proforma ([Annexure-6](#)) and got approved by APGENCO. If the supplier fails to furnish the Performance bank guarantee, 10% of order value will be deducted from the bills. The deducted 10% performance guarantee amount will be released after expiry of guarantee period or furnishing of 10% BG.

The Corporation shall at its discretion have recourse to the said Bank Guarantee for recovery of any or all amount due from the supplier in connection with the purchase order including of the Guarantee obligations. Checking/approval of supplier's drawings, inspection and acceptance of materials/equipment furnishing to effect shipment and /or work done by Installation, testing and commissioning of the equipment by Corporation or any other agency on behalf of the Corporation shall not in way relieve the supplier from the responsibility for proper performance during the Guarantee period.

- 3.9. Insurance:** Supplier shall arrange suitable transit insurance cover at their risk and cost.

- 3.10. Removal of Rejected Goods and Replacement:**

- a) If upon delivery, the material/ equipment if it is found not in conformity with the specifications stipulated in the purchase order, whether inspected and approved earlier or otherwise, those shall be unacceptable to the Corporation or its authorized representative. A notification to this effect shall be issued to the supplier, normally within 30 days from the date of receipt of materials at our stores.
- b) Supplier shall arrange suitable replacement supplies and remove the rejected goods within 30 days from the date of notification failing which, the goods shall be dispatched to vendor by road transport on 'freight to pay basis' at supplier risk and cost.
- c) External damages or shortages that are prima-facie the results of rough handling in transit or due to defective packing shall be intimated within a fortnight of the receipt of the materials, spares etc. In case of internal defects, damage or shortages or any internal parts, which cannot ordinarily be detected on a superficial visual examination, though due to bad handling in transit or defective packing should be intimated within 3 months from the date of receipt of these articles. In either case the damaged or defective materials should be replaced by the supplier free of cost to the company.
- d) If no steps are taken within 15 days of receipt of intimation of defects or such other reasonable time as company may deem proper to afford, the company may without prejudice to its other rights and remedies arrange for repairs/ rectification of the defective materials or replace the same and recover the expenditure incurred from the deposits such as EMD, SD and performance guarantees or other amounts available with the company or by resorting to legal action.
- e) However, if any advance payment had been made by the Corporation for the goods so rejected on technical ground, rejected materials shall be returned to the supplier after receipt of suitable replacement supplies. If the supplier does not settle the rejection within a period of 60days from the date of notification from stores, rejected goods shall be sent back to supplier at his risk and cost.

3.11. Force Majeure:

- 3.11.1. The supplier shall not be liable for any delay or failing to supply the materials /equipment for reasons of Force Majeure such as Acts of God, Acts of War, Act of Public Enemy, Natural calamities, Fires, Floods, Frost, Strikes, Lockouts etc. Only those causes which have duration of more than 7 days shall be considered for force majeure.
- 3.11.2. The vendors shall within 10 days from the beginning of such delay notify to the Corporation in writing the cause of delay. The corporation shall verify the facts and grant such extension of time as facts justify.
- 3.11.3. No price variation shall be allowed during the period of force majeure and Liquidated damages would not be levied for this period.
- 3.11.4. At the option of the Corporation, the order may be cancelled. Such cancellation, would be without any liability whatsoever on the part of the Corporation. In event of such cancellation, supplier shall refund any amount advanced or paid to him by the Corporation and deliver back any materials issued to him by the Corporation and release the facilities, if any provided by the Corporation.

3.12. Cancellation of Order: The Corporation reserves the right to cancel the order in part or in full by giving two weeks' notice there by if

- The supplier fails to comply with any of the terms of the order.
- The supplier becomes bankrupt or goes into liquidation.
- The supplier makes general assignment for the benefit of the creditors and
- Any Receiver is appointed for the property owned by the supplier.

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Section -4 Technical Specification

4.1. General technical requirement:

- The Supervisory Control and Data Acquisition system shall be designed based on the Distributed Control System (DCS). The DCS shall be microprocessor based and shall be used for carrying out automatic control, interlocking & sequencing, monitoring, data acquisition, and complex process regulation. The major hardware constituents of the system are the redundant controllers, Dual data communication bus at each rack and the operator stations along with large video displays for supervisory and control functions. Each Unit control board/ Local Control Boards comprise I/O modules for signal processing and the terminations for field signals , DCS controller, Redundant power supply modules,.
- The DCS system shall co-ordinate with existing digital governor (available at site) & excitation systems and the existing numerical protection relays of Generator, Generator transformer, Unit Auxiliary Transformer, Lines etc., Remote Terminal Units as detailed below.

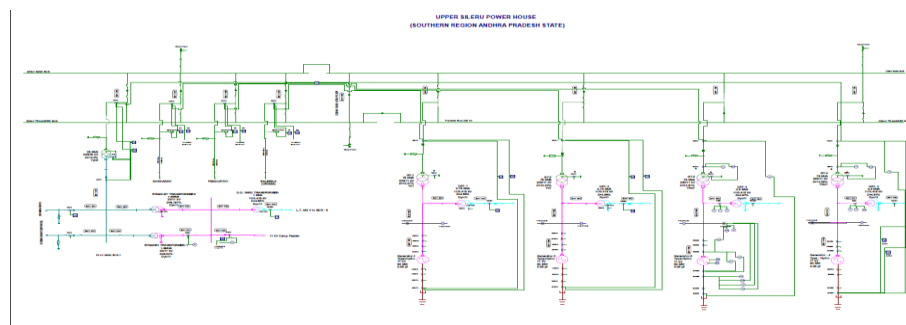
Details of the existing Governors and Excitation systems of USPH are given below for ready reference.

Description	Static Excitation System	Governor	To be supplied RTU panel
Make	M/s. Andritz make	M/s ABB India Ltd	Synergy make
Model	Excitation –Thyne-500	Microprocessor based with Restricted Governor mode of Operation.	HUSKY 6049-E70- RTU panel

List of Relays of USPH

List of Relays of UPPER SILERU POWER HOUSE									
S. No	Relays	Main-I				Main-II			
		Qty	Make	Model	IEC 61850 connectivity	Qty	Make	Model	IEC 61850 connectivity
1	Unit GRP - Gen. Protn.	4	Andritz	HIPASE	YES	4	ABB	REG670	YES
	Unit GRP - GT Protection		Andritz	HIPASE	YES				
	UAT protection relay		C&S	CSEGEN	NA				
2	Feeder Protection Relays	3	MICOM	P442	YES	2	GE	D60	YES
						1	ABB	REL670	YES
3	Station Transformer Protection Relay	1	MICOM	P643	YES	1	GE	T60	YES
4	Busbar Protection Relays	1	ABB	REB670	YES	NA			
5	33KV DNK feeder	1	L&T	MC61A	NA	NA			
6	11KV Camp feeder	1	ABB	SPAJ140C	NA	NA			

Protection and SLD scheme are attached and detailed below. All the existing relays have Ethernet connectivity with IEC 61850 functionality.



- An integrated system combining process control, common auxiliaries control & substation control shall be provided, preferably using the IEC 61850 standard. Protection & control devices shall

exchange information with the SCADA system preferably using IEC 61850 substation communication protocol. Preferably there should not be any protocol convertor between SCADA and Numerical Relays communicating on IEC 61850 or any other communication protocol.

- The operator's console comprises the operator work stations (04 Nos), engineering work station (02 Nos), separate dot matrix type printers for alarm and events, colour laser jet printer for reports and hard copies.
- The large video display shall comprise single line mimic diagram of the station with status of the equipment and its parameters required to be monitored by the operator including alarm status.
- The operator stations perform the supervision of various peripheral equipment and data communication within the DCS as well as other system. The system shall provide the capability to perform operation, monitoring and control of the plant from a Central Control Room (CCR)/Master Control Room (MCR). It shall be microprocessor and computer-based system with components physically and functionally distributed at various plant locations.
- The system described in this specification shall be manufactured using the latest state-of-the art DCS system suitable to cater the needs of process control application. All the plant operations will be done through operator work stations housing LED Monitors, keyboards and pointing devices. The control system shall include completed, tested and operational programs that are fully documented and described clearly.

Redundancy for the system at:

- Hot Standby Redundant DCS controllers (primary and standby) with bump less transfer
- Redundant Power supply unit shall be offered for DCS controllers and I/O subsystem separately at MCR to avoid controller failure in case of any short circuit in the field or IO sub system.
- Redundant communication bus between controller and IO subsystem shall be provided.
- Redundant communication between centralized DCS based SCADA system and control boards

In addition to above following shall be provided

- Standard user-friendly Programming language shall be used as per international standard for DCS programming.
- Ladder (LD)
- Functional Block Diagram(FBD)
- Sequential Functional Chart(SFC)
- Structured Text(ST)
- Instruction List(IT)

4.2. Scope of work:

The scope of work under this specification comprises detailed Design, Engineering, Manufacture, Testing, Packing & forwarding, delivery at site stores, Loading & Unloading, Supply, Dismantling of the existing system, Erection, Testing & Commissioning of DCS based Supervisory Control and Data Acquisition (SCADA) system and Field Instruments for complete Power House, Common auxiliaries equipment and Switchyard of Upper Sileru Power House (USPH-4X 60 MW) in addition with Vibration Monitoring System for USPH.

The Distributed Control & Monitoring system for plant control shall be configured as detailed below

4.2.1. Centralized DCS with Work stations & Monitors:

A centralized unit shall be multiprocessor based DCS to be installed at centralized control room of the station. The DCS shall acquire all the required inputs from all individual Unit simultaneously & control, monitor, operation of the Units in sequential way shall be performed from the centralized DCS.

The Work stations console shall comprise of Servers, Operator cum Historian station, Engineering Work Station, Emergency Push Button Station, alarm, Events record, and dedicated laser printer & dot matrix printers for the system. Segregation and location of OWS and EWS will be decided during detailed engineering.

All the data's required for centralized DCS shall be universally available for control, monitoring (including plant alarms, fire protection) on real time, operator displays, data acquisition, performance monitoring & other functions with Master stations.

The system shall have user programmable algorithm specifically designed for power plant applications. Such algorithms include flow controllers with mass flow computing capabilities & device control algorithms with diagnostic logic.

The centralized DCS shall be controlled and monitored through Operator cum Historian Work stations and Engineering Work station installed in the control room.

Reporting of everyday generation reports in excel, monthly energy meter readings in excel, Events, alarm logging, trends & storage of data as required.

The system should be flexible enough to accommodate any changes or up-gradation taking place as and when in future. **The OEM shall provide the services for the changes or up-gradation and an undertaking in this regard shall be furnished.**

System shall be Unified SCADA system for Plant Automation & Substation Automation.

It is the responsibility of the Contractor to visit the Power House and to ascertain the cable layout, length of cables required & location for installation of Centralized DCS system in Generator Hall and Control room respectively.

The automatic system shall be capable of carrying out the following functions automatically with a command from operator workstation in the control room of power station.

- Automatic start/stop of the units and its auxiliaries in Idle spin, Spin Gen, Generator and shutdown mode of operations duly checking of sequence and interlocks.
- Step-by-step mode of operation
- Manual operation from control room ECR panel.
- Automatic synchronizing, loading/unloading of the units.
- Parameter monitoring and data acquisition on real time basis.
- Display of mimic on the station computer for effective Human machine interaction.
- Reports, event and alarm logging, trends and storage of data as required.
- Display of parameters and status of units and feeders on Large Video Display.

The system should be flexible enough to accommodate any changes or upgradation as per changed requirements in future.

Cables for Field instruments like pressure switches, Pressure transducers, level switches, level transducers, Switch cum transducers, flow measuring instruments, Limit switches, proximity switches / sensors to feedback status, temperature measurement, vibration pickups etc. whatever required to complete the total SCADA system for power house is also in the present scope of supply.

Scope of supply of Field instruments is also in vendor scope. Details of the Field instruments required and their range is as mentioned elsewhere in this specification.

4.3. System configuration:

The automatic system offered should be multiprocessor based distributed control system, shall be modular structured IO cards, DCS controllers and I/O cards should be of same make & series and suitable for establishing decentralized and autonomously functioning automation unit as follows:

- 1 LCU (Qty is as per requirement, Qty minimum 5 Nos one for each unit and one common for switchyard, LT, HT and station common auxiliaries) : Unit 1 to 4, 220KV , 33 KV & 11KV switchyard, ECR & common auxiliaries automation and interlocks at MCR, control and automation (sequencing and interlocks) for Auto and Local manual start/stop functions.
- 2 Human Machine Interface (HMI) consists of Operator workstations (04 Nos), Engineering work station, Historical Data Storage, servers, printers, peripherals etc.,.
- 3 Real time LAN (redundant data high way)
- 4 Large Video Display for supervision
- 5 SCADA servers shall have inbuilt IEC 60870-5-104 & 101 communication protocols for transmitting the selected data to LDC or Separate Gateway PC for central load dispatch center shall be provided.
- 6 **I/O's shall be considered as detailed in Annexure-9.**

Equipment	Digital inputs		Digital outputs	Analog Inputs for 4-20mA signals / soft signals through communication	Analog Inputs for PT 100 temp signals	Analog Outputs
	Ordinary DIs	SOEs				
LCU 1-4(Units)	946	628	784	450	178	72
LCUs(common Aux & Switchyard)	445	(-)	231	152	(-)	35
ECR1 & 2	790	(-)	316	(-)	(-)	(-)

**** Complete list of AI/AO, DI/DO, Instruments are enclosed to this specification. All the signals & instruments prepared are tentative only.**

Bidders are requested to visit the site before participating in the pre bid meeting & bidding. Signal list will be finalised after pre bid meeting.

4.4. SYSTEM REQUIREMENTS:

4.4.1. CENTRALIZED DCS SYSTEM:

The automation system offered should be a distributed, multi-processor DCS control system.. All automation tasks must be distributed among the parameter tables and user programmable modules of the automation system. All on-line redundant modules configured in main and standby processor module shall have switchover time from main to standby processor less than 10 msec. The Transfer shall be bump less.

Redundancy at the controller, Redundancy at the communication and Redundancy at the power supply levels should be available to afford maximum flexibility. When a fault occurs in a primary circuit, bump less transfer to the back-up should ensure uninterrupted operation. The fault tolerance of Control and I/O should result maximum control system availability with no single point of failure. When safety and process applications are executed within the same controller or within the same system, they should freely exchange signals and data without the need for external, complex interface hardware, software, and mirroring of data. Online programming changes in the main CPU should also bring changes in the hot standby CPU with automatic synchronization and message display of that both CPUs are upgraded with same program. No manual intervention is allowed. All Modules shall be able to be replaced ON LINE without switching off of Power supply.

The automation system should have an open architecture and shall be able to interface with other open communication protocols. There should be a built-in provision to connect to Ethernet TCP/IP LAN. The real-time communication network is considered the backbone of the system and only extremely high reliability and quality network architecture shall be used. The general-purpose IT related network products shall not be utilized for establishing real time communication network. The system must permit the use of protocols for interconnection with other devices. It should be possible to transfer specific information from the automation system to the external device. Similarly, the automation system shall be capable of receiving commands and other process information from the external device, and process it, as intended. The vendor shall provide a comprehensive document with details of this interconnection interface.

The offered system should ensure swift reaction times between command initiation and acknowledgement throughout the process control system. The autonomous function units should have a provision to connect remote input/output modules, so as to reach very close to the process equipment and reduce the interconnecting wiring. Remote

automation units must be interfaced via redundant bus with the main autonomous function units. All field input voltage for the sensors and all outputs of the process control system must be short circuit proof / fuse protected.

The system should offer individual/ dedicated (for each units) automatic synchronizer for each unit separately for synchronising the units to grid. Auto synchronizer and check synchronizer shall be part MCR panels for auto and manual synchronization to the grid. All modules of automation system must have internal diagnosis and monitoring functions to alarm the operator, in case of any faults the automation system must be able to register, diagnose and limit internal and external errors after they have been recognized. Suitable indication must be available on the front fascia of the modules to indicate health of module.

The user-level programming of the automation system must be based on user-oriented programming tools (ladder diagram, function block diagram, structured text, sequential function chart, instruction list and Control Module language. Control software for each function is developed using basic logic functions like AND, OR, R-S FLIP FLOP etc. and Macro functions (dedicated functions) like Sequence Control, Drive Control etc., instead of conventional programming language such as C, C++, FORTRAN or PASCAL. The software for each function is allocated an address space in the memory thereby decentralizing the functional software. The entire automation system must be self-explanatory. It must be possible to display and print all programs, parameter and lists any time, if required, without interrupting the operation of the system.

In addition to the stated requirements, the offered system must be expandable, both in 'data acquisition' and in 'functionality'. The vendor shall specify the expandability feature of the offered system.

4.4.2. ELECTRICAL CONTROL PANEL:

- Provision shall be provided in a separate panel for all four units to trip and handle the units in emergency conditions and also to operate the units when SCADA system fails/ Out of service.
- Provision shall be provided to shut down the units within the safe limits, when centralized DCS system fails, by closing the Guide vanes, MIV and opening the field breaker, generator circuit breaker through hard wired signals.
- Provision shall be provided on the Electrical control panel to operate the units in "MANUAL MODE".
- In case of failure of communication with the central/Master control room, the units can be able to be operated from ECR/local control units with the push buttons provided as conventional control desk.
- Provision shall be provided on the ECR panel for indication, feedback & control of the following signals
 - a. MIV ON/OFF & feedback
 - b. Guide vane limiter raise, lower and max., min. position indication
 - c. Speed/Power setter raise/Lower and max., min. position indication
 - d. Governor ON/OFF & Feedback
 - e. Field Breaker ON/ OFF and Field flashing ON/OFF
 - f. Excitation ON /OFF & feedback and Raise/Lower
 - g. Generator Circuit Breaker ON/OFF & feedback
 - h. Equipment for manual synchronization of the units.
 - i. Emergency stop and CO₂ release control and Indication
- Logics for manual synchronizing/tripping of the units will be provided during detailed engineering.
- An emergency stop pushbutton with protection cover and with 3 sets of contacts shall be provided for energizing the quick shut down of unit.
- An indication lamp for indicating the fault of Centralized SCADA system

4.4.3. DCS CONTROLLER:

The DCS controller shall be powerful 32-bit controller in Hot standby redundancy with redundant communication with required flash Memory configuration, one acts as main and other as standby. They shall be designed to meet the needs of today's process control applications. The controller shall support full redundancy and a variety of levels of controls.

- Digital and Analog Value Processing
- Integration of Field buses
- Operator station Support

The controller shall collect and process diagnostic data from field bus lines. Furthermore, it shall be suitable for both simple installation in the switchgear room and for use directly in the field.

- The controller shall also allow using the field bus type for:
 - MODBUS protocol
 - Bus for connecting Input/ Output modules

The controller should be capable of segmenting the programmable memory to accommodate the control logics in an optimized manner giving faster speed of scanning and execution. Control modules, applications and hardware settings, should be changeable on line, in real time and under power, resulting in maximum control availability. The application and data should be stored in Compact Flash memory to secure its contents e.g., after a power failure or during transport.

Redundant cards of every kind shall be kept on line all the time and shall take over instantaneously and automatically in case of failure of the active card. Furthermore, any configuration changes made on active controller should automatically be copied to the redundant. Design must ensure that data integrity is maintained during switch over and no portion of data to be transferred is corrupted before and during switch over to the backup controller. The Controllers to be loaded to a maximum of 60% taking into account the spare capacity and scan time requirement defined elsewhere in the specification.

Redundant Control Module processors shall perform calculations in parallel and synchronized manner so that switching from main processor to backup cause no interruption to analog or digital output signal and without any data loss. The system shall guarantee on-line replacement of any failed redundant module without complete system shutdown. IO cards and CPU should be of same family and same series. IO cards and other components of the Control Module shall be replaced on-line without shutting down the Control Module and without the need to remove any field signal cable. Replacement of Redundant modules shall have no effect whatsoever on the process Input/Output signals.

4.4.4. **Input/ Output modules:**

The input/output modules of the system should have the following features:

- IO Cards and CPU should be of same family and same series.
- IO cards are mountable on DIN RAIL, or High speed rack based Backplane
- Quick fault finding with the help of LED's of each module and channel
- Operating temperature of all the module should be 60 degree C
- Support dual redundancy in power supply
- Support of field bus media supervision, bump less change-over and failure reporting

Multiplexing of DI/DO/AI/AO channels in ONE Combined card is NOT PERMITTED. Exclusive cards for DI, SOE, DO,AI,AO &AI RTD shall only be used.

I/O modules shall have protection from destruction by a mechanical keying arrangement if an attempt is made to insert a module type in a position with a different key code than the factory set code of the I/O module. Terminal units have keys that are set to key code of its I/O module's key code. Hot-swap I/O modules allowing replacement of faulty modules without disconnecting field power or system power to the I/O-station. I/O modules should allow for 60°C ambient temperature. The data exchange between the modules takes place through the internal system module bus.

4.4.4.1. **Digital Input Modules:**

All Digital Inputs should be obtained from field through relays with 3 C/O contacts. Each digital input module can have capacity of measuring minimum 16 field digital inputs having two-isolated groups with voltage supervision. The modules should be suitable for voltage levels of 24V DC or 48 V DC as required. Every input channel should have current limiting components, EMC protection components, input state indication LED. The input signal channels should be optically isolated. Suitable transient filters and firmware filters should be available for each channel. For obtaining switchyard inputs, 220V DC relays should be used.

4.4.4.2. **Digital Output modules**

Each digital output module can have capacity minimum 16 digital outputs. All outputs should be suitable for voltage level of 24 VDC. The output signal channels should be isolated from the internal logic. The modules should have short circuit, over current and over temperature protection. Each output channel of the module shall be able to drive an output relay with multiple contacts for field operation. The Potential free contacts of the Output Relays will be used for switching the drives with different voltage levels. Contact rating of the output relays shall be 660VAC,5Amps OR 220v DC, 2A , 2 NO +2 NC or more as required.

Note: The architecture of I/O Modules should be designed such that at least 10% (Minimum-2) of Channels in Each and every Module shall be left free to utilize for the channel failures in future. However, it shall be a facility arrangement not overriding the number of I/Os mentioned in this specification.

4.4.4.3. **SOE Modules:**

Digital Input Modules with time stamping at a resolution of 1 msec to be provided in the system as integral "Integrated sequence of Events Recording System "described elsewhere in this Specification.

Analog Input Modules for current signal:

4.4.4.4. **Analog inputs:**

Signal type is 4-20 mA DC, suitable for 4 wire transmitters (power supply for transmitters is external), and 2-wire transmitter (24 VDC power supply for the transmitter shall be supplied from the DCS). Short circuit protection by current limiting or replaceable fuse shall be provided for each channel. All Analog signals shall be galvanically / optically isolated. The isolation shall be channel to channel and between System and field. Vendor to give details on how this isolation is achieved. All Modules with Maximum 16 channels are to be used.

4.4.4.5. **Analog Input Modules for Temperature Signal**

- Each module can have up to 8/16 analog inputs per module suitable for direct interface with PT20 or PT50 or PT100 or PT150 temperature sensors.
- Inputs should be isolated from each other

- All inputs should be provided with EMC filter
- Resolution should be at least 16-bit
- Inputs should be monitored for open-circuit, short-circuit and has a input grounded Sensor.

4.4.4.6. **Analog output module**

Each module can have up to 8/16 analog outputs per module with mA outputs. All outputs should be provided with EMC filter and error protection device. Resolution should be at least 10 bit.

4.4.4.7. **Communication modules:**

Redundant communication modules shall be provided on each rack of Primary and Standby of CPU to communicate to Centralised SCADA System ~~HMI~~ and access data from other Local Control Units (LCU) through station 01 GBPS TCP/IP Ethernet LAN.

Note: Redundancy of Power & Communication Modules should establish clear redundancy without any bottle neck components at all.

4.5. **Power Supply:**

a) Power supply for CPU and IO subsystem.

The philosophy should be to have redundant power supply due to failure of any component in the power supply system without any bottle neck components. Power Supply for the DCS system should be rack Mountable and with Hot standby redundancy feature. All power supply should be provided with redundancy on each rack of CPU and IO systems. (if one power supply fails the standby power supply mounted on same rack should take care without any manual intervention).

Alternatively, the Bidder may also offer external redundant power supply with diode oring unit.

b) Power supply at Control Room.

The philosophy should be to have redundant power supply due to failure of any component in the power supply system. The control cabinet should be designed to have two separate incoming feeders for incoming power supply. The automation system should be able to operate on 24V DC supply sourced from 220V DC station battery of APGENCO through redundant **220V/24V DC/DC** converters with a Diode coupler unit. Power supply to the control room process computer system shall be from redundant 230V AC.

Hot standby uninterrupted power supply unit of 150% capacity with common battery to be supplied as required. Any other Power supplies as required must be generated by the automation system internally with the help of two redundant DC/DC converters with a diode coupler unit suitably isolated on the output side. In the event of failure of one DC/DC converter, the other should be able to take the entire load. Redundant power supply units shall be protected from affecting each other with internal or external short circuits. Redundant power supplies shall be designed with not more than 80% load one each unit when operating individually. **Supply of Redundant UPS (25 KVA) with static bypass is in the present scope of this contract, with adequate common battery having capacity for minimum of 3 hrs backup for the SCADA. Sealed Maintenance free batteries are to be provided for the UPS.**

4.6. **Application program debugging:**

Programming tool (LAPTOP) must be included in the proposal for testing and debugging application programs of the DCS. The tool will be used for testing the master files of application program before being downloaded to the Control Module or operator station. The tool should perform the functions mentioned in the following paragraphs:

Debugging tool shall have all standard operation displays of the operator station including but not limited to graphic displays, detail panels, and group displays and tag faceplates. Standard application programs of the operator station shall be downloaded directly into the engineering workstation without the need to generate separate displays for the program debugging.

Two modes shall be available for debugging the program, an on-line mode and off-line mode.

On-line mode: On-line mode shall allow the engineer test and debug application programs by running them on actual Control Module hardware, and test the application from the engineering workstation. On-line mode shall allow debugging of any group of algorithms (analog control, monitoring, sequencing and calculations) without affecting other control functions connected to the process IO directly. On-line test function shall allow the engineer to disconnect the software link of control functions from actual I/O cards and replace the process signals with signals generator, or connect control function output to input.

Standard Engineer tool shall allow the engineer to select and disconnect I/O cards from control function. This on-line test function shall be used for analog signal simulation, instead of signal generators, during pre-commissioning stage at site.

Off-line mode: Off-line mode shall allow the engineer build, test and debug the application program from a stand-alone workstation not connected to real-time LAN or Control Modules of the DCS. The off-line mode shall include emulation software to emulate the Control Module functions. This software shall allow standard application programs generated for the Control Module to be downloaded into the stand-alone engineering workstations and emulate their functions without the need to generate any programs to simulate each control function. The emulator mode shall allow two Control Modules be emulated simultaneously. Operator workstation functionality shall run together with the emulator. Debugging program shall include the following functions as minimum. Ability to perform debugging on entire Control Module (off-line and on-line).

Ability to perform debugging on applications covering smaller parts of the program such as plant unit.

Software blocks shall be available in the debugging tool to simulate various process I/O signals such as digital and analog I/Os, timers. Analog signal generators shall include:

- Mathematical functions
- Signal ramp up or down
- Waveform generator
- Pulse
- Dead-time lag
- First order lag

A display shall be available as a window allowing the engineer modifies the status and value of function generators (analog and digital values). Sequence and interlock application programs shall be tested stepwise. The engineer shall have the freedom to test:

- One single sequence step at a time
- A specified number of sequencing steps at a time
- Continuous execution with configurable scan periods (ability for slow motion execution).
- The ability to create BAD data including open circuit status for analog inputs and outputs.
- Ability to connect control functions to signal generator software block, by virtual wiring procedures.

A Vibrant View LED 15.4" Widescreen Laptop With Intel Latest Generation i7 Processor, At least 16 GB DDR4 or higher RAM, 2 TB Hard Drive, and DVD Dual Layer Writer, DVD writer, Two 10/100/1000 Ethernet ports, Other standard ports (USB/HDMI/DVI/Bluetooth/wifi adaptors etc.) including ports to be used for connectivity with UCBs/LCBs/ relays/ governor/DVR etc., shall be supplied along with the licensed Operating System software, SCADA and HMI Software and Anti-virus softwares and above mentioned tools for testing during pre-commissioning checks from the LCU panels and for modification/uploading at LCU level directly.

4.7. **Application program documentation:**

A documentation software package must be added to the proposal to allow for documentation of the application program that is built using the standard engineering tools of the system. The documentation shall include every detail configured in the engineering environment including but not limited to the following:

- System configuration with Control Modules and Operator Station configurations, gateways etc.
- Operator Station assignments including trends, overviews, grouping, function keys and window assignment.
- Regulatory control functions (including instrument details and parameters, instrument connections).
- Sequence control functions (including sequence programs, Digital I/O and flags, messages, elements, timers, counters settings etc.)

4.8. **Computational functions:**

Graphic displays and related graphic attributes. Configurations of user defined report and report scheduling. The documentation function shall provide easy to understand documentation in the form of table of contents, chapters and sections. User shall have the choice to insert document Header, Footer.

User shall have the choice to specify printout of any of the following:

- Full printout of all system configuration database
- Printout of selected items only (such as controller only)
- Printout of modifications in a user defined time frame

4.9. **SPECIFICATIONS FOR STATION LAN:**

The station LAN i.e. redundant communication system (real-time LAN) for communication between the LCU's (actual), with the control room process computer system & field equipment should be as per Ethernet TCP/IP protocol 1 GBPS. The LAN should have the following features: Highest possible availability through redundancy.

In the event of multiple errors at the station bus, the functional areas in the remaining bus islands can continue operation. All the parts of the automation system connected to the station bus are organized as equal station at the bus.

Data rate must be at least 1 Giga Byte per Second. The station bus can be of optical fiber in case of long distances. Each node on the network shall be notified of the status of all nodes for any trouble or failure. Both communication lines in a dual redundant network shall be continuously diagnosed and checked for errors at least 200 times per second. Network load in normal operating condition shall not exceed 50%.

Real-time performance and through put shall not be degraded in case of failure of one network link in redundant configuration. Each processor of a redundant module on the redundant real-time LAN shall be linked to both network cables.

The network shall carry out time synchronization of all nodes connected to the network. Time synchronization signal shall be broadcasted to all nodes at least once per minute. All nodes shall be synchronized to within +/- 5msec. Failure of any device/node on the network shall not affect the real-time LAN or the performance of other nodes/devices. The Vendor shall provide with his proposal a detailed block diagram depicting all interconnections. Transfer between redundant real-time networks shall be instantaneous and with no data loss at all during the transfer.

IRIG-B time synchronization protocol shall be available.

All the necessary cables between the LCU panels/Operating stations/ Large Video Display and any type of special cables required for the interconnection etc. shall be in the scope of supply of contractor.

4.10. **Connectivity with upper level computers and networks:**

Openness is defined here by the ability of the system to easily be integrated with upper level computers on the information LAN with minimum development of application programs to interface with the DCS. The control systems shall have the capability to interface with upper level computers and network using Ethernet with TCP/IP protocol. Data transferred from DCS to a database on the plant information network will be used for plant analysis and reporting to maintenance personnel, process, management and others.

System supplied shall support the data transfer to the long distances such as Load dispatch center or HQ at Vijayawada, for that system shall support IEC 101 & IEC60870-5-104 communication or else separate Gateway PC shall be supplied along with the above equipment in order to transfer the data to the Load dispatch center/Vijayawada. Necessary firewalls shall also be deemed to be included in the scope. Scope includes transmitting the required data to SLDC to the satisfaction of APSLDC.

NOTE: The supplied system shall have the firewalls and malware protection for protection against data corruption, malware entry into system etc., and all the features of data protection policy of Govt. of India for Hydel power stations should be incorporated in the supplied system.

The offered system/servers shall be Open Platform Communications (OPC)/ OPC complaint system/communication protocol, Hardware and Software shall be in the scope for communicating the plant data to SLDC, ERP etc., along with necessary firewalls and safety system.

4.10.1. **Interface requirements:**

The DCS shall be connected with upper computers and networks using Ethernet with TCP/IP protocol. Historical data/files platform shall be interfaced with information LAN directly so that historical data and files can be transferred to the upper computer database without loading the real-time network of the DCS. The storage modules shall have a high security operating system to prevent unauthorized user from accessing the system database.

4.11. **LARGE VIDEO DISPLAY:**

TECHNICAL SPECIFICATION OF LVS DISPLAY

1. SCOPE:

a. The scope of supply includes :

Upper Sileru Power House (USPH): 8 Nos. of LVS (Size of Each Screen / Cube shall be 72 inches diagonal) to be mounted as a Two tier (2 X 4) seamlessly in main control room with its associated Display Controllers, personal computers, all mounting accessories, optical components, Graphic adapters, cables, software and accessories as applicable and required for each LVS.

b. All the cables (Communication as well as power cables) along with cable accessories such as terminal blocks, connectors, sockets, cable alley, ties, etc, are in the scope of supply.

c. The mounting stands for LVS etc shall be designed to suit the above keeping in view of the aesthetics. The height of the LVS stands shall be suitably designed so that there shall be no obstruction for viewing for the operator sitting at the control desk with LED monitors placed on the desk.

d. The LVS shall be operable from the OWS/EWS of the plant.

2. Technical specification for LVS:

LVS shall be capable of 24 hours X 7 days of continuous operation under normal ambient lighting in the control room.

The LVS and its accessories shall be designed such a way that the brightness in the centre of the screen and the edges of the screen to be uniform and there is no perceivable difference in the quality of the picture in the centre and at the edges of the screen.

3. TECHNICAL SPECIFICATION FOR LVS WITH A DISPLAY CONTROLLER FOR MAIN CONTROL ROOM AS DETAILED BELOW.

Sno.	Item / Description	Requirement
a.	Size of Each Screen / Cube	72 inches diagonal/8 Nos(2X4)
b.	LVS Screen	Non-reflecting, flicker free suitable for control room. These shall be no burn-in due to prolonged display of the same picture at the same place.
c.	Type of Projection	Rear Projection with single DLP technology
d.	Resolution	3840 x 2160,4K Ultra HD pixels or better
e.	Viewing Angle	At least 150 Degree
f.	Light Source Type	LED light source with separate LED array for each colour (RGB).
g.	Life of LED Lamps	Average Life: Min 60000 Hrs. (or better)
h.	Operating temperature	5-40°C(20°C +- 3°C for optimal screen performance)
i.	Humidity	80% and above non-condensing
j.	On screen diagnostics	To be provided
k.	Power Supply Input	240 V A.C + 10% and – 15% 50 Hz, 1 Phase (Indian type plugs & sockets)
l.	Brightness ANSI	Minimum 750 Lumens.
m.	Brightness Uniformity	≥ 90 %
n.	Dynamic Contrast	12, 00,000:1 or more.
o.	Redundancy	The Visual Display Unit / Rear Projection Modules shall have Redundant Power Supply modules.
p.	Hot Swappable Power Supply	Cube should have a Hot swappable Power Supply In built
q.	Control	IP based control to be provided
r.	Remote	IR remote control should also be provided for quick access
s.	Cube arrangement	LVS for Main plant shall be in 2 X 4 matrix (in Two Tier) for USPH
t.	Screen to Screen Gap	≤ 0.2mm Seamless
u.	Screen Support	Screen should have Anti-Reflective Glass Backing to prevent bulging
v.	Control BD Input terminal	Input: 2 x Digital DVI
a.	Display controller	Controller to control Video Walls with outputs , video inputs and Universal inputs along with necessary software
b.	Processor	Single Quad Core Intel® Xeon/i7 64-bit 2.0 GHz CPU or better
c.	RAM	Min 8 GB
d.	HDD	Min 1 TB Hard Disk. Hard disk Capacity should be upgradable

4 Functions of LVS

- Display of important data, graphics coming from the DDCMIS, PLC, Workstation, Video, SCADA, images from CCTV, IP camera etc in real time.
- LVS shall provide real time clear luminous view to share information to operators and visitors.
- The whole screen of the Large Screen Graphics Wall should behave as a single logical screen and the control of the same should be from a dedicated Graphical Control Unit (Controller) having a Keyboard & mouse. However, as option shall be provided, to control the Graphics Wall from all work stations on LAN having Windows latest version.
- The complete system shall be interfaced with station/SCADA LAN.
- The offered system should be able to work in 24/7 days environment and is of industrial nature.

5. SOFTWARE

All associated software and drivers for the said LVS to run on Licensed software, whose license shall be valid for the life time of the product/equipment

a) For each unit, the graphic display shall be incorporating with the following:

- Status for circuit breakers, isolators and earth switches, field circuit breakers, B F Valve and 415 V breakers for

unit auxiliary supply, reserve supply etc., to represent the relevant switching conditions.

- Customized screens to display important trip and non trip annunciations.
- Customized screens to display Metering for each generator comprising: (All 3 phase current, voltage, MW, MVAR, PF, frequency and speed).
- Customized screens to display Other metering as per requirements like station supply voltage/current, air compressor pressure, etc.,

Station System

- Customized screens to display Mimic diagram showing status of levels of main reservoir and tailrace.
- Customized screens to display Station supply Mimic And status of CB and DG set
- Customized screens to display Station air compressors status and Pressure values
- Customized screens to display Dewatering pit level

The Large Video Display shall be updated by a dedicated computer/controller through which it was interfaced or by other better option.

4.12. Human –Machine Interface (HMI) System

Operator interface shall be provided by operator stations and peripherals, which shall permit the operator to control and monitor the plant from the control room. Server-client or server-less architecture shall be acceptable. In case of Server-less architecture, separate redundant historian shall be provided.

If server-less architecture is provided, it shall be truly server-less, which includes all the functionality. Each server station & historian should have its own database. The software licensing shall also reside locally on all such workstations. Licensing on one station and transferring to other stations on network shall not be acceptable. In case of server less architecture, each station will have its own tag database. All the HMI functionality, including tag modifications, etc. shall be possible on each station, without any dependence on another station. If any operator station is down, it shall not limit any functionality including HMI modification functions, on other running operator stations. However, the type of architecture will be finalized during detailed engineering stage.

All the tags must be accessible on each of the operator stations. It shall be possible to interchange any of the operator stations with other one. It shall be possible to operate & monitor all plant areas from every operator station. The HMI platform shall include integrated alarm analysis tools in support of EEMUA191 requirements and reports. Alarm analysis reporting shall be possible without the need to build and maintain custom interfaces. If OPC (Open Platform Communication) is used to connect to control systems, for alarm and events both OPC DA, OPC HAD (Historian Data Access) and OPC AE (Alarm & events) shall be available in order to display the control systems alarm and events as well as numeric data.

Alarm management/analysis features per EEMUA 191 and ISA 18.2 shall be inherent to the system. Supplier shall not subcontract any system or subsystem, configuration, and / or design to 3rd parties.

Software functions:

The HMI system shall be based on Windows as a graphical user interface, which enhances the ease of use and performance of the system.

Human –Machine Interface system should have the following features:

- Transparent and rapid operation
- **A large number of standard displays,**
- Easy operation based on the industry-standard Windows, i.e. straightforward process operation using mouse and keyboard,
- Direct and rapid selection of measuring points,
- **Full graphic display,**
- Uniform message concept and clearly arranged display of messages and operator Hints.
- Configurable sound for each message,
- Password for each user
- Trend archiving,
- Logging,
- System diagnostics, even in the field device.
- E-mail and SMS facility to report critical alarms.

Process visualization shall be supported by:

- Standardized displays,
- Plant-specific free graphic displays,
- Faceplates for process points,
- Up to 15 plant areas.

Using these tools, the operator shall obtain quick and complete information on the process sequence as well as the ability to directly intervene at various process points

4.12.1. Plant-Specific Displays

Plant-specific displays geared to the specific demands of the plant, operator will be configured to depict process activities. Current process data or process states can be viewed in digital or analog form (e.g. bar graphs, dynamic filling and trend windows). Depending on process states, graphic symbols can be replaced, flash and change color and position in the graphic display. Selected process points can be viewed either via faceplates in the graphic displays or via the standard group displays. If display selector fields or buttons have been configured, a specific selection hierarchy can be set up within free graphics for operation.

In addition, there is the standard selection hierarchy offered by the display menu. This menu appears on the lower part of the screen, and can be opened in any situation to show all display types in which the required process point is displayed. The number of free graphics available in the operator station is limited only by the hard disk capacity.

4.12.2. **Standardized displays**

Standardized displays shall be adapted to the needs of process control engineering with regard to structure and information content. The following standardized displays shall be available:

- Overview display,
- Group display,
- Faceplate,
- Sequential Function Chart (SFC) display,
- Time scheduler display,
- Trend display,
- Message list and operator hint list,
- System display.

Therefore, most functions already have fully-prepared displays for monitoring and operation and can be used without any further programming

4.12.3. **Point Identification:**

Each point shall be designated by an identification tag number. There shall be no restriction to the use of letters or numbers. Each tag shall have a short description (service name). There shall be no restriction to the use of letters or numbers. Each tag shall have engineering units, which shall have a minimum of six characters. There shall be a minimum of 100 pre-configured internationally used engineering units. Empty space shall be available for user-defined units. Process data accessed by the HMI displays shall be continuous and in real-time.

4.13. **Standard operation displays:**

The Operator Station shall be able to perform the functions of the following listed displays as a minimum in the system:

4.13.1.1. **Overview display:**

The process information of the entire plant shall be presented in a compressed manner in a single overview display. System shall offer facilities for selecting the group, graphic, time scheduler, SFC and trend displays. Logs shall also be selected directly from the overview display. Up to 96 displays (16 lines, each with 6 displays per line) shall be shown in the overview display. The information on the automation functions shall be represented by graphic symbols. The symbols and colors shall permit rapid detection of disturbed states. The group display symbols within the overview display shall also feature dynamic update of process points. If required, graphic display shall be used as overview display.

The following specifications shall be standard of this display:

Overview display shall enable the operator to determine the overall operation of a large segment of the plant. The alarm condition of the pre-assigned points and groups shall be displayed in the overview display with color change and blinking. The number of points that can be displayed in one screen (i.e., one page) shall be more than 200 when configured.

The operator must be able to call up directly any group display or other pre-determined displays covered by overview screen.

Each operator station shall have capacity to display required points in Overview display pages. Those displays can have different assignments among different operator stations.

4.13.1.2. **Group display:**

The following specifications shall be standard of this display:

The group display shall contain detailed information up to six analog or 24 binary process points. Analog functions, controllers, time and monitoring functions as well as logic functions shall be displayed and operated. In addition, binary values shall be shown in blocks of four. To provide a quick source of information, analog values shall be displayed as colored bars. For a more precise reading, they can be shown digitally as physical values. Pending disturbance states of the respective variables can be detected immediately through a change in color and by flashing. Configured alarm values shall be additionally displayed as symbols.

System should have facilities to create faceplates for user-defined function blocks. Direct selection of the desired value in the group display element shall support quick and appropriate intervention of the operator in the process activity. An operation line beneath the group display shall permit the execution of operator interventions and entries for the process point selected. Each tag shall be displayed with graphical as well as numerical presentation of variables like the measured process variable, set point and controller output. It shall have scale in engineering unit and appropriate divisions. High/low limits of output and alarm limits for process variables shall be also displayed. For discrete elements such as timers, switches, digital I/O.etc., a standard faceplate shall be available as for each type. Each faceplate shall be accompanied with numeric and text description of: tag number, tag service comment, alarm status, controller mode, engineering units, and digital values for process variable, set point, and output are also to be displayed. The alarm condition of each point shall be displayed in the group display with color change and blinking. Alarm Acknowledge shall be possible.

The number of points displayed in one screen shall be eight to sixteen. It shall be possible to call up any individual point display swiftly with one operator action from tags shown on the group display. Any tag may be displayed in several pages of the group displays according to the operator or system engineer assignment.

4.13.1.3. **Individual point display:**

The following specifications shall be standard of this display:

An individual display for all tags configured in this system shall be available and showing all relevant information. This information shall include tuning and operational parameters, along with the faceplate and information as in the group display. The operator shall be able to change parameters from this display, with the security clearance. The alarm condition of the point shall be displayed with color change and blinking. Alarm acknowledgment shall be possible. The individual point display shall include a small size of real time non-historized trend display to facilitate easy tuning of control loops. The small trend display shall have a rotary buffer of 240 samples, with data sampling period of 1 to 10 seconds. It shall be possible to show detailed loop connection in graphical format for all configured tag in the system. The graphical format shall be an exact replica of the configuration database with real-time data indication and graphic templates.

4.13.1.4. **SFC / Function block Display:**

The programming language shall be user friendly and as per international standard based on IEC 61131-3 standard. Disturbed states, such as non-fulfilled process criteria or time out shall be easily detected by a color change within a criteria window for steps and transitions. Furthermore, a display selection shall be configured for each step and transition.

Function block overview display shall be provided for accessing to a step or transition and the desired information can be selected immediately.

4.13.1.5. **Graphical trend display:**

The following specifications shall be standard of this display:

Graphical trend display shall present data in the form of a strip chart.

A minimum of three and a maximum of eight variables are to be displayed in one screen, and are to be identifiable by different colors.

Following two types of trends shall be available in the system:

Rotary buffer trend: this is continuous trend with new data overlapping old data when the buffer is full. Scheduled trend: with starting time and end time of the trend recording. Such trends shall start/stop on operator demand or triggered by sequence program. Operator shall have the ability to input a background trend pattern from reference on scheduled trends, as well as the ability to compare two trends gathered at different time for the same point. Trend display shall support:

- Scale magnification by up to 10 times
- Time axis variation

Trends shall be snap shots of process data. Accuracy of trended process value shall be exactly the same as the actual process value being measured by the control module processor.

Side information on the trend display shall show the following information, for each trend channel:

- tag number and service comment
- process value
- Scale of trended value

Operator shall be able to select any point on the trend display to be individually displayed in detail. The trend display will have the capability to call up the faceplate for any point being trended and manipulate the faceplate from the operator keyboard while trend group is displayed.

4.13.2. **Trend Capacity:**

The system shall be sized to provide 1-second snapshots for 30% of all hardwired analog inputs assigned to the system. Those trends shall be historized in rotary memory. The system shall be sized to provide 1-minute snapshots for 100% of all hardwired analog inputs and outputs assigned to the system. Those trends shall be historized in rotary memory.

4.13.3. **Process Alarm Types**

The following process alarm types shall be available within the system Absolute high high, high, low, low low and deviation from set point alarms for the control tag. Process value rate of change alarms for each analog monitoring point. Input and output signal open for each point due to short circuit or open signals. All RTD signals shall be provided with open circuit detection, which shall be a standard feature and doesn't require application programming.

4.13.3.1. **Process alarm management:**

Operator stations shall be grouped per plant area, such that each operator will receive only the alarms assigned to his group. Alarm prioritizing shall be configurable on per tag basis such that different tags will have different alarm priority settings for the similar alarm types (e.g. Hi alarm in one tag can be of high priority while with other tags could be of less importance).

4.13.3.2. **Custom graphic display:**

The following specifications shall be standard of this display: A custom graphic display shall have the ability to present process and control schematics, alphanumeric text, real-time data, and faceplates together in one page. The capability to display at least 200 dynamic data shall on a graphic page, updated continuously at 1 second as a standard. The proposed system shall have a capacity for building and showing at least 600 graphic pages accessible by any operator station. The call up time for any of those graphics shall be within one second. The engineer using user-friendly interactive software can configure the lay out of each screen. A library of ISA symbols shall be available to reduce the time for graphic generation. The operator shall be able to operate the control strategies, i.e., change set points, control modes, outputs and so forth, from graphic displays. The operator shall be able to call up any operation displays from graphic display.

4.13.3.3. **Alarm summary display:**

Alarm display shall show all existing process alarms with blinking and color modification. Each alarm shall have time stamp of Month, Day, Hour, Minute and Second. Each alarm shall consist of time stamp, point identification (tag number), point description and the kind of alarm. Current value of the process variables (input) in alarm shall be displayed. It shall be possible to call up the group display, in which the alarm point is included, directly from alarm display. Alarm acknowledgment shall be possible. Further each HMI shall store minimum 20000 alarms in historical storage. The system shall have the capability to filter alarms by any of the following: priority, process area, tag number basis.

Alarm Summary display shall not include system self-diagnostic alarms. Self-diagnostic alarms shall be displayed in a different dedicated display.

Alarm monitoring shall be performed for system failures and process alarms. All alarms generated shall be displayed on the operator screen with color change. The system must alert the operator for process alarms with an audio and a visual signal, regardless of the current display on the screen. The operator should be able to call up the proper display with a single action from the Alarm Summary display. Process alarm condition of each point shall be clearly shown in alarm, group and individual point displays. Also, it shall be easily determined if the alarm has been acknowledged from these displays (for example, blinking indication for not acknowledged alarms).

4.13.3.4. **Other displays:**

The screen shall have dedicated area which is independent from the main display to enable the operator enter data using the alphanumerical keys. Other displays shall also be provided for displaying historical events and self-diagnostics with menus for data retrieving and filtering.

4.13.3.5. **Window management:**

Window Management tools and software shall be included in the system for all operator stations.

General guidelines:

- A dedicated area shall be available on the top of the screen showing alarm status, alarm messages and other tools to call displays and navigate through them.
- The system shall have the capability to show standard operation displays as windows with fixed size.
- The System shall have capability to open multiple windows on same display / screen. The Multiple windows can be Graphic, trend, overview or group display.
- Windowed operation displays shall have the same capabilities performed by the standard full-page display, including pointing to assigned targets.
- Operator will be free to move windows and bring them forward/backward.
- Window calls up.

- Upon window call the system shall position the window on a predefined area on the display. Position definition shall be user configurable from the engineering tools.
- The system shall allow a set of windows be called simultaneously with single click. Windows name, position and size shall be pre-configured from the engineering tools.
- The system shall provide a menu of the pre-arranged window sets.
- The system shall provide the capability for the operator to arrange his own window sets to be called when required.
- It shall be possible to pre-configure a set of displays to be shown simultaneously on several operator workstations with one click from the operator keyboard.
- Memory Management
- Window Management software shall have the means to guarantee workstation memory is well managed.
- The system shall not allow the operator to open more than 5 display windows simultaneously.
- The system shall automatically and without operator intervention refreshes all data on the opened displays in real-time.
- Window Hierarchy
- **Display Navigator:** the window manager program shall include a built-in tool to navigate all displays assigned to the operator workstation. The navigation displays shall be accessible with one keystroke or one click on a dedicated icon on the display.
- Display Navigator shall show all displays organized in accordance to their hierarchy.
- Display Navigator shall show alarm status of each display.
- The operator keyboard shall have dedicated keys to move upward or downward to show displays in accordance with their hierarchy.

4.13.3.6. **Alarm acknowledgment:**

The system shall allow alarms to be acknowledged from Alarm Summary display on per tag basis or per page basis. The selection shall be configurable. The system shall allow alarm acknowledgement from customized graphic display. In case of several graphics were opened simultaneously, the acknowledgement from a certain graphic display shall not effect alarms of other tags indicated on other graphics. **Vendor shall clarify how this is achieved in the offered system.** Alarm acknowledgement shall be historized in the historical files with date and time.

4.13.3.7. **Alarm priorities:**

Minimum four levels of alarm priority levels shall be provided. Each level shall be assigned to each tag based on necessity of alarm indication on Monitor, alarm printing, audible alarm, and acknowledge action.

4.13.3.8. **Historical events:**

Historical event recording shall be a standard feature of the proposed system. The following paragraphs list the type of events that must be logged by the system and other related specifications:

4.13.3.9. **Process events:**

This shall include at least the following events:

Tags going into alarms, showing: tag number and associated comment, status, and process value that triggered the alarm.

- Tags recovering from alarms.
- Messages initiated by control algorithms.
- Operator actions: Related to control functions, such as:
 - Modifying controller parameters.
 - Modifying controller settings: PID parameters, alarm-settings etc.
 - Modifying controller mode (A/M/C) and scan On/Off Alarm masking.

4.13.3.10. **System events:**

The following events should be logged in the system event files with date and time stamp:

- System alarms and component failures to card level.
- Off-line and On-line loading.
- Start/stop of system modules.

4.13.3.11. **Engineering Events:**

System shall log every on-line engineering and configuration action taken on the EWS. The events shall include time, date, action type and user login name who performed the action.

Database for events shall be as much as possible distributed in separate hardware platforms to serve operators of different plant areas.

For each group of operator stations handling specific area of the plant, the capacity of event recording shall be not less than 20,000 events for the combined categories mentioned above.

All events shall be time stamped with date and time with 1-second resolution.

4.13.3.12. **On-demand reporting:**

The system shall have standard function to allow the operator access the global real-time database and historical files to search for data based on the following criteria:

- Search for tags under certain alarm or status condition.
- Check digital I/O status at IO card level.
- Check for specified events that occurred at specified period from the historical files.
- Check for message history by defining text of the message.
- Check for current alarms at certain plant sections.

Search pattern: search function shall allow quick filtering by defining several conditions such as: plant section + tag number + alarm type.

The search utility shall allow the operator create several search patterns which can be called for immediate search of the history file.

4.13.3.13. **Process reporting and logging**

The vendor must include software package to generate reports and tabulated logs. The reporting package has preferably been based on MS Excel. Otherwise, it should have the capability to create reports in formats directly readable by MS Excel without conversion tools. Reporting package shall have the capability to use direct process data or data from historical files. Historical data shall include events, snapshots, hourly closing data, daily closing data and monthly closing data. Closing data means accumulated, average, minimum and maximum values extracted from one-minute snapshot data. Reporting package shall include pre-defined templates for creating the following reports: hourly, shift, daily, weekly and monthly. Configuration of pre-defined reports shall be limited to assigning tag numbers only. Reporting package shall have pre-defined templates to present data in colored graphical format. Reporting package shall have the capability to access data status for all acquired data. BAD data shall be clearly marked on the reports. Reporting package shall be spreadsheet type giving the user the choice to freely create tables and reports in any format. Formatting shall include font type and size, cell color, security per cell, lines and frames and tools to create graphical shapes. Reports shall support DDE and OPC data exchange with other applications including MS Word and MS Access. The DCS/PLC operator workstation functionality shall have built-in-scheduler function that triggers reports on scheduled bases.

It shall be possible to trigger reports on-demand from any of the following:

- ☐ User defined keys on the operator keyboard
- ☐ According to certain logic in the Control Module sequence function
- ☐ User defined soft pushbuttons from a graphic display

Following reports are required on demand as well as automatically.

- a) Shift/Daily/Monthly reports of different process variables
- b) Hourly avg., hourly total, hourly max/min., instantaneous values of the process variables.
- c) The shift/daily/monthly report shall be printed automatically at a specified time. But the On-Demand report shall be printed with demand from operator station.
- d) Daily/Monthly reports showing raw material, utility consumption and production of limited goods.
- e) Energy consumption report for a section/total plant.
- f) Energy and mass balance and other analysis reports.
- g) System diagnostic reports in case of failure of any module/component of the system both current and historical.
- h) Management Information Reports.
- i) Log of operator initiated actions, on demand.
- j) Alarm and trip review reports.

4.13.3.14. **Signal Sequence Log:**

The signal sequence log shall be used for logging events such as process and system messages, switch messages, operator interventions and hints. System should provide flexibility for user to prioritize the log. By means of digital input cards, digital events with a time-out of 2 ms shall be logged for the whole system.

4.14. **Integrated sequence of events (SOE) system:**

The DCS shall be required to be provided with Sequence of events recorder (SOER) system as integral to DCS system. No. of Digital inputs are to be considered for SOE inputs in LCUs are as mentioned elsewhere in the specification. The

SOE system shall have a resolution period of 1 millisecond. SOE module shall be of same family and same series of DCS controller and I/O subsystem.

The printer shall be kept on-line continuously with the SOER. It shall be possible to acknowledge events recorded on SOER. It shall be possible to print Event log reports from its History database.

Alarm occurrence shall be printed in RED and Alarm normalization event in BLACK, While Screen Display will be in RED and Green. All acknowledged alarms shall be displayed on screen in Black and white.

All Events shall be printed strictly in chronological order during on-line printing.

For on-demand printing from history, criteria selection for printing order shall be possible.

4.15. **OPERATOR WORKSTATION/ ENGINEERING WORK STATION:**

4.15.1. **OPERATOR WORKSTATION AND ENGINEERING WORK STATION:**

There shall be operator stations in the Control Room each with global access capability to any point in the plant. The operators shall use those stations for all process sections monitoring and control. The operator station shall reside directly on data highway.

4 (Four) Nos. of operator stations and 2 (Two) no. of Engineering Workstation with 32" color LED screens, standardized keyboard and pointing device such as mouse / trackball, integrated telephone set, microphone, writing pad and workplace integrated shall be provided. Engineering workstation shall be similar to Operator workstation. Operator workstations shall be based on standard market available PC hardware PC with a configuration as detailed below

- Each monitor with 32", LED backlit flat screen and flicker-free, minimum resolution of 1920 x 1280 pixels.
- At least Octa core Processor CPU with 3.2 GHz processor and Mother Board Front Side Bus speeds available at the time of supply, with 16 GB DDR4 or higher RAM,
- Hot swappable 2 NOS hard disk drives with latest technology 2 TB or above hard disk and one (1) DVD/CD-READ& WRITE ROM drive
- 4 Nos. USB ports.
- The PC shall operate on multi-user, multitasking environment. The keyboard of the Operator's station shall be membrane type (spill-proof).
- Pointing devices
- The keyboard shall be multipurpose user configurable Type featuring a number of assignable keys. These keys shall be available for providing dedicated display call-up and other similar functions.

The graphical user interface should be based on the windows technology. Windows should primarily be used for operating dialogs. All information pertaining to a process or a process element should be visible in one window and all activities belonging to that process element or process can be executed from the same.

Operating system for the workstation must be Microsoft Windows of latest version compatible with supplied DCS system. Operator/Engineering workstations shall share printers and auxiliary storage devices through LAN Ethernet. Auxiliary storage devices and printers must be market available devices to ease the long-term maintenance and cost of ownership. Vendor shall clearly give names, models and manufacturer information for the proposed devices.

As minimum one auxiliary storage device shall be proposed for each operator console (group of operators handling specific process unit or plant). The Vendor shall provide MS Windows Workstations as the bases for Engineering Workstation EWS,. The EWS shall have the capability to fully perform standard system generation including control functions, operation displays and graphics. All standard operator station functions shall be supported in the EWS.

4.15.2. **Operator keyboard:**

The keyboard shall be flat membrane type. The operator keyboard is a MUST requirement. The vendor to provide details of operator keyboard along with the offer. The operator keyboard shall have dedicated keys to perform the functions listed below as a minimum:

Auto /Manual/Cascade keys. Set Point or output ramp Up/Down (two speeds), and changing digital status keys. Alarm Acknowledgment key, and alarm silencing key.

Dedicated display keys for: graphics, group display, detailed display, overview, trends, alarm messages and HELP key. Screen hardcopy print. Alphanumeric keys aligned in QWERTY style tag number and Data entry keys.

4.15.3. **Monitors:**

Each Monitor shall be of 32 inch and shall be of LED backlit flat screen and flicker-free type it shall have a minimum resolution of 1920 x 1280 pixels. Refresh time of real time data on a standard operation display shall be less than **one second**.

Refresh time of real time data on customized graphic displays shall be less than **one second**. Customized graphic displays shall have the capability to be configured for data refresh rates lower than 1 second. Call up time to bring full display with all information of a standard operation display shall be within one second. All dynamic data including historical trends embedded in graphic displays shall be presented on the screen.

Dedicated keys 2 sets for emergency shut down of units with cover shall be provided near the operating station.

4.15.4. **Printers:**

i) Printers:

S.No.	Printer Description	Purpose of the printer	Requirement for each station
1	Logging Printer: Make : Hewlett-Packard, Samsung or equivalent	Logging printer shall provide following facilities. • Printing of shift, daily, weekly, monthly log • Shutdown report printing	Black and white laser printer: 1 No. Colour Laser jet Printer: 1 No.
2	Alarm and Event Printer	Alarm printer shall log the process and system alarm messages as and when they occur and alarm history for every shift of operation on demand from operator console. Print out shall show as a minimum the date, description, date and time of occurrence, time of acknowledgment, time of return to normal. In case of failure of any of the logging or alarm and event printer the other printer shall perform the printing of the same.	2 Nos- A3 size line/ Dot matrix printers.
3	Printer with Engineering Station Make: Hewlett-Packard	Printers shall be capable of taking print outs of Engineering Graphics/ Sequence charts/ User Programs etc	1 No. Colour Laser jet Printer

Color LaserJet printers shall be provided in line with standard font. Printer should be with ordinary paper. Printers shall be capable of taking print outs of graphic panel and displayed pages on Monitor (Hard copy personality).

4.16. **UPS System:**

Redundant UPS system of 25 KVA with static bypass and common battery required for monitors, printers and process computer systems shall be supplied duly taking the consideration of back up of 3 hrs.

4.17. **System maintenance & service function:**

The automation system offered shall be easy to maintain and survive. All of the maintenance and service functions for the automation system offered should be performed by a suitable engineering tool. The engineering tool should have a full graphic interface and provide a comprehensive support during all phases of plant configuration and maintenance and shall ensure an integrated and continuous engineering for automation as well as the computer control system. The engineering tool should provide a sufficient number of help functions for every step of work.

4.18. **System Diagnosis**

The current state of the hardware and software of the system shall be automatically monitored by a system diagnosis function. The result shall be depicted in standardized system displays in the following detailed levels:

- System overview with operator and process stations, as well as the bus systems (system bus and station bus).
- Station overview, in which information is displayed on the state of the process stations' modules,
- Module overview, in which detailed information is given on the currently selected module.
- Field bus overview/devices.

The system MUST include comprehensive on-line diagnostics with the following minimum features:

System alarms initiated by the self-diagnostics functions must alert the operator at the Operator Station within 3 seconds. System alarms directed to the EWS only will not be permitted as it is assumed that EWS will not be attended continuously. Diagnostic displays must be available for all operator stations. The on-line diagnostic program shall consist of a malfunction check program that will alert the operator upon the detection of a fault. This shall be a unique and separate system from plant alarms.

The self-diagnostics shall detect a fault or malfunction in, but not be limited to the following:

Real-time network diagnostics which shall include as minimum errors due to wrong address, wrong frame length, and response wait time over, other side busy, receive data check sum error, network configuration error, communication timer error, Real-time LAN shall include error counters.

- Power supplies and fans.

- All DCS cards (analog and digital I/Os, controllers, Processors, etc.)
- Printers.
- Control Module CPU ROM Sum Check Error.
- Control Module algorithm execution error.
- Calculation function execution error On-line/off-line downloads error.
- Recovery message.
- Auxiliary system (3rd party) communication error and link failure.
- Redundant Control Module database difference among processors.
- Instantaneous AC power supply failure/recovery to the Control Module.

4.19. **System boot up.**

Operator Workstations and historization platform shall boot up automatically to the level where all its functions are in operation. User log in and password shall not be required during the boot up process. Boot up shall take place automatically upon switching on the power source. All Control Modules and nodes connected on the DCS network shall boot up automatically upon switching the power source on. Each Control Module or node on the network shall have its own database stored inside it, which will enable it to boot up independently without loading the database from other nodes or servers on the network.

4.20. **Maintenance**

The system shall be designed so that any failure can be eliminated as quickly as possible. The repair policy shall be based on replacing printed circuit boards (cards) or sub-systems (Monitors, hard disk, keyboard...).

4.20.1. **Card failure indication:**

Each individual card and power pack shall be fitted with an LED or lamp to denote failure on the card or power pack. The hardware shall be modular in construction and cards replacements and adjustments can be on-line. Wherever redundancy is specified, it shall be possible to replace the failed part on-line without affecting the system performance.

4.20.2. **Cards access:**

Access to cards and printed circuit boards of operator station, Control Modules and other main components of the system shall be easily replaceable from the rear or front of the main body. Pulling out the failed card and replacing it with healthy card without the need to dismantling or opening the body enclosure.

4.20.3. **System backup:**

The entire control software shall be backed up: this includes vendor software, control database, user-built programs, source code, data files, schematics and so forth.

Back up must be possible on commercially available media. To recover from an outage, any component of the system must be able to be re-loaded from bulk memory (hard disks).

All the system-related software including builder, application programs, standard and optional packages that are included in the scope of supply shall be delivered with the system on storage media.

4.20.4. **Remote maintenance and diagnosis**

The system being offered must permit the use of comprehensive remote maintenance and diagnosis via standard communication network such as Internet and TCP/IP.

4.20.5. **Local maintenance from LCUs and debugging:** The system offered shall provide local maintenance from LCU panels through a laptop for on-line and off-line mode of debugging during the pre-commissioning checks and during periodical maintenance checks. The required software and hardware shall be included in the scope of supply.

4.21. **IEC 60870-5-104 communication:** The systems offered must communicate to distances to the outside network i.e., to load dispatch centre/APTRANSCO or to the APGENCO Headquarters at Vijayawada on IEC 60870-5-104 protocol. It should preferably be inbuilt to SCADA system. Separate Gateway P.C with different software can also be provided.

4.22. **Conditions of service**

The automation system and the rest must be designed for the following limiting ambient conditions:

Temperature	:	50 deg C
Relative humidity	:	95 %
Pressure	:	Atmospheric
Atmosphere	:	Plant.

4.23. **Cables and cable trays:**

A. Instrumentation Cables:

All the supplied Cables shall have annealed high conductivity non-compacted circular copper conductor PVC insulated colour coded cores twisted into pairs. They shall be bound with non-hygroscopic material such as polyester tape; pairs

stranded in concentric layers and shall be duly separated by non-hygroscopic material. Final layer shall be wrapped with non-hygroscopic material by taping or extrusion. Cable shall be overall screened with aluminum Mylar tape & tinned copper drain wire, non-metallic ripcord, extruded inner sheath & outer sheath of PVC.

B. Optic fiber cables:

Optical fiber cable used for communication with various devices & DCS which shall be multiple single-mode or multimode fibers graded index type, shall have Immunity to EMI/RFI, Lightning protection, the ability to safely bridge high potential differences for applications where fumes or sparks exist, shall have Higher bandwidth (Bandwidth shall be decided during detailed Engineering) that supports higher data rates over longer distances.

Armored Glass Optic Fiber cable shall be ZH-LS, galvanized corrugated steel taped armored, fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multimode fibers on as required basis so as to avoid the usage of any repeaters.

Armored Glass Optic Fiber cable outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturer, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.

Armored Glass Optic Fiber cable shall withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions. Cable shall have heat and moisture resistant properties on type and design with proven record of service in generating stations.

The above Quantities mentioned above are tentative only. To ascertain the complete details, the bidders are requested to visit the Upper Sileru Power house before tendering.

The Power, Control and Signal cables required for the SCADA, GPS, Field Instruments and also for Vibration Monitoring system for USPH as per Tender Specification are in the Contractor Scope only, which includes Supply, laying, termination etc complete along with MCBs, Fuses, Terminal blocks, cable ties, lugs, termination etc.

However, the scope of contractor is limited to cabling among the supplied Panels, Equipment, Transducers/ Transmitters etc only. Other Field signals required for operation of SCADA shall be provided by APGENCO

Total supply of the above cable for the purpose of SCADA and integration of field instruments etc., is in Bidder scope. Any additional cable requirement will be met by APGENCO if required.

C. Cable Trays: Supply of cable trays for the above cables for the purpose of SCADA and integration of field instruments etc., is in Bidder scope. hot-dip galvanized or mild steel sheets with a minimum thickness of 2.0 mm, standard lengths of 2.5 to 3 meters, standard widths from 150 mm to 600 mm, and compliance with codes like

4.24. **SYNCHRONIZING EQUIPMENT**

Synchronizing facilities shall be provided for each unit separately from control room and Synchronizing facilities shall be provided for all units from ECR panel to allow automatic and manual Synchronizing of the units respectively (Dismantling of the existing equipment and replacing is in the bidders scope).

The fully automatic synchronizing devices shall be of the electronic type, comprising of auto-synchroniser, rotary switches, synchronizing relays, DFM, DVM, synchro scope etc. complete with all auxiliaries for automatic connection of the generators to the grid. Manual check synchronising relay shall also be provided and the breaker closing shall be executed duly checking the permission from the check synchronising relay.

The circuit-breaker closing time, maximum admissible frequency & voltage difference as well as the control time shall be adjustable. Selector switches off / test / manual / automatic and all necessary instruments for manual synchronizing shall be provided at the Unit Control Boards.

The automatic synchronizing shall also be possible when the generating units are controlled locally from their respective Unit Control Boards and plant control network is non-functional.

4.25. **CONTROL ROOM FURNITURE**
4.25.1. **GENERAL**

The existing control room furniture and unnecessary panels etc, shall be removed / modified as per the necessity with the following features.

The control room layout of furniture shall be state of the art and aesthetically designed in synchronization and resemblance to the control room equipments by specialized architectural vendors having proven track record in this field. Control Room Layout of furniture shall include, but not limited to the following:

- i) One (1) set of Modular control desks for Operators Stations (4 Nos-OWS)
- ii) One (1) No. Modular printer tables for each printer
- iii) One (1) No. Modular computer tables for each of the following:-
 - a) Engineering stations

- b) Historian stations
- c) Plant computers
- d) Plant servers etc.
- iv) Control room chairs

All the furniture should be of same family and look for better aesthetics, ergonomics, comfort etc. Various aspects should be considered and extreme care shall be taken while designing control room layout so as to create ideal work place. Physiological aspects such as line of sight & field of vision and cognitive factors such as concentration & perceptivity etc. shall be considered with special care.

All the control desk, computer tables, printer tables shall have receptacles for receiving incoming power supply & outgoing feeders with proper mounting of MCBs, surge arresters etc. and necessary jacks for telephone & power house LAN. All the cable trays shall run internally. The system should provide a good cable routing system with concealed cabling for power & instrumentation cables, telephone cables and networking cables. The cable entry to the console shall be from the bottom. The separation necessary between network and power cabling shall be taken care of. All trays should be easily accessible during installation and maintenance. The horizontal cable tray shall have arrangement to accommodate plug connectors and sockets of varying sizes.

The colour of the board in desk surface, shutters, other furniture and architectural design on acrylic solid surface shall be decided during detailed engineering.

All equipments, accessories and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC.

Various aspects should be considered and extreme care shall be taken while designing control room layout so as to create ideal work place. Physiological aspects such as line of sight & field of vision and cognitive factors such as concentration & perceptivity etc. shall be considered with special care.

4.25.1.1. FURNITURE

The contractor shall provide a set of ergonomically designed furniture from a reputed manufacturer especially designed for computer peripherals. The set of furniture shall include the following:

A) CONTROL DESK:

The Modular open workspace console system to be installed shall provide conveniently organized work surfaces to install the control room equipment and also to provide work surfaces for the operating personnel to carry out the operations. The control desk shall accommodate operator stations, hidden keyboard and mouse, integrated telephone set, microphone, writing pad, emergency push buttons etc., and shall have adequate working space. Arrangement with arm extension and tilting facility shall be provided for the telephone sets.

The facility is intended to be a state-of-the-art facility for control operations. Aesthetics, convenient organization, flexibility finish, durability are very important attributes of the console system. All materials and accessories used in the construction of console system should be of high quality and finish should be of international standards for control centres. The System should be non-welded modular construction system with provision for extension and expansion. The modular construction shall allow adding and relocating the modules to meet the future requirements. Material of construction shall be in extruded aluminium with powder coating in approved colour.

Control desk surface shall be made of high-quality 12 mm Acrylic Solid Surface on 25 mm thick MDF and shall be powder coated aluminium sturdy structure. The top layer of the surface shall be capable of withstanding day to day usage of the work surface (Free usage) without losing the high-quality finish. The surface should have following features.

- i) Non-porous (does not hold dust).
- ii) Seamlessly joined (no joints will be visible throughout the desk)
- iii) High scratch resistant
- iv) Repairable (in case of any scratches / requiring just normal buffing to regain its normal form)
- v) Homogenous (Textures visible on top surface are present throughout the depth)
- vi) Boiling water resistant
- vii) Bacteria, Fungi and Termite proof
- viii) High temperature resistant (180 degrees no change)
- ix) Flammability (Class 1/Class A as per ISO)
- x) High Impact resistant etc,

Shutters made of high grade MDF board of 18 mm thickness with auto closing hinges. The support legs for the vertical support system should be provided with levelling mechanism for compensating minor flooring variations. The CPU cabinet with rotatable trolley/sliding tray should be integral part of each module. Proper cooling arrangement shall be considered while designing console. Vertical Support should have adequate height & base depth and minimum 2.5 mm

thick suitable extruded aluminium beam to hold Mounting base, Tabletop surface and LED monitors, Tilting tray, Side & top aluminium profiles for stiffening and providing strength and wire-way. Suitable flexible arms moveable in all directions shall be provided for LED monitors. Foot extension in Cast aluminium, powder coated in approved colour/shade.

The structure frame shall consist of extruded aluminium top and bottom horizontal beams and vertical support tensioned together to form an integrated, finished, robust frame. All frame assemblies and equipment support are built-off the structural frame. Structure shall be powder coated (the colour code shall be approved during detailed engineering).

A Valance of extruded aluminium should run throughout the length of console providing light on work surface top to maintain the appropriate lux level on table top. Also it shall be possible to mechanically dim the light on work surface. The Edges of the tabletop shall be cut at an angle to give impressive look.

The system shall have receptacles for receiving incoming UPS power supply and outgoing feeders with proper mounting of MCBs, spike busters/arresters etc., and necessary jacks for telephone & powerhouse LAN. The control desk shall accommodate operator stations each equipped with VDUs, hidden keyboard and mouse, integrated telephone set, microphone, writing pad, emergency push buttons etc., and shall also have adequate working space. Arrangement with arm extension and tilting facility shall be provided for the telephone sets.

B) COMPUTER TABLES

The tables shall be of modular construction and have MDF board of approved colour with matching colour steel work. Suitable arrangement for placing the CPU below the top of the table using CPU trolley or any other means may be provided. Retractable keyboard holder using MDF board may also be provided. Arrangement for providing concealed wiring along with necessary jacks for telephone and powerhouse LAN shall be provided in an aesthetic manner. Power and LAN cable entry to the console shall be from the bottom and shall be unobtrusive.

C) PRINTER TABLES

Printer table shall be of modular type. Desktop shall be made of 25 mm thick MDF and shall be powder coated aluminium sturdy structure.

All tables shall have receptacles for receiving incoming UPS power supply and outgoing feeders with proper mounting of MCBs, spike busters/arresters etc. Boxes having provision for network and telephone connection shall be provided on table with each printer. Arrangement for providing concealed wiring along with necessary jacks for powerhouse LAN shall be provided in an aesthetic manner. Power and LAN cable entry to the console shall be from the bottom and shall be unobtrusive.

D) CHAIRS

It shall be Industrial grade with Aluminium extrusion at back and armrest. Chairs shall have synchronized tilting mechanism Multiple locking systems, ABS for seat, Mesh back with extra lumbar with fine tuning Knob for depth adjustment and height adjustable back, with swivel & depth & Height multi-dimensional adjustable arm pad & option of PVC padding, gas lift for height adjustment and Nylon base with castors. Chairs and control desk should look of same family for better aesthetics, ergonomics, comfort etc.

4.26. Training of personnel:

The bidder shall provide free facilities for training the corporation's Engineers at his works before & after the supply & execution of total SCADA system. For Training at manufacturers works – local conveyance and accommodation shall be provided by the vendor.

The bidder shall intimate in advance the schedule of completion of designs and manufacture of equipment against the contract (of this specification) to be manufactured at the works so that the corporation may depute up to 5 (Five) Engineers for training at the manufacturers works for a period of 4 days . In addition to this a training program at USPH project site should be conducted for a period of 01 week after completion of commissioning of SCADA.

The training shall include Operation of DCS based SCADA, Interfacing of various equipment's involved in specification, Detection & Rectification of faults in different types of modules, software configuration of logics and complete explanation of the scheme.

The training shall be arranged by the contractor at the works in such a way that the persons under training shall be freely acquainted with the equipment. The Engineers shall also be provided with training modules.

4.27. CONFORMANCE TO STANDARDS:

All the equipment and supplies (and services) must conform to the respective Indian (or in its absence, the respective International) standard. The contractor is required to specify the applicable standards.

THE SCADA system shall conform with relevant sections of IS 15953 : 2011 / relevant IEC /ISA standards.
and IS3043 : 1987 for Code of practice for earthing
IS9000 : 1977 for Basic environmental testing procedures for electronic and electrical items
12746 for Telecontrol equipment and systems: (Part 1/Sec 3) : Part 1 General considerations

14570 : 1998 Electrical measuring transducers for converting ac electrical quantities to analogue or digital signals
 IS 60947 (Part 1) for Low voltage switchgear and 2004 controlgear
 SP 30 : 1985 : National Electrical Code

4.28. TYPE TESTS:

All the type tests, acceptance & routine tests shall be conducted and Type test reports shall be uploaded while bidding in the e-procurement and same shall be furnished to the Quality control wing for review and approval at the time of drawings submission (or) as requested by APGENCO. The type test reports shall not be older than TEN years as on date of Purchase order. In any case if the contractor not able to produce the above documents, the type tests shall be carried out for the offered system in presence of APGENCO representatives without any financial burden to APGENCO and submit the same for approval.

4.28.1. The following Type test Certificates are to be furnished:

- i. Surge Immunity Test (1.2/50µs) IEC 61255-22-5
- ii. Electrical Fast Transient Burst Test IEC 60255-22-4
- iii. Damped Oscillatory Wave Test IEC 61000-4-12
- iv. Electrostatic Discharge Test IEC 60255-22-2
- v. Radiated Electro-magnetic Field Test IEC 61000-4-3
- vi. Damped Oscillatory Magnetic Field Test IEC 61000-4-10
- vii. Power Frequency Magnetic Field IEC 61000-4-8
- viii. Power Frequency Voltage Withstand IEC 60255-5
- ix. 1.2/50µs Impulse Voltage Withstand IEC 60255-5
- x. Insulation Resistance Test IEC 60255-5
- xi. Dry Heat Test IEC 60068-2-2
- xii. Damp Heat Test IEC 60068-2-3.

4.28.2. SHOP TESTS:

The automation system will be factory tested by the purchaser to ensure that all equipment, subsystems and modules shall perform as per requirements of the PO. The contractor shall maintain proper records duly signed by authorized quality assurance personnel regarding all stage inspections, tests on individual equipment or subsystem.

The contractor shall prepare a detailed procedure for conducting Factory Acceptance Test (FAT) for every major equipment singly and also in logical combinations, in line with the final configuration. This document shall be submitted to purchaser for approval. Purchaser may ask for modification of the procedure therein, if found necessary. After approval, the final document shall form the basis of FAT. The Contractor is required to notify his readiness to conduct FAT, at least two weeks prior to the intended start of the test. The FAT shall normally be conducted at the Contractor's (or his sub supplier's) factory. However, if so desired by the contractor, he may suggest any other suitable location within India, stating his reasons for the change. Site acceptance tests shall be carried out in accordance with the approved test specifications furnished by the contractor after completion of installation and commissioning of the system. All the charges concerning FAT/SAT are to be in the account of contractor.

4.29. INFORMATION TO BE SUPPLIED:

The Supplier must provide the information listed hereunder, along with the tender Principle schematic diagram showing the proposed structure of the control and monitoring system and possibilities of later extensions as specified. Detailed product catalogues with functional description and technical data of the main components of the system to be supplied.

Clause by clause comments and conformance /non-conformance to the above specifications.

a. Mandatory Spare Parts: -

Cube root of the total quantity used for all LCUs of the following items rounded off to the nearest integer for USPH

i	processor controller
ii	Digital input card
iii	Digital output card
iv	Analog input card
v	Analog output card
vi	Each type module bases and racks
vii	Communication card (if offered separately)
viii	Power Supply Components and Modules of each type
ix.	HMI
x	Each type of indication lamps, Meters, field instruments, gauges, transducers and sensors etc.,

xi	Any other modules/components used in the system like Ethernet switches, Modbus communication modules etc.,
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b. Recommended Spares

If any additional spare parts are recommended by the Tenderer, these shall be stated in quantity and description in the Technical Data Sheets for each item.

Orders for recommended spare parts shall be optional to purchase by the Employer for a period of five (5) years after the date of the completion of the project.

In addition, the Contractor shall supply sufficient number of erection and commissioning spares based on their experience so that erection, testing and commissioning work progresses smoothly and is not hampered for want of such spares.

The spare parts provided by the Contractor shall be of the same quality and have the same mechanical and/or electrical properties as "the original parts and be fully interchangeable with them. If modifications are made to equipment during erection, the Contractor shall ensure that these modifications are also made to all spare parts.

Conditions for tests, surface treatment, painting, etc., stipulated in the Employer's Requirements, shall also apply for the spare parts.

Spare parts shall be conditioned, packaged, shipped and stored to ensure long term storage without degradation.

The complete set of the spare parts for the works or a section shall be delivered prior to taking over.

For mandatory spares and recommended spares 10 years spare part support should be ensured by the successful bidder. The bidder shall provide declaration on their letter head along with Bid and shall be part of evaluation for the successful bidder. In the absence of this declaration the bid shall be summarily rejected.

4.30. Tools and Tackles:

Special tools and tackles if any required for Erection, testing and commissioning shall be in the scope of supply by the contractor and the contractor has to furnish the list of all the tools and tackles, special hardware and software along with the bid.

4.31. Field Instruments, Transducers, Transmitters and multi-function meters:

The supply and Integration of necessary Field Instruments, transducers, Switch cum transducers, transmitters and multi-function meters to the SCADA system as listed below is in the scope of the contractor. Providing of Impulse / Purging lines and their isolation / Bye pass valves etc., as required is also in the contractor's scope.

For complete details of the instruments, Transducers, Transmitters and multi-function meters bidders are advised to visit the site and ascertain the actual requirement.

Necessary connecting and communicating cables for the listed field equipment (i.e. transducer, transmitter or multifunction meter etc) are included in the contractor's scope. Provision for tapping points will be made by APGENCO but Installation, Testing, commissioning and integration with SCADA system is in bidders scope including necessary hardware and isolation valves.

• List of field instruments required are detailed in the Annexure-9

- a. Data collection from Multi-function meters to be handled by separate controller if necessary, so as to maintain plant controllers data updation to be within 250 ms.
- b. Sampling time of any signal should not be more than 1 ms.
- c. Any Extra cables apart from the existing cables to bring all the signals of Listed I/O's and its integration with existing Station Equipment are included in the scope of contractor.
- d. The bidder is requested to visit the site for assessment of the required cables and to check the feasibility and end connection data for installation of the supplied field instruments. It is the responsibility of the bidder to install all the supplied field instruments appropriately without disturbing the functioning of existing equipment.
- e. It is the responsibility of the bidder to bring all the data from field instruments data and I/O data on to the display available in the control room and vice versa.

New instruments supply and erection is in bidder scope only. Scope of making process connection is in Bidder Scope, However APGENCO will assist in making Process connection.

4.32. TENDER SPECIFICATION OF VIBRATION MONITORING SYSTEM FOR USPH:

The scope of this specification covers the Design, manufacture, Inspection & testing at manufacturer's works before dispatch, delivery on F.O.R. project site basis, erection, site testing & commissioning of Vibration Monitoring Systems along with Mandatory spares as per the specification for 4 Nos. Power Generating units (4x60MW capacity) at Upper Sileru Power House.

The system shall meet the international (or) equivalent Indian standards for mechanical vibration, evaluation of

machine vibration by measurements on rotating shafts of hydro power generating units.

Machine to be monitored is Hydro turbine Vertical Francis with a power of 60MW. Rated speed of the turbine is 187.5 RPM (For stage-1 Units) & 200 RPM (For stage-2 Units). As the hydroelectric turbines operate at low speed, special monitoring hardware capable of detecting these extremely low frequencies for analyzing the health of the unit shall be designed & supplied.

The bidders are requested to visit the powerhouse before submission of tenders, so as to assess various aspects involved in the supply & installation of the vibration monitoring systems such as location of sensors, drivers, junction boxes, distance from the measurement location to control room and suitability & length of cables to be laid from the sensors to the control room, etc., **After opening of the bids or placing of purchase order, if the tenderer makes any claims like non-compliance of the equipment due to abstaining from visiting the power house, such claims will be viewed seriously and action will be taken against such bidders including recovery of losses sustained by APGENCO.**

4.32.1. DESCRIPTION OF HYDRO TURBINE AND GENERATORS:

UPPER SILERU POWER HOUSE

Upper Sileru Power House consists of 4 Nos. 60 MW conventional units (Stage-I, Units-1 & 2 supplied by M/s Excherwyss, Charmillies, Switcherland & Stage – II units-3 & 4 supplied by M/s BHEL).

The various parts of the units are as follows:

S.No.	Description	Stage-I (Units 1 & 2)	Stage-II (Units 3 & 4)
1.	Rated Speed	187.5 Rpm	200 Rpm
2.	Rating of the Machine(Generator)	11KV, 66.67 MVA, 0.9PF, 50Hz, 3500A.	11KV, 66.67 MVA, 0.9PF, 50Hz, 3500A.
3.	No. of Upper Guide Bearing Pads	Shell type (Four halves)	NIL
4.	No. of Lower Guide Bearing Pads	Shell type (Four halves)	Segment type: 16 Nos.
5.	No. of Thrust Bearing Pads	12Nos.	Spring Mattress type, No. of pads: 12Nos.
6.	No. of Turbine Guide Bearing pads	Shell type (two halves)	Shell type (two halves)

4.32.2. PROPOSED LOCATIONS OF THE SENSORS:

The vibration systems to be supplied under the contract shall measure the relative shaft vibrations in X and Y directions at UGB (for stage-1 units), LGB, TGB and Thrust Bearing. In addition, the relative shaft vibration in Z direction shall be measured at the Turbine-Generator shaft coupling and speed of the machine/reference point sensing. The location of the sensors shall be fixed accordingly. ***“Sensors shall be wired to the measurement modules in the rack placed in control room and (shaft vibrations for each unit shall be displayed locally by installing local monitors) local display is not required at sensors i.e., at machine but required at measurement cards.”*** The vibration measurements shall also be displayed in the work station provided in the control room, either dedicatedly or can be included in the SCADA workstation as a separate screen. The interlinking between the vibration measurement cards/rack to the SCADA can be 4-20mA, modbus etc., but integration is part of the scope. One spare channel shall be provided as spare in the monitoring system.

SCOPE OF SUPPLY:

The scope of supply for the vibration system shall include but not limited to the following equipment. For full functioning and easy maintenance, the tenderer shall quote the latest vibration monitoring system for all equipment necessary to complete the vibration monitoring systems in full shape and for satisfactory functioning of the systems. The monitoring/protection system should be complaint to API 670 standard or better.

The tenderer shall quote the vibration monitoring system consisting of following equipment.

PROBE/SENSOR DETAILS

- Sensor Type: Non-Contact eddy current type displacement sensors
- Linear Range of measurement: 0-3000 μm peak to peak (radial measurement), for axial measurement it shall be 0-5000 μm peak to peak.
- Frequency Range: 0 Hz to 1000Hz
- Sensitivity: 8 mV/ μm or better or 4-20mA over measurement range
- Operating Temperature: 0-65 deg C

- f) Humidity: 100 % non-condensing
- g) The probe drivers and mounting brackets are in the scope of the bidder.
- h) Flexible conduit for extension cables, Junction boxes for transmitters and signal conditioners are also in the bidder's scope.

4.32.3. MEASURING & MONITORING UNIT:

- a) **MONITORING SYSTEM:** The monitoring system shall consist of one rack chassis per unit which shall house the redundant power supply modules and monitoring modules. ***"The system shall consist of Local display at Card/Transducer level in addition to vibration analyser system at Main Control room of Power house, to show relative shaft vibrations"***. An "Auto" channel shall scan all the vibration readings and each channel shall have analog scale/Bar graph display for on line monitoring in local. *The bar graph shall be configured as a percentage of set alarm level, making easy for operator to view the signal level in relation to set value.*

- b) **MEASUREMENT MODULE:**

In case of Dual channel measurement module: Each rack shall preferably consist of 5 nos. dual channel microprocessor based electronic measurement/transducer modules. Four modules shall display the relative shaft displacements in X and Y directions at UGB, LGB, TGB and Thrust Bearing. One channel in the 5th module shall display the relative shaft displacement in Z direction at the Turbine-Generator coupling. Each module shall be independent with its own short circuit protection. Any short circuit in the module shall not impair the operation of other monitoring modules. In the unlikely event of failure of one module only two channels of measurement shall be effected. The above measurements are in addition with the speed or reference sensing. **OR**

In case of Multi-channel Measurement module: The modules shall display the relative shaft displacements in X and Y directions at UGB, LGB, TGB and Thrust Bearing & in Z direction at Turbine-Generator coupling. One live spare module shall be provided in the rack in lieu of compromise in the redundancy. The operation of all the channels shall be independent and failure of any channel should not impair operation of other channels.

In addition, with the above, the Machine speed reference shall also be sensed if necessary with a separate card.

"Further, each channel shall have an LED bright bar graph with numeric display (or) equivalent and the following indications"

- (i) **'OK':** Constant green LED ON to show the condition of monitor, transducers and the measurement system is healthy.
- (ii) **'NOT OK'** – Constant red LED to indicate un-healthiness of the system.
- (iii) These modules shall be fully programmable for range, sensitivity, alarm and trip, relative time delay, etc., The Operator shall view the alarm and trip levels, bias voltage etc., No separate software or equipment should be required to carry out any changes in settings to ease the service by any personnel in the field. Every Channel should have BNC connector for buffer output for Portable analyzer connection.
- c) The monitor shall have the following features
 - (i) Frequency Response: 2 Hz to 5,000 Hz
 - (ii) Accuracy: +/- 1%
 - (iii) 4-20 mA output per channel/modbus/OPC output such that the signal shall be suitable for use as an input to SCADA system as well as for analog recording & analysis, linear in proportion to vibration velocity as well as displacement. Application software shall be supplied to view and to monitor the machine condition, FFT analysis and trend analysis shall be provided in the application software. Necessary communication hardware required to connect Vibration monitoring system to PC.
 - (iv) Each monitor shall have an adjustable operational relays (Minimum Two Nos. with minimum 2NO+NC contacts) to give alarm and Trip in case the vibration exceeds the pre-set limit. It should be programmable individually by monitor front keypad. Alarm reset button also shall be provided.
The Rack should be modular in construction with plug in type cards, Mother board, Dual hot Redundant power supply in rack, Back Terminal for all interfaces, No hardwiring inside rack is allowed including wiring upto terminals for external interface.

4.32.4. POWER SUPPLY:

APGENCO will provide 220 V DC input power to the system offered by the bidder near each monitoring system rack and distribution of the same has to be carried out by the successful tenderer duly following relevant safety standards with relevant devices and in accordance with the field departmental Engineer's directions. The vibration monitoring system shall derive its own power from these inputs. Redundancy in power supply shall be provided.

4.32.5. SYSTEM MONITOR:

The system monitor shall be provided at MCR (Main Control Room) of power house to continuously supervise the working status

of all the channels & redundancy of the power supply. The system shall have a self-testing function to continuously monitor the healthiness of the modules and the measurement system.

Work Station (Not required if integrated in SCADA Operator Work Station):

One Desktop with licensed windows 10 or any latest OS, DVD RWdrive (Make- HP, COMPAQ, Dell, Lenovo with required software (licensed OS, Anti Virus, and MS Office) in it, for displaying the data at MCR. It shall be the latest model available at the time of procurement with latest licensed antivirus software and suitable laser printer. The computer specifications are to match with the requirements of the predictive maintenance software and should be supplied along with Standard accessories & cables for the PC & printer including operating system software & printer drivers loaded in compact disks. The work station shall be able to show the status of all the channels of 4 units at a time and by unit wise depending on operator choice. The parameters shall also be shown on a bar chart with the set value and the actual value. The station shall annunciate alarm, when any channel's operating values exceeds set value and shall also store history for future review and analysis for at least 45 days. The work station shall be located in the MCR (Main control room) of power house.

4.32.6. Analysing Software:

Vibration monitoring workstation shall have vibration analysis software as a part of unit. Vibration analysis software shall operate in Windows environment (Licensed OS). The user interface shall follow Windows standards with menus and icons.

The Vibration Analysis Software shall be capable of at least the following:

- a. Real time, historical trend and bar graph display of real time data.
- b. Correlating and Analyzing all monitored Vibration parameters for quick and easy machine diagnostics.
- c. Keep record of all vibration and alarm history.
- d. Provide graphical display of all monitored vibration parameters of one machine on same graph for easy comparison and correlation for diagnostics.
- e. Print out of all graphs can be taken on a printer connected to the vibration monitoring workstation.
- f. Simultaneous monitoring of multiple machines.
- g. Fast Fourier transforms (FFT) plots for vibration analysis (harmonic analysis).
- h. Waterfall diagram of the FFT plots.
- i. Orbit plot displaying displacement of bearings with respect to the rotating centre.
- j. 3D Waterfall diagram of Orbit Plots.
- k. Measurement and analysis of data at pre-selected time intervals.
- l. Shaft position and shaft centreline.
- m. Healthy condition of transducers shall be available at vibration monitoring workstation.
- n. Resultant Vector (Smax.) of the vibrations along with the Phase angle
- o. Animation of the actual rotating shaft on the basis of the acquired orbit plots of the shaft at all the bearings.
- p. Generation of daily report which consists of the Minimum, Maximum and Average readings of Vibration for a particular date.
- q. Software should have the provision of remote monitoring of all the vibration readings through LAN/WAN.
- r. Password protected configuration settings to avoid any misuse
- s. Database management software

4.32.7. CABLES:

All the necessary integrated cable, extension cable, signal cable and power cables required from the sensor to Drivers/JBs and to local and remote Measuring and Monitoring system shall be included in the scope of the bidder. The necessary tools and tackles, material, equipment such as cable glands, lugs, ferrules, conduit, cable tray, cable clamps etc., required for cabling work shall be in the scope of the bidder. ***Distance from each bearing to the Vibration Monitoring System is about 250m. Exact cable requirements may be arrived only by visiting the Power House by the Bidder.*** All cables necessary for the vibration monitoring system including, power, earthing, signal etc., are in bidders scope.

Panel:

All Vibration transducers shall be placed in the Panel and the Panel shall be in the Bidder scope. The Panel dimensions may be manufacturer standard size.

4.32.8. SPARES:

The supplier shall provide a guarantee that the spares for the Vibration Monitoring system shall be available at least for 10 years after the last delivery of the system. In the event of phasing out of any spare part, the vendor shall intimate the purchaser, well in time to enable the purchaser to decide on the later strategy to procure spares. In particular, the purchaser must be offered the opportunity to purchase the spare part being phased out. The scope of

supply shall include the required spares as indicated below. The list of spares and quantity shall be furnished in a schedule form.

Mandatory spares:

1. Power supply module - 1 No.
2. Monitoring module - 1 set(4Nos) in case of dual channel type Or 1 No (No.of Channels shall be as per the quantity required for each unit) in case of multi-channel type. Speed or reference sensor card shall also be supplied if separate card is used.
3. All other modules - 1 No each type
4. Eddy current Sensor/probe with connected cables - 8 Nos
5. Tachometer/key phaser transducer - 1 No.

4.32.9. **STANDARDS AND QUALITY ASSURANCE PLAN:**

The equipment shall comply in all respects with the latest issues of Indian or any other authoritative standards. The bidder shall enclose the quality Assurance plan, duly indicating the type of the tests to be carried out on the whole system, party to witness the tests etc., along with the tender in Part-I i.e. “Technical & Pre-qualification Bid”. All vibration monitoring equipment shall be functionally tested for circuit continuity and output response. All the components & interconnection cables shall be tested to ensure compliance with the specification requirements & all other applicable codes & standards.

ERECTION AND MAINTENANCE TOOLS:

The tenderer shall furnish the item wise list of any special tools required for erection and maintenance of the equipment supplied by him.

4.32.10. **COMPLETENESS OF EQUIPMENT:**

The tender shall be complete in all respects and include all fittings and accessories which may not be specifically mentioned in this specification but which are essential for the completeness of equipment offered. All the necessary mounting accessories such as sensor/probe mounting brackets, probe driver housing, junction boxes bolts, nuts screws etc., shall be in the scope of bidder. The tenderer shall quote the prices taking into account all the extra items, which are not specifically mentioned.

The vibration monitoring system shall include all power supplies, interconnecting cabling, calibration equipment, indicators, integrating units, signal conditioning devices and all other accessories, erection hardware required for mounting & monitoring of Vibration at each point.

4.32.11. **DRAWINGS AND DATA TO BE FURNISHED BY TENDERER IN HIS TENDER:**

Drawings, data schedules and catalogues must be furnished by the tenderer in his offer for proper evaluation of his tender. Tenderer shall also furnish any other essential information not specifically mentioned below. Incomplete tenders not giving required information in systematic manner are liable to be rejected outright. All parameters of the equipment and dimensions shall be given in Metric units only.

A write-up shall be furnished supported by computation on aspects of design of the system, vis-à-vis this specification and tenderers verification thereof. Any other technical/physical details that tenderer considers necessary for purchasers reference and understanding of equipment and system, shall also be furnished. Detailed product catalogues with functional description and technical data of the main components of the system shall be furnished. Clause by clause comments and conformance / non-conformance to the above specifications is required.

4.32.12. **ERECTION, SITE TESTING AND VIBRATION MONITORING SYSTEM AT SITE:**

Erection, site testing and commissioning of the complete vibration monitoring systems for all the units shall be the responsibility of the contractor. *Supplier shall assume full responsibility for erection, testing and commissioning and the subsequent performance of the equipment.* Erection, Testing & Commissioning of Vibration monitoring equipment has to be carried out by the successful bidder. **All the necessary special tools and tackles required for erection of the equipment shall be supplied by the manufacturer.** Any civil works that are necessary for successful erection of the equipment is in the scope of APGENCO.

Required special erection tools and special tools which in the opinion of supplier would be required for erection work shall be provided by supplier for smooth execution of works. Any assistance required by the supplier in securing entry and exit permits for such tools shall be rendered by APGENCO.

4.32.13. **TRAINING:**

Supplier shall impart training for at least one week's duration for at least 6 persons at manufacturer's works/owner site for customer operating and maintenance engineers on the fundamentals of the system (as installed) and the use of the

monitoring instrumentation package and software with suitable recommendation, test procedures, data/result interpretation, test file management, operation and maintenance, troubleshooting etc. for implementation by end user. Therefore, training charge, if any, shall be considered as included in the main offer.

The training should also include the fundamentals of machine balancing, suitable literature along with at least a couple of case studies.

4.33. **ERECTION, TESTING, COMMISSIONING AND INTEGRATION OF ENTIRE SYSTEM:**

The Erection, Testing, commissioning and integration of the system has to be carried out by the bidder. All the necessary special tools and tackles required for erection, Testing & Commissioning of the equipment shall be supplied by the manufacturer. It is the responsibility of the bidder to furnish a detailed program (bar charts) for erection, testing and commissioning works of the system as soon as the supplies are completed. Site clearance for taking up the works will be communicated by APGENCO under concurrence with SLDC. Upon intimation of the readiness of the system the contractor within one week from such intimation shall depute his team along with detailed plan for execution of works so as to complete the works during the agreed contract period. No accommodation will be provided by APGENCO.

NOTE: 1. The supplied equipment is to be replaced with the existing equipment in the power house. Hence, the erection of the system depends on the availability of line clear based on the water availability in the reservoir and other constraints.

2. The Power, Control and Signal cables required for the SCADA, Field Instruments and also for Vibration Monitoring system at USPH as per Tender Specification are in the Contractor Scope only, which includes Supply, laying, termination etc complete along with MCBs, Fuses, Terminal blocks, cable ties, lugs, termination etc.

However, the scope of contractor is limited to cabling among the supplied Panels, Equipment, Transducers/ Transmitters etc only. Other Field signals required for operation of SCADA shall be provided by APGENCO.

ii) Cable Quantity required for Upper Sileru Power House:

S.No.	Cable Details	Total Quantity (Approx.)
1	2PX0.5 Sq.mm Copper Overall screened and Armoured Heat Resistant FRLS Cable	5000 Mts.
2	7PX0.5 Sq.mm Copper Overall screened and Armoured Heat Resistant FRLS Cable	2000 Mts.
3	Communication Cable (Ethernet/FO as required)	500 Mts.
4	Cable for Vibration Monitoring System	3000 Mts.

Total supply of the above cable for the purpose of SCADA and integration of field instruments etc., is in Bidder scope.

4.34. **COMPLETENESS OF EQUIPMENT:**

- The tender shall be complete in all respects and include all accessories which may not be specifically mentioned in this specification but which are essential for the completeness of equipment offered. All the necessary mounting accessories shall be in the scope of bidder. The Bidders shall quote the prices taking into account all the extra items which are not specifically mentioned.
- All Softwares are to be supplied in compact disc. All standard accessories, like probes, cables, connectors etc. are to be supplied as part of instrument. The equipment offered must be Industrial Grade & of latest version at the time of procurement. Test certificates of calibration from reputed laboratory are to be submitted with relevant operation/maintenance instruction manuals. Installation and commissioning of hardware and software to be done by supplier at the site.

LIMITS OF CONTRACT: The scope of the contract shall not be limited to the items or equipment scheduled in the specification. Any item or equipment required for satisfactory performance of the equipment or completeness of the contract shall be deemed to have been included in the scope of supply and shall be complete in themselves, unless otherwise stated.

Suppliers are requested to visit the power house to understand and ascertain the requirement and to acquaint with the existing provisions of the system / Power House. No variation of price will be entertained at later date due to unforeseen requirement as a result of non visiting of power house.

4.35. **PAINTINGS**

All the equipments shall be protected against external corrosion by providing suitable painting as per standards. The surfaces of stainless steel, gunmetal, brass, bronze and non metallic components shall not be applied with any painting.

All steel surfaces (external) exposed to atmosphere (outdoor installation):

Painting: One coat of red oxide primer of thickness 30 to 35 microns followed with three (3) coats synthetic enamel paint with 25 microns as thickness of each coat.

All steel surfaces (external) inside the building (indoor installation)

Painting: One coat of red oxide primer of thickness 30 to 35 microns followed up with two (2) coats synthetic enamel paint with 25 microns as thickness of each coat.

All sheet steel work shall be pre-treated, in tanks, in accordance with IS:6005. Degreasing shall be done by alkaline cleaning. Dust and scale shall be removed by pickling; the parts shall be washed in running water. Then these shall be rinsed in slightly alkaline hot water and dried. The phosphate coating shall be "Class-C" as specified in IS: 6005. The phosphated surfaces shall be rinsed and passivated prior to application of stoved lead oxide primer coating. After primer application, two coats of finishing synthetic enamel paint on panels shall be applied. Electrostatic painting shall also be acceptable. Finishing paint on outdoor equipment shall be shade 632 (smoke grey) and on indoor equipment & panels shall be shade 631 of IS:5 unless required otherwise by the Employer. The inside of the panels shall be glossy white. Each coat of finishing shall be properly stoved. The paint thickness shall not be less than 100 microns. Finished parts shall be coated by peelable compound by spraying method to protect the finished surface from scratches, grease, dirt and oily spots during testing, transportation handling and erection.

4.36. **Panel Construction:**

The panels shall be enclosed sheet steel cubicle, indoor, floor mounting free standing type. Panels shall be totally enclosed, dust and vermin proof with IP-31 degree of protection as per IS: 2147. Panels shall be suitably reinforced to provide rigid flat level surfaces, resistant to vibration during transportation and installation. No welds rivets, hinges or bolt threads shall be apparent from outside. The colour of the panels (both interior and exterior) will be decided later. The panels shall have front and back opening doors. Ventilating louvers, detachable filters shall be provided for the panels. All the components and devices shall be mounted in an orderly manner. Easy access of components shall be possible for maintenance purpose. Necessary panel space heaters should be provided

4.35.1. **Sheet metal thickness:**

Minimum 2.0mm for load bearing members and 1.6 mm for non load bearing members shall be provided.

4.36. **Cabling:**

Inside the control panels, minimum 1 Sq.mm copper wires are to be used. Other prefabricated system cables are standard connections. For CT, PT and Auxiliary supply minimum 2.5 sq.mm wires shall be used.

4.37. **Terminals Blocks:**

The measuring circuits are provided with disconnecting terminals for 2.5 sq.mm wires. Standard 2.5 sq.mm CATM4 type ELMEX make or equivalent terminals shall be provided for the interfacing control and signal circuits. For CT and DC/AC power supply input terminals shall be of disconnecting type equivalent to CATDM4 of ELMEX make.

4.38. **Label:**

Name plates of approved design shall be provided for each panel. Danger plates/ Warning messages as per regulations shall be provided outside each door. The components and devices shall be labeled clearly with non deteriorating tape or anodized aluminum stickers. Provision to keep the circuit diagram drawings inside the panel shall be made possible.

4.39. **Grounding and Cable Entry:**

Two separate grounding terminals shall be provided for each panel for connection of 50x6mm GI or 25x6 copper flat earthing strips. If separate Electronic Earth is required same shall also be provided in line with the panel earth i.e 50x6 mm GI or 25x6 mm copper. Station earth and electronic earth pits will be arranged by APGENCO. All the cable entries shall be from bottom. Cable glands, lugs and other items necessary for cable termination shall be provided by the supplier. Removable gland plates for cable terminations shall be provided with panels.

4.40. **SCOPE OF WORK for SCADA, Field Instruments and Vibration Monitoring System:-**

- Shifting of supplied Equipments from site store to the work site at USPH.
- Removing of existing panels/equipments, its fitting arrangement and wiring as required. Removing of old panels and control desk at USPH is in the scope of bidder.
- Cutting / fabrication work, supply of plate /Channel and other items for fixing or installing of supplied equipments, blanking the open space by plates, fixing of fitting arrangement for easy operation etc., wires, termination, fuses, ferrules, sleeves etc., required for retrofitting is in Bidder's scope.
- Necessary chipping of concrete, New concrete pedestals, Reinforcement for fixing of Equipments is in Bidder's scope.
- Testing and commissioning of Equipments with protection relays and external interlocks- permissive for all functions/logics, parameter setting, operation, interlocks, indications, annunciations etc., and furnishing of test certificates.
- The Equipment panels have to be fully tested, commissioned before putting into service.

- Bidder shall integrate the IEDs into SCADA, if necessary, by consulting the respective OEMs. Alternatively, Bidders can bring the required signals through hard wired mode from the respective IED.
- Any defects arise in the Equipments during testing, Commissioning or its operation during Guarantee period at site shall be replaced free of cost, which include transportation also.
- The equipment shall also comply with the latest revision of Indian Electricity Act, Indian Electricity Grid Code(IEGC) and Indian Electricity Rules and any other applicable statutory provisions, rules and regulations applicable with latest revisions as on the date of bid submission in the locations where these are to be installed.
- All Supplied items are to be provided with labels. The labels shall be mounted properly showing name of auxiliary, rating and compartment No. of the panel.
- The Equipments shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent equipment confirming all safety interlocks.
- All documents including drawings, data sheets, erection and commissioning manuals, O & M manuals shall be provided on electronic media viz. DVD's. Each electronic media shall be of high quality and suitable for long-term storage. The reproduction from media shall be of good quality.
- Before dispatch of equipments to consignee, the supplier is required to submit (FOUR+TWO) sets of following drawings/documents in suitable files. FOUR sets Hard and TWO sets of soft copies per equipment shall be forwarded to consignee along with equipment and (FOUR+TWO) sets final as built drawings after commissioning of equipments.
 - a) Control schematics and wiring diagrams.
 - b) Operation and maintenance manual.
 - c) Commissioning manual.
 - d) Catalogues for all bought out items.
- The manuals and test reports should be submitted in bound form suitable for long storage with the necessary information printed on the cover page as well as back for easy traceability in addition to soft copies. The documents not submitted in the above manner will not be accepted.
- Integration of existing energy meters (Generator, feeders, auxiliaries etc., shall be done to SCADA system as well as ECR panel.
- All Erection, operation & maintenance manuals & drawings shall be furnished in reproducible form (DVDs/CDs) also.
- The supplier shall provide a guarantee that the spares for the system shall be available for at least **10 years** after the delivery of last item of the system. In the event of phasing out of any spare part the vendor shall intimate the purchaser well in time to enable the purchaser to decide on the later stage to procure spares. In particular the purchaser must be offered the opportunity to purchase the spare parts being phased out.
- Recommended Spares, if any, required for trouble free operation of SCADA, Vibration Monitoring system for a period of 5 years in addition to the Mandatory spares shall be indicated separately along with cost for each item of spare. The purchase of these spares is at the discretion of APGENCO. The cost of recommended spare items mentioned should be Firm until completion of the contract. The cost of Recommended Spares will not be considered for the evaluation of the BIDs.
- The training on SCADA and other systems as per Tender Specification shall cover familiarization with manufacturing and assembly techniques, procedures of installation, testing, commissioning, operation, maintenance and trouble shooting and associated softwares.
- APGENCO will provide following facilities to the successful bidder at the time of work execution
 - a) Providing required LT power supply.
 - b) Providing required D.C (220V) Power supply.
 - c) E.O.T. crane facility with operator.
 - d) Service air for cleaning purpose.
- APGENCO will not provide any accommodation to the bidder or any associated third party.
- Supply, Erection, Testing and commissioning and integration of the entire system shall be in the scope and responsibility of the bidder.
- Miscellaneous materials required for successful commissioning of SCADA, Filed Instruments and Vibration Monitoring System required for the units is to be supplied free of cost. Integration of SCADA, Filed Instruments and Vibration Monitoring System as per field conditions, testing and commissioning of the entire system shall be in the scope and responsibility of the bidder.

- The offered equipment shall be complete with all components necessary for their effective trouble-free operation. Such components shall be deemed to be included in the scope whether those are specifically brought out in this specification and/or the commercial order or not.
- The work should be executed as per the instruction of Engineer In-charge of the project and his decision will be final in any matter.
- The supply shall include all software and their licenses in required numbers for satisfactory operation.
- All the interconnections to the supplied equipment including supply, laying and termination of cables and impulse / purging lines for gauges/ Transmitters as required shall be in scope of the bidder.
- The offered systems of SCADA, Field Instruments and Vibration Monitoring System consisting of Laptops, computers, Ethernet switches, PLC/Processors, LVS, Power & I/O cards, Communication devices etc., should be of Industrial grade only but not of general purpose/ personal/domestic usage grade or quality.
- The bidders shall visit the USPH Hydro Power Station and interact with the concerned engineers to estimate / assess the Scope & Quantum of work. If they have any queries they must get them clarified during their site visit. Later no appeals/Claims at any stage of Contract will be entertained and the contractor is bound to execute the contract in Full & complete shape.

Schedule-1
Guaranteed Technical Parameters for SCADA system

The Bidder shall furnish the following details:

Sl No	Description	Specifications offered by the firm
1	Centralised DCS (SCADA) with HMI (Work stations)	
2	Printer	
3	· Automatic start/stop of the units and its auxiliaries in Idle spin, Spin Gen, Generator and shutdown mode of operations duly checking of sequence and interlocks. · Step-by-step mode of operation · Manual operation from control room and from local control (LCU) panels. · Automatic synchronizing, loading/unloading of the units. · Parameter monitoring and data acquisition on real time basis. · Display of mimic on the station computer for effective Human machine interaction. 4. Reports, event and alarm logging, trends and storage of data as required. 5. Display of parameters and status of units and feeders on Large Video Display.	
4	Digital Inputs/Outputs for each LCU	
5	Analog Inputs(4-20 mA)&RTD/Outputs for for each LCU	
6	Digital Inputs/Outputs for common aux & switchyard LCU	
7	Analog Inputs(4-20 mA)&RTD /Outputs for common aux & switchyard LCU	
8	System requirements a. Switchover time from main to standby processor	
9	ECR Panel Functional features: The features of CRP can be categorized under the following headings. · Equipment for manual synchronizer	
10	DCS Controller	
11	Digital input modules	
A	Measuring capacity	
B	Signal voltage level	
12	Analog Input modules for current signal	
A	Signal type	
B	Resolution	
13	Digital Output modules	
A	Capacity	
B	Suitable for Voltage	
14	Output modules should have the following Protection 1. Short Circuit 2. Over current 3. Over temperature	
15	Contact rating of output relays & No of contacts	
16	Communication modules;	

17	Power Supply: A. Power supply for CPU and IO subsystem. B. Power supply at Control Room. Operation Voltage i. Power supply to the control room process computer systems"	
18	Application program debugging:	
19	Laptop	
20	Application program documentation:	
21	Specifications for Station LAN: a. The LAN should have Highest possible availability through redundancy. b. Data rate c. Redundancy d. Time synchronization signal shall be broadcasted to all nodes e. All nodes shall be synchronized to within +/- 5msec. f. All the necessary cables between the LCU panels/Operating stations/ Large Video Display and any type of special cables required for the interconnection etc. shall be in the scope of supply.	
22	Connectivity with upper level computers and networks:	
23	<u>Display Wall / Video Screen</u>	-
24	A. Plant-Specific Displays B. Standardized displays C. POINT IDENTIFICATION	-
25	<u>Operator work station</u>	-
26	<u>Operator keyboard:</u>	-
27	<u>Monitors</u> a. <u>Specification</u> b. <u>Refresh time</u>	-
28	Printer a. Logging Printer i. Quantity ii. Make iii. Logging printer shall provide following facilities. b. Alarm and Event Printer i. Quantity c. Printer with Engineering Station: i. QUANTITY ii. Type	
29	UPS System:	
30	Standard Operation displays a. Overview display b. Group display c. Individual point display d. SFC/Function Block display e. Graphical trend display	
31	Process alarm types	
32	Process alarm management	
33	Custom graphic display	
34	Alarm summary display	
35	Other displays	

36	Window management	
37	Process alarm types	
38	Process analysis and management	
39	Alarm acknowledgement	
40	alarm properties	
41	Historical events	
42	Process events	
43	System Events	
	a. Engineering events	
44	Engineering Events	
45	On-demand reporting	
46	Process reporting and logging	
47	Integrated sequence of events(SOE) System	
48	System maintenance & service function	
49	System diagnosis	
50	System boot up	
51	Maintenance	
52	Card failure indication	
53	Cards access	
54	System backup	
55	Remote maintenance and diagnosis	
56	Local maintenance from LCUs and debugging	
57	IEC 60870-5-104& 101	
58	Conditions of service	
59	Instrumentation cables	
60	Optic fiber cables	
61	Training of personnel	
62	Field instruments	
63	Surge Immunity (Yes/No)	
64	Insulation Resistance	
65	Electro Magnetic Compatibility (Yes/No)	
66	Electro Static Discharges Immunity (Yes/No)	
67	Shock Immunity (Yes/No)	

B. Technical specification for Vibration Monitoring System for USPH

The Bidder shall furnish the following details:

S.No	Description	As per the Tenderer
1	Sensor Type:	
2	Sensor Tip diameter:	
3	Frequency Range of Sensor	
4	Frequency response of the system	
5	Sensitivity	
6	Accuracy	
7	Whether overall vibration, converted in to 4–20mA out put, is proportional to monitor full scale.	

8	Input impedance of the measuring module	
9	Output impedance	
10	Maximum load:	
11	Power Supply	
12	No. of relays and whether they are adjustable type	
13	No. of alarms	
14	Whether Alarm reset button is provided	
15	Type of output display on each module	
16	No. of LED indicators (give functional details)	
17	Whether OK/Not OK LED indication on the channels is provided	
18	No. of digits of the digital display unit	
19	Whether Auto channel scan is provided	
20	Whether the offered system is provided with self-testing function to monitor the healthiness of the modules and the measurement system.	
21	Operating Temperature:	
22	Storage Temperature:	
23	Humidity	
24 (i)	Length of integral cable for each unit:	
(ii)	Length of extension cable for each unit:	
25	Description of the cables	
(i)	integral cable	
(ii)	extension cable	
(iii)	signal cable	
(iv)	Power cable	
26	size of the rack	
27	Whether Erection and maintenance tools are included in the supply.	
28	Whether Mounting accessories for probes, junction boxes included in the supply	

Schedule –2
Proforma Of Guarantee For Equipment Performance
(to be enclosed in the Part-I Pre-qualification bid)

The tenderer hereby guarantees the requirements of this specification.

If any of the requirements of the guarantees given are not fulfilled, the purchaser has the right to reject the equipment. The Tenderer hereby affirms that **the defective Equipment /Part** will be made good by rectifying/replacing the defective parts. All the replaced parts will be removed from the site. The facility for making good the deficiency will be normally given once and, the purchaser is entitled to reject the equipment in case of repeated failure to meet the guarantee as per the specification.

Name of the firm :

Signature of the bidder :

Designation :

Date :

Seal of the company

Schedule – 3
Schedule Of General Terms And Conditions
(to be uploaded in the Part-I Pre-qualification bid)

Bidders are requested to fill in the blank space and upload the same along with offer otherwise their offer will be either treated as non-responsive or suitable cost compensated for deficiencies as deemed fit by the Corporation.

1	Tender Specification No., date and due date	:	
2	Offer/quotation No. & Date	:	
3	Name of the bidder	:	
4	GST Registration No	:	
5	DGS&D's Registration No., if any (Please enclose copy of rate contract, if any)	:	
6	NSIC/SSI/MSME Registration No., if any (Copies of certificates to be enclosed)	:	
7	Price Basis (F.O.R.)	:	
8	Discount, if any	:	
9	Packing and forwarding charges (If price basis ex-works)	:	
10	GST for material	:	Included/Excluded (Indicate rate)
11	GST for services	:	Included/Excluded (Indicate rate)
12	Freight charges	:	Included/Excluded
13	Transit Insurance	:	Included/Excluded
14	Bank charges	:	To be borne by seller.
15	a) Delivery Period	:	<u>Material:</u> Within Months from the date of approval of Drawings
	b) Erection, Testing & commissioning	:	Erection, Testing & Commissioning shall be completed within months from the date of intimation of readiness of the site of the respective plant.
16	Whether phased delivery acceptable	:	
17	Mode of dispatch	:	
18	Confirmation of submission of Performance Bank Guarantee for 10% of order value for performance of Equipment.	:	
19	Earnest Money Deposit Details (APGENCO reserves the right to reject/consider offers without EMD)	:	

We Confirm acceptance towards the following:

20	Payment Terms	:	APGENCO payment terms as per tender specification
21	Security Deposit	:	2.5% of order value (for full execution of order) by the way of DD/Pay order/Bank guarantee.
22	Validity of offer	:	180 days from the date of opening of pre-qualification & Technical bids
23	Recovery of Liquidated Damages.	:	In case of delay in Execution of order beyond stipulated delivery period, APGENCO reserves the right to recover from the vendor Liquidated Damages equivalent to 0.5% of the value of delayed materials/work for each week or part thereof subject to maximum of 5% of total value of Purchase Order of each station.

24	Part order	:	Acceptable
25	Price Variation	:	The prices quoted shall remain firm till execution of full order (in case of any specific price variation formula, the same shall be mentioned with ceiling limits. If the bidder quotes for variable prices, Non furnishing of Ceiling limit and the applicable formula may lead to disqualification of the tender.)
26	Rate Certificate	:	It is certified that prices quoted herein are the same as applicable to other Government Departments/ Public Sector Undertakings.
27	Guarantee Certificate	:	Materials quoted shall be guaranteed for a period of 24months from the date of supply or 18 months from the date of Commissioning, whichever is earlier against any manufacturing defects or poor workmanship.
28	Interchangeability	:	It is certified that the quoted items are interchangeable with the items existing in APGENCO and if fails to interchange, the same shall be replaced free of cost.

**Signature of Bidder with Name,
Designation and Office Seal**

Schedule - 4
Schedule Of Deviations From The Specification
(to be enclosed in the Part-I Pre-qualification bid)

Bidder shall carefully state here below all points not in accordance with enclosed specification.

Chapter	Section	Deviation
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The Bidder hereby certifies that the above mentioned are the only deviations from the specification No.

Signature of the tenderer.

Schedule-5
Bidder's Undertaking

We M/s. _____ visited/(aware of the USPH Project) and thoroughly understand the tender scope and field requirements & availabilities at Upper Sileru Power House. We will not claim any extra/additional cost/requirements to execute this order in complete shape, as per the site requirement and for satisfactory performance.

Signature of the Bidder

Company Seal

Schedule - 6
Proforma for Back Up Guarantee of Performance & SAS

The Chief Engineer (HPC&HP),
Fourth Floor, Block-A, APGENCO,
Vidyut Soudha,
Gunadala, VIJAYAWADA – 520007.

Sub: Backup guarantee for SCADA/PLC System to be supplied for Upper Sileru Power House.

Dear Sirs,

- 1 We M/s..... Wish to supply our SCADA/PLC Equipment/ materials to this tender No..... for USPH. We are Submitting our Performance certificates along with work orders/purchase orders in accordance with the respective eligibility criteria for SCADA/PLC system of the tender through the Bidder i.e., M/s..... for your consideration.
2. In this regard, We confirm that in case the Present Contract is awarded in favour of M/s (Name of the Bidder) we undertake:
 - a) To provide the full backup guarantee for complete and satisfactory commissioning & performance of the equipment and services after sales (SAS) for the SCADA/PLC System to be supplied under this contract.
 - b) To provide the full backup guarantee for the supply of spare parts and services for a period not less than 10 years from the date of commissioning for SCADA /PLC System equipment to be supplied by us for this contract.

Thanking you,

Yours faithfully,

Signature, Name, Seal, and address of OEM

Address of the Bidder

1. Witness:

(Signature, name and official address)

2. Witness:

(Signature, name and official address)

SCHEDULE – 7
List of Recommended Spares for SCADA system
(to be enclosed in the Part-I Pre-qualification bid)

Sl. No.	Description of Spare Item or Equipment	Qty	Rate/item
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Signature of the Bidder

Company Seal

Schedule –9
Consent Form

We hereby issue Consent for the SBI e-payment System implemented by APGENCO for arranging e-payment for the Supply of following material/Execution of Work.

S.No.	Description	
1	Name of the Work	
2	Purchase Order/Agreement Ref No.	
3	Bank Account No. with Branch Details	
4	Type of Account (Current/Cash Credit etc)	
5	Full Name of the Beneficiary as per Bank Records	
6	IFSC Code etc.,	

It is noted that APGENCO will not accept any responsibility in any manner for any technical glitches/problems/malfunctioning of the Bank Portal etc., during the course of transfer of funds through Bank Portal.

Authorised Signatory of the Agency

Schedule – A
Proforma of Summary Price Proposal

S. No	Description of the material	Qty. for USPH	USPH	
			Unit Price in Rs.	Total Amount in Rs.
A	Material Portion			
1	Supply of DCS based SCADA (Supervisory Control And Data Acquisition) system for 1 to 4 units (60 MW each), Common Auxiliary equipment and switchyard, field instruments along with Mandatory Spares	LS		
2	Supply of Online Vibration Monitoring system including Mandatory Spares	4 sets		
a	GST for material @%			
b	Packing & Forwarding Charges			
c	Freight Inclusive of GST			
d	Insurance Inclusive of GST			
	Sub Total A for material portion			
B	Service portion			
1	Removing of existing panels/equipments/control desk, it's fitting arrangement and wiring as required, Erection, Testing, Commissioning and integration of supplied DCS based SCADA, including field instruments. Common Auxiliary equipment and switchyard.	LS		
2	Erection, Testing and Commissioning of Online Vibration Monitoring system and integration with SCADA system.	4 sets		
a	GST for Services @ %			
	Sub Total B for service portion			
	Gross Total Amount			

Note: 1) The Bidder should compulsorily quote the Prices of all items in the price bid through AP e-platform otherwise their offer will be treated as non-responsive and disqualified.

2) However, the bidder may upload this sheet in Attachments folder in the price bid only.

Date
Place

Signature-----
Name-----

Designation-----

(Seal)-----

ANDHRA PRADESH POWER GENERATION CORPORATION LIMITED

GUIDE-LINES FOR SUBMISSION OF BANK GUARANTEE

The Bank Guarantee shall fulfill the following conditions failing which it shall not be considered valid:

1. Bank Guarantee shall be executed on non-judicial stamp paper of applicable value purchased in the name of bank.
2. Non-judicial stamp paper shall be used within 6 months from the date of purchase. Bank Guarantee executed on the stamp paper of more than 6 months old shall be treated as invalid.
3. The contents of the Bank Guarantee shall be as per our proforma which will be enclosed along with the Purchase Order.
4. The Bank Guarantee should be executed by a nationalized bank's/Scheduled bank's/public sector bank's.
5. The executor of Bank Guarantee (Bank Authority) should mention the Power of Attorney No. and date executed in his/her favour authorizing him/her to sign the document or produce the Photostat copy of Power of Attorney.
6. All conditions, corrections, deletion in the Bank Guarantee should be authenticated by signature of Bank Officials signing the Bank Guarantee.
7. Each page of Bank Guarantee shall bear signature and seal of the Bank.
8. Two persons should sign as witnesses mentioning their full name and address.
9. **Validity of Bank Guarantees:**
 - a) The Bank Guarantee for EMD shall be valid for a period of 270 days from the date of opening of pre-qualification with a claim period of 6 months.
 - b) The Bank Guarantee for PEMD shall be valid for a period of 3 years from the date of submission with a further claim period of 6 months.
 - c) The Bank Guarantee for Security Deposit shall be valid for a period of 6 months over and above the contract period with a claim period of 6 months over and above the validity period.
 - d) The Bank Guarantee for Performance Guarantee shall be valid up to the Guarantee period with a claim period of 6 months over and above the Guarantee period.

ANNEXURE – I (EMD)

(TO BE STAMPED IN ACCORDANCE WITH INDIAN STAMP ACT)

PROFORMA OF BANK GUARANTEE FOR THE EARNEST MONEY DEPOSIT (EMD)

Bank Guarantee No: _____

Date: _____

Valid Up to: _____

Claim Period up to: _____

In consideration of the Andhra Pradesh Power Generation Corporation Limited (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at Vidyut Soudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 having agreed to exempt (Name of the Tenderer/Vendor/Contractor/Supplier) having its registered office at _____ (hereinafter called the said Tenderer/Contractor which term includes Supplier), under the terms and conditions of the Tender Notification No. _____, Dated _____ payment of EMD of Rs. (Rupees -----only) is payable part of EMD for the due fulfillment by the said Tenderer/Contractor of the terms and conditions contained in the said Tender for _____, on production of a Bank Guarantee for Rs. _____ (Rupees -----only).

At the request of _____ [Tenderer/Contractor] We, _____, (hereinafter referred to as the "Bank"), having Registered/Head office at _____ and a branch at _____ being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the APGENCO without any delay or demur, merely on your first demand any sum or sums up to a maximum amount but not exceeding Rs. ----- (Rupees-----).

We undertake to pay unconditionally to the APGENCO any money so demanded notwithstanding any dispute(s) raised by the Tenderer/Contractor in any suit, or proceedings pending before any Court or Tribunal or Arbitration or any other Authority relating there to our liability under this present being is absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the Arbitration proceeding or by any other Authority.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer/Contractor shall have no claim against us for making such payment.

We, (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effective till the award of tender to the successful bidder. Validity of BG will be for a period of 270 days from the date of opening of pre-qualification bid with a further claim period of 6 months. However, BG of EMD will be returned after the award of Tender. BG is to be valid till _____.

We, _____ (indicate the name of the Bank) further agree with the APGENCO that the APGENCO shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend time of BG by the said Tenderer/Contractor from time to time or to postpone for any time or from time to time.

This guarantee will not be discharged due to the change in the constitution of the Bank or the Tenderer/Contractor.

We, _____ (indicate the name of the Bank) lastly undertakes not to revoke this guarantee during its currency except with the previous consent of the APGENCO in writing. Furthermore, we _____ (indicate the name of the Bank) accept that

1. This Bank Guarantee is unconditional and absolute
2. Claim against this Bank Guarantee shall be honoured without any delay or demur; and
3. This Bank guarantee covers all the losses, claims, damages and costs suffered by the APGENCO against the said Tender.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....
- b) This Guarantee shall be valid up to Dt. _____
- c) Unless the Bank is served a written claim or demand on or before Dt. _____ (claim period) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ (indicate the name of the Bank), have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

In witness where of signed this Guarantee on this ____ Day __ Year__ for __ Bank at

(Signature(s) of Authorised Personnel of the Bank with Seal)

Designation:

Address:

ANNEXURE – 2 (PEMD)

TO BE STAMPED IN ACCORDANCE WITH INDIAN STAMP ACT)

PROFORMA OF BANK GUARANTEE FOR THE PERMANENT EARNEST MONEY DEPOSIT (PEMD)

Bank Guarantee No:

Date:

Valid Up to:

Claim Period up to:

In consideration of the Andhra Pradesh Power Generation Corporation Limited (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at Vidyut Soudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 has afforded a facility to Tenderer(s)/Contractor(s)/Vendor(s) and Supplier(s) who submit tender(s)/bid(s)/offer(s) in response to the Tender notice(s) of the Andhra Pradesh Power Generation Corporation Limited calling for Tenders for supply of materials or rendering of services or execution of works permitting Tenderer(s)/Contractor(s)/Vendor(s) and Supplier(s) who furnish a Permanent Earnest Money Deposit (PEMD) of Rs. _____ (Rupees _____ only) in the shape of Bank Guarantee in lieu of Cheque/Demand Draft to have their tenders considered without separate payment of earnest monies with each tender, wherever the EMD is not more than Rs. 5.00 lakhs (Rupees Five Lakhs only) in a single case/Tender.

Whereas (Name and address of the Tenderer/Vendor /Contractor/ Supplier)..... has offered the guarantee of this Bank (indicate the name and address of the Bank), towards the Fixed/Permanent Earnest Money Deposit and the APGENCO has agreed to accept the same.

At the request of _____ [Tenderer/Contractor] We, _____, (hereinafter referred to as the "Bank"), having Registered/Head office at and a branch at being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the APGENCO without any delay or demur, merely on your first demand any sum or sums up to a maximum amount but not exceeding Rs. _____ (Rupees _____).

We, _____ (indicate the name of the Bank), do hereby undertake to forthwith and immediately pay the amounts due and payable under this guarantee without any demur, merely on a demand from APGENCO. Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____/- (Rupees _____ only).

We _____ (indicate the name of the Bank) undertake to pay unconditionally to the APGENCO any money so demanded notwithstanding any dispute(s) raised by the Tenderer/Vendor /Contractor / Supplier in any suit, or proceedings pending before any Court or Tribunal or Arbitration or any other Authority relating thereto our liability under this present is being absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the Arbitration proceeding or by any other Authority.

The payment so made by us under this guarantee shall be a valid discharge of liability for payment there under and Tenderer/Vendor /Contractor / Supplier shall have no claim against us for making such payment

We, _____ (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect till the award of tender to the successful bidder. Validity of BG shall be for a period of 3 years from the date of submission with a further claim period of 6 months. BG is to be valid till _____.

This guarantee will not be discharged due to the change in the constitution of the Bank or the Tenderer/Vendor /Contractor / Supplier.

We, _____ (indicate the name of the Bank) lastly undertakes not to revoke this guarantee during its currency except with the previous consent of the APGENCO in writing. Furthermore, we _____ Bank accept that

1. This Bank Guarantee is unconditional and absolute
2. Claim against this Bank Guarantee shall be honoured without any delay or demur; and
3. This Bank guarantee covers all the losses, claims, damages and costs suffered by the APGENCO against the Tender.

Notwithstanding anything to the contrary contained hereinabove:

- a. The liability of the Bank under this Guarantee shall not exceed Rs. _____/- (Rupees _____ only)
- b. This Guarantee shall be valid up to Dt. _____
- c. Unless the Bank is served a written claim or demand on or before Dt. _____ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ (indicate the name of the Bank), have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

In witness where of signed this Guarantee on this _____ Day ____ Year ____ for ____ Bank at

(Signature(s) of Authorised Personnel of the Bank with Seal)

Designation:

Address:

ANNEXURE-2(i)
FORM OF INSURANCE SURETY BOND FOR BID SECURITY

Insurance **Surety Bond** No
Date:

To: (Name and address)

1. In consideration of the Andhra Pradesh Power Generation Corporation Limited (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at Vidyut Soudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 having agreed to exempt _____ (Name of the Tenderer/Vendor/ Contractor/Supplier) having its registered office at _____ (hereinafter called the said Tenderer/ Contractor which term includes Supplier), under the terms and conditions of the Tender Notification No., Dated., payment of EMD of Rs _____ (Rupees _____ only) is payable part of EMD for the due fulfillment by the said Tenderer/Contractor of the terms and conditions contained in the said Tender for _____ (name of the work), on production of a **Surety Bond** for Rs. _____ (Rupees _____ only). At the request of [Tenderer/Contractor] We, _____, (hereinafter referred to as the "**Surety Insurer**"), having Registered/Head office at and a branch at being the Guarantor under this **Surety Bond**, do hereby irrevocably and unconditionally undertake to forthwith and pay to the APGENCO as our primary obligation without any delay or demur, merely on your first demand and without reference to the Bidder, if the Bidder fail to fulfil or comply with all or any of the terms and conditions of the above tender notification any sum or sums up to a maximum amount but not exceeding Rs _____ (Rupees-----only).
2. Any such written demand made by the APGENCO stating that the Bidder is in default of the due and faithful fulfillment and compliance with the terms and conditions contained in the Bidding Documents shall be final, conclusive and binding on the **Surety Insurer**.
3. We, the **Surety Insurer**, do hereby unconditionally undertake to pay immediately the amounts due and payable under this **Surety Bond** without any demur, reservation, recourse, contest or protest and without any reference to the Bidder or any other person and irrespective of whether the claim of the APGENCO is disputed by the Bidder or not, merely on the first demand from the APGENCO stating that the amount claimed is due to the APGENCO by reason of failure of the Bidder to fulfil and comply with the terms and conditions contained in the Bidding Documents including failure of the said Bidder to keep its Bid open during the Bid validity period as set forth in the said Bidding Documents for any reason whatsoever. Any such demand made on the **Surety Insurer** shall be conclusive as regards amount due and payable by the **Surety Insurer** under this **Surety Bond**. However, our liability under this **Surety Bond** shall be restricted to an amount not exceeding Rs. _____ (Rupees _____ only).
4. This **Surety Bond** shall be irrevocable and remain in full force for a period of 270 (two hundred and seventy) days from the Bid Due Date or for such extended period as may be mutually agreed between the APGENCO and the Bidder, and agreed to by the **Surety Insurer**, and shall continue to be enforceable till all amounts under this **Surety Bond** have been paid.
5. We, the **Surety Insurer**, further agree that the APGENCO shall be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfillment and compliance with the terms and conditions contained in the Bidding Documents including, inter alia, the failure of the Bidder to keep its Bid open during the Bid validity period set forth in the said Bidding Documents, and the decision of the APGENCO that the Bidder is in default as aforesaid shall be final and binding on us, notwithstanding any differences between the APGENCO and the Bidder or any dispute pending before any Court, Tribunal, Arbitrator or any other Authority.
6. In order to give effect to this **Surety Bond**, the APGENCO shall be entitled to act as if the **Surety Insurer** were the Principal Debtor and any/**Change** in the constitution of the Contractor and/or the **Surety Insurer**, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the **Surety Insurer** under this **Surety Bond**.
7. In order to give full effect to this **Surety Bond**, the APGENCO shall be entitled to treat the **Surety Insurer** as the principal debtor. The APGENCO shall have the fullest liberty without affecting in any way the liability of the **Surety Insurer** under this **Surety Bond** from time to time to vary any of the terms and conditions contained in the said Bidding Documents or to extend time for submission of the Bids or the Bid validity period or the period for conveying acceptance of Letter of Award by the Bidder or the period for fulfillment and compliance with all or any of the terms and conditions contained in the said Bidding Documents by the said Bidder or to postpone for any time and from time to time any of the powers exercisable by it against the said Bidder and either to enforce or forbear from enforcing any of the terms and conditions contained in the said Bidding Documents or the securities available to the APGENCO, and the **Surety Insurer** shall not be released from its liability under these presents by any exercise by the APGENCO of the liberty with reference to the matters aforesaid or by reason of time being given to the said Bidder or any other forbearance, act or omission on the part of the APGENCO or any Indulgence by the APGENCO to the said Bidder or by any change in the constitution of the APGENCO or its absorption, merger or amalgamation with any other person or any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of releasing the **Surety Insurer** from its such liability.
8. Any notice by way of request, demand or otherwise hereunder shall be sufficiently given in writing if addressed to the **Surety Insurer** and sent by courier or by registered post or by certified e-mail to the **Surety Insurer** at the address or e-mail set forth herein.
9. We undertake to make the payment immediately on receipt of your notice of claim on us addressed to name of **Surety Insurer** along with branch address and delivered at our above branch who shall be deemed to have been duly authorized to receive the said notice of claim.
10. It shall not be necessary for the APGENCO to proceed against the said Bidder before proceeding against the **Surety Insurer** and the **Surety Bond** herein contained shall be enforceable against the **Surety Insurer**, notwithstanding any other security which the APGENCO may have obtained from the said Bidder and which shall, at the time when proceedings are taken against the **Surety Insurer** hereunder, be outstanding or unrealized.
11. We, the **Surety Insurer** further undertake not to revoke this **Surety Bond** during its currency except with the previous express consent of the APGENCO in writing.
12. The **Surety Insurer** declares that it has power to issue this **Surety Bond** and discharge the obligations contemplated herein, the undersigned is duly authorized and has full power to execute this **Surety Bond** for and on behalf of the **Surety Insurer**.
13. The **Surety Insurer** declares that this Insurance Surety Bond is issued by the (name of Insurance Company) as per the applicable rules and regulations of Insurance Regulatory Development Authority of India (IRDAI).
14. For the avoidance of doubt, the **Surety Insurer's** liability under this **Surety Bond** shall be restricted to Rs. _____ (Rupees _____ only). The **Surety Insurer** shall be liable to pay the said amount or any part thereof only if the APGENCO serves a written claim on the **Surety Insurer** in accordance with paragraph 9 hereof, on or before _____ [** (indicate date falling 270 days after the Bid Due Date)].

15. This **Surety Bond** shall also be operatable at our , branch at , from whom, confirmation regarding the issue of this **Surety Bond** or extension/renewal thereof shall be made available on demand. In the contingency of this **Surety Bond** being invoked and payment hereunder claimed, the said branch shall accept such invocation letter immediately and make payment of amounts so demanded immediately under the said invocation.
16. The Insurance **Surety Bond** shall be verifiable from the specific portal created for this purpose:-

In witness where of Signed and sealed this Surety Bond on this ____ Day ____ (month) of __ (Year) __ at _____.

SIGNED, SEALED AND DELIVERED

For and on behalf of the Insurance company by:

(Signature of the Authorized Official)

(Name) (Designation) (Code Number)

ANNEXURE-3 (SD)

**(TO BE STAMPED IN ACCORDANCE WITH INDIAN STAMP ACT)
PROFORMA OF BANK GUARANTEE FOR THE SECURITY DEPOSIT (SD)**

Bank Guarantee No: _____

Date: _____

Valid Upto: _____

Claim Period: _____

In consideration of the Andhra Pradesh Power Generation Corporation Limited (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at Vidyut Soudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 having agreed to exempt (Name of the Contractor/Supplier/Vendor) having its registered office at _____ (hereinafter called the said Contractor/Supplier/Vendor) from the demand/payment of Security Deposit payable under the terms and conditions of the Contract/Purchase Order/Work Order No. _____, Dated _____ made between the APGENCO and (Name of the Contractor/Supplier/Vendor) for supply/commissioning/rendering services/execution of work _____ (herein after called 'the said Contract/Agreement'), on production of a Bank Guarantee for Rs. _____ (Rupees _____ only).

At the request of _____ [Tenderer/Contractor] We, _____, (hereinafter referred to as the "Bank"), having Registered/Head office at _____ and a branch at _____ being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the APGENCO without any delay or demur, merely on your first demand any sum or sums up to a maximum amount but not exceeding Rs. _____ (Rupees _____) in the event of any breach by the said Tenderer/Contractor of any of the terms and conditions contained in the said Contract/Purchase Order/Work Order No. _____, Dated _____.

We, _____ (indicate the name of the Bank), do hereby undertake to forthwith and immediately pay the amounts due and payable under this guarantee without any demur, merely on a demand from APGENCO. Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ (Rupees _____ only).

We undertake to pay unconditionally to the APGENCO any money so demanded notwithstanding any dispute(s) raised by the Contractor/Supplier/Vendor in any suit, or proceedings pending before any Court or Tribunal or Arbitration or any other Authority relating thereto our liability under this present being is absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the Arbitration proceeding or by any other Authority.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor/Supplier/Vendor shall have no claim against us for making such payment.

We, (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/Agreement and that it shall continue to be enforceable till all the dues of the APGENCO under by virtue of the said Contract/Agreement have been fully paid and its claims satisfied or discharged or till the concerned authority of APGENCO certifies that the terms and conditions of the said Contract/Agreement have been fully and properly carried out by the said Contractor/Supplier/Vendor and accordingly discharge the guarantee, subject to however that the APGENCO shall have no right under this bank guarantee after expiry of _____ (period) from the date of its execution. BG is to be valid till _____, Unless a demand or claim under this guarantee is made on us in writing on or before the _____, we (indicate the name of the Bank) shall be discharged from all the liability under this guarantee thereafter.

We, (indicate the name of the Bank) further agree with the APGENCO that the APGENCO shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract/Agreement or to extend time of BG by the said Contractor/Supplier/Vendor from time to time or to postpone for any time or from time to time.

This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor/Supplier/Vendor.

We, (indicate the name of the Bank) lastly undertakes not to revoke this guarantee during its currency except with the previous consent of the APGENCO in writing. Furthermore, we (indicate the name of the Bank) accept that

1. This Bank Guarantee is unconditional and absolute
2. Claim against this Bank Guarantee shall be honoured without any delay or demur; and
3. This Bank guarantee covers all the losses, claims, damages and costs suffered by the APGENCO against the said Contract/Agreement.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....
- b) This Guarantee shall be valid up to Dt. _____
- c) Unless the Bank is served a written claim or demand on or before Dt. _____ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ (indicate the name of the Bank), have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

In witness where of signed this Guarantee on this _____ Day ____ Year ____ for ____ Bank at _____

(Signature(s) of Authorised Personnel of the Bank with Seal)

Designation: _____

Address: _____

ANNEXURE – 4 (PBG)

(TO BE STAMPED IN ACCORDANCE WITH INDIAN STAMP ACT)

PROFORMA OF BANK GUARANTEE FOR THE PERFORMANCE (PBG)

Bank Guarantee No: _____

Date: _____

Valid Up to: _____

Claim Period up to: _____

In consideration of the Andhra Pradesh Power Generation Corporation Limited (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at VidyutSoudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 has agreed to accept upon request of (Name of the Contractor/Supplier/Vendor) having its registered office at _____ (hereinafter called the said Contractor/Supplier/Vendor) this Bank Guarantee No. _____, Dt. _____ for making payment without effecting recovery of 10% of the value of Contract/Agreement/Purchase Order/Work Order towards Performance Guarantee for the satisfactory fulfilment of the Contract/Agreement/ Purchase Order/Work Order under the terms and conditions of the Contract/Agreement/Purchase Order/Work Order No. _____, Dated _____ made between the APGENCO and (Name of the Contractor/Supplier/Vendor) for supply/commissioning/rendering services/execution of work _____ (herein after called 'the said Contract/Agreement'), on production of a Bank Guarantee for Rs. _____ (Rupees _____ only).

At the request of _____ [Tenderer/Contractor] We, _____, (hereinafter referred to as the "Bank"), having Registered/Head office at _____ and a branch at _____ being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the APGENCO without any delay or demur, merely on your first demand any sum or sums up to a maximum amount but not exceeding Rs. _____ (Rupees _____).

We, _____ (indicate the name of the Bank), do hereby undertake to forthwith and immediately pay the amounts due and payable under this guarantee without any demur, merely on a demand from APGENCO. Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ (Rupees _____ only).

We undertake to pay unconditionally to the APGENCO any money so demanded notwithstanding any dispute(s) raised by the Contractor/Supplier/Vendor in any suit, or proceedings pending before any Court or Tribunal or Arbitration or any other Authority relating thereto our liability under this present being absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the Arbitration proceeding or by any other Authority.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor/Supplier/Vendor shall have no claim against us for making such payment.

We, (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/Agreement and that it shall continue to be enforceable till all the dues of the APGENCO under by virtue of the said Contract/Agreement have been fully paid and its claims satisfied or discharged or till the concerned authority of APGENCO certifies that the terms and conditions of the said Contract/Agreement have been fully and properly carried out by the said Contractor/Supplier/Vendor and accordingly discharge the guarantee, subject to however that the APGENCO shall have no right under this bank guarantee after expiry of _____ (period) from the date of its execution. BG is to be valid till _____.

We, (indicate the name of the Bank) further agree with the APGENCO that the APGENCO shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract/Agreement or to extend time of BG by the said Contractor/Supplier/Vendor from time to time or to postpone for any time or from time to time.

This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor/Supplier/Vendor.

We, (indicate the name of the Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the APGENCO in writing. Furthermore, we (indicate the name of the Bank) accept that

1. This Bank Guarantee is unconditional and absolute
2. Claim against this Bank Guarantee shall be honoured without any delay or demur; and
3. This Bank guarantee covers all the losses, claims, damages and costs suffered by the APGENCO against the said Contract/Agreement.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....
- b) This Guarantee shall be valid up to Dt. _____
- c) Unless the Bank is served a written claim or demand on or before Dt. _____ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this

guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ (indicate the name of the Bank), have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

In witness where of signed this Guarantee on this _____ Day __ Year __ for __ Bank at

(Signature(s) of Authorised Personnel of the Bank with Seal)

Designation:

Address:

ANNEXURE-5
FORM OF INSURANCE SURETY BOND (Security deposit)

[Performance Security/Additional Performance Security/
Advance Payment Security]

Insurance Surety Bond No

Date:

To:

(Name and address)

In consideration of the **Andhra Pradesh Power Generation Corporation Limited** (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at Vidyut Soudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 has agreed to accept upon request of _____ (Name of the Contractor/ Member of JV or Consortium /Supplier/Vendor) having its registered office at _____ (hereinafter called the said Contractor/ Member of JV or Consortium / Supplier/ Vendor) this **Surety Bond** No. _____, Dt. _____ for making payment without effecting recovery of 2.5% of the value of Contract/ Agreement/Purchase Order/Work Order towards Performance Security/Additional Performance Security/Advance Payment Security for the satisfactory fulfilment of the Contract/ Agreement/ Purchase Order/Work Order under the terms and conditions of the Contract/ Agreement/Purchase Order/ Work Order No. _____, Dated _____ made between the APGENCO and _____ (Name of the Contractor/ JV or Consortium /Supplier/Vendor) for supply /commissioning/ rendering services/ execution of work _____ (name of the work) (herein after called 'the said Contract/ Agreement/Purchase Order/Work Order'), on production of a **Surety Bond** for Rs. _____ (Rupees _____ only).

AND WHEREAS we, _____ ("**Surety Insurer**") through our branch at _____ have agreed to furnish this **Surety Bond** by way of Performance Security/Additional Performance Security/Advance Payment Security.

NOW, THEREFORE, the **Surety Insurer** hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The **Surety Insurer** hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during the Contract Period/ Warranty period/Defects Liability Period under and in accordance with the Contract, and agrees and undertakes to pay immediately to the APGENCO, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the **Surety Bond** Amount as the APGENCO shall claim, without the APGENCO being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the APGENCO, officer not below the rank of Chief Engineer/APGENCO that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Contract shall be conclusive, final and binding on the **Surety Insurer**. The **Surety Insurer** further agrees that the APGENCO shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Contract and its decision that the **Contractor** is in default shall be final and binding on the **Surety Insurer**, notwithstanding any differences between the APGENCO and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
3. In order to give effect to this **Surety Bond**, the APGENCO shall be entitled to act as if the **Surety Insurer** were the Principal Debtor and any/**Change** in the constitution of the Contractor and/or the **Surety Insurer**, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the **Surety Insurer** under this **Surety Bond**.
4. It shall not be necessary, and the **Surety Insurer** hereby waives any necessity, for the APGENCO to proceed against the Contractor before **presenting** to the **Surety Insurer** its demand under this **Surety Bond**.

5. The APGENCO shall have the liberty, without affecting in any manner the liability of the **Surety Insurer** under this **Surety Bond**, to vary at any time, the terms and conditions of the Contract or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Contract or to postpone for any time, and from time to time, any of the rights and powers exercisable by the APGENCO against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Contract and/or the securities available to the APGENCO, and the **Surety Insurer** shall not be released from its liability and obligation under these presents by any exercise by the APGENCO of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the APGENCO or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the **Surety Insurer** from its liability and obligation under this **Surety Bond** and the **Surety Insurer** hereby waives all of its rights under any such law.
6. This **Surety Bond** is in addition to and not in substitution of any other **Surety Bond** or security now or which may hereafter be held by the APGENCO in respect of or relating to the Contract or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.
7. Notwithstanding anything contained herein before, the liability of the **Surety Insurer** under this **Surety Bond** is restricted to the **Surety Bond** Amount and this **Surety Bond** will remain in force for the period specified below and unless a demand or claim in writing is made by the APGENCO on the **Surety Insurer** under this **Surety Bond** all rights of the APGENCO under this **Surety Bond** shall be forfeited and the **Surety Insurer** shall be relieved from its liabilities hereunder after the date mentioned.
8. The **Surety Bond** shall cease to be in force and effect on _____. Unless a demand or claim under this **Surety Bond** is made in writing before expiry of the **Surety Bond**, the **Surety Insurer** shall be discharged from its liabilities hereunder.
9. The **Surety Insurer** undertakes not to revoke this **Surety Bond** during its currency, except with the previous express consent of the APGENCO in writing, and declares and warrants that it has the power to issue this **Surety Bond** and the undersigned has full powers to do so on behalf of the **Surety Insurer**.
10. Any notice by way of request, demand or otherwise hereunder may be sent by courier, registered post or certified e-mail addressed to the **Surety Insurer** at its above referred branch or e-mail set forth herein, which shall be deemed to have been duly **authorized** to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer & the APGENCO that the envelope was so posted shall be conclusive.
11. This **Surety Bond** shall come into force with immediate effect and shall remain in force and effect for up to the date specified above or until it is released earlier by the APGENCO pursuant to the provisions of the **Contract**.
12. The **Surety Insurer** declares that this Insurance Surety Bond is issued by the (name of Insurance Company) as **per** the applicable rules and regulations of Insurance Regulatory Development Authority of India (IRDAI).
13. This Surety Bond shall also be operatable at our _____, branch at _____, from whom, confirmation regarding the issue of this Surety Bond or extension/renewal thereof shall be made available on demand. In the **contingency** of this Surety Bond being invoked and payment hereunder claimed, the said branch shall accept such invocation letter immediately and make payment of amounts so demanded under the said invocation.
14. The Insurance Surety Bond shall be verifiable from the specific portal created for this purpose.

In witness where of Signed and sealed this Surety Bond on this ____ Day ____ (month) of 2024 at _____.

SIGNED, SEALED AND DELIVERED

For and on behalf of the Insurance company by:

(Signature of the Authorized Official)

(Name) (Designation) (Code Number)

ANNEXURE-6
FORM OF INSURANCE SURETY BOND(Performance)

[Performance Security/Additional Performance Security/
Advance Payment Security]

Insurance Surety Bond No

Date:

To:

(Name and address)

In consideration of the **Andhra Pradesh Power Generation Corporation Limited** (An enterprise of the Government of Andhra Pradesh) (hereinafter referred to as 'APGENCO' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Indian Companies Act, 1956 read with subsequent amendments and Act(s) and having its registered office at Vidyut Soudha, Gunadala, Vijayawada, Andhra Pradesh, India-520004 has agreed to accept upon request of _____ (Name of the Contractor/ Member of JV or Consortium /Supplier/Vendor) having its registered office at _____ (hereinafter called the said Contractor/ Member of JV or Consortium / Supplier/ Vendor) this **Surety Bond** No. _____, Dt. _____ for making payment without effecting recovery of 10% of the value of Contract/ Agreement/Purchase Order/Work Order towards Performance Security/Additional Performance Security/Advance Payment Security for the satisfactory fulfilment of the Contract/ Agreement/ Purchase Order/Work Order under the terms and conditions of the Contract/ Agreement/Purchase Order/ Work Order No. _____, Dated _____ made between the APGENCO and _____ (Name of the Contractor/ JV or Consortium /Supplier/Vendor) for supply /commissioning/ rendering services/ execution of work _____ (name of the work) (herein after called 'the said Contract/ Agreement/Purchase Order/Work Order'), on production of a **Surety Bond** for Rs. _____ (Rupees _____ only).

AND WHEREAS we, _____ ("**Surety Insurer**") through our branch at _____ have agreed to furnish this **Surety Bond** by way of Performance Security/Additional Performance Security/Advance Payment Security.

NOW, THEREFORE, the **Surety Insurer** hereby, unconditionally and irrevocably, guarantees and affirms as follows:

15. The **Surety Insurer** hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during the Contract Period/ Warranty period/Defects Liability Period under and in accordance with the Contract, and agrees and undertakes to pay immediately to the APGENCO, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the **Surety Bond** Amount as the APGENCO shall claim, without the APGENCO being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
16. A letter from the APGENCO, officer not below the rank of Chief Engineer/APGENCO that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Contract shall be conclusive, final and binding on the **Surety Insurer**. The **Surety Insurer** further agrees that the APGENCO shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Contract and its decision that the **Contractor** is in default shall be final and binding on the **Surety Insurer**, notwithstanding any differences between the APGENCO and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
17. In order to give effect to this **Surety Bond**, the APGENCO shall be entitled to act as if the **Surety Insurer** were the Principal Debtor and any/Change in the constitution of the Contractor and/or the **Surety Insurer**, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the **Surety Insurer** under this **Surety Bond**.
18. It shall not be necessary, and the **Surety Insurer** hereby waives any necessity, for the APGENCO to proceed against the Contractor before **presenting** to the **Surety Insurer** its demand under this **Surety Bond**.

19. The APGENCO shall have the liberty, without affecting in any manner the liability of the **Surety Insurer** under this **Surety Bond**, to vary at any time, the terms and conditions of the Contract or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Contract or to postpone for any time, and from time to time, any of the rights and powers exercisable by the APGENCO against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Contract and/or the securities available to the APGENCO, and the **Surety Insurer** shall not be released from its liability and obligation under these presents by any exercise by the APGENCO of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the APGENCO or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the **Surety Insurer** from its liability and obligation under this **Surety Bond** and the **Surety Insurer** hereby waives all of its rights under any such law.
20. This **Surety Bond** is in addition to and not in substitution of any other **Surety Bond** or security now or which may hereafter be held by the APGENCO in respect of or relating to the Contract or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.
21. Notwithstanding anything contained herein before, the liability of the **Surety Insurer** under this **Surety Bond** is restricted to the **Surety Bond** Amount and this **Surety Bond** will remain in force for the period specified below and unless a demand or claim in writing is made by the APGENCO on the **Surety Insurer** under this **Surety Bond** all rights of the APGENCO under this **Surety Bond** shall be forfeited and the **Surety Insurer** shall be relieved from its liabilities hereunder after the date mentioned.
22. The **Surety Bond** shall cease to be in force and effect on _____. Unless a demand or claim under this **Surety Bond** is made in writing before expiry of the **Surety Bond**, the **Surety Insurer** shall be discharged from its liabilities hereunder.
23. The **Surety Insurer** undertakes not to revoke this **Surety Bond** during its currency, except with the previous express consent of the APGENCO in writing, and declares and warrants that it has the power to issue this **Surety Bond** and the undersigned has full powers to do so on behalf of the **Surety Insurer**.
24. Any notice by way of request, demand or otherwise hereunder may be sent by courier, registered post or certified e-mail addressed to the **Surety Insurer** at its above referred branch or e-mail set forth herein, which shall be deemed to have been duly **authorized** to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer & the APGENCO that the envelope was so posted shall be conclusive.
25. This **Surety Bond** shall come into force with immediate effect and shall remain in force and effect for up to the date specified above or until it is released earlier by the APGENCO pursuant to the provisions of the **Contract**.
26. The **Surety Insurer** declares that this Insurance Surety Bond is issued by the (name of Insurance Company) as **per** the applicable rules and regulations of Insurance Regulatory Development Authority of India (IRDAI).
27. This Surety Bond shall also be operatable at our _____, branch at _____, from whom, confirmation regarding the issue of this Surety Bond or extension/renewal thereof shall be made available on demand. In the **contingency** of this Surety Bond being invoked and payment hereunder claimed, the said branch shall accept such invocation letter immediately and make payment of amounts so demanded under the said invocation.
28. The Insurance Surety Bond shall be verifiable from the specific portal created for this purpose.

In witness where of Signed and sealed this Surety Bond on this ____ Day ____ (month) of 2024 at _____.

SIGNED, SEALED AND DELIVERED

For and on behalf of the Insurance company by:

(Signature of the Authorized Official)

(Name) (Designation) (Code Number)

ANNEXURE-7
MANUFACTURING QUALITY PLAN

MFGR.'s LOGO		MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN				PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER:						
			ITEM : SUB-SYSTEM:	QP NO.: REV.NO.: DATE: PAGE: OF....									
S. N O	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTITY OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
					M	C / A				M	C	A	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.		11.
MANUFACTURER/ SUB-SUPPLIER		MAIN-SUPPLIER	<u>LEGEND:</u> * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER **C: MAIN SUPPLIER, A: APGENCO, P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP:APGENCO SHALL IDENTIFY 'W' IN COLUMN "A"					DOC. NO.:		REV..... CAT.....			
								FOR APGENCO USE					
SIGNATURE								REVIEWED BY	APPROVED BY		APPROVAL SEAL		

ANNEXURE-8
FIELD QUALITY PLAN

SUPPLIER'S LOGO		SUPPLIER'S NAME AND ADDRESS	FIELD QUALITY PLAN				PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER:			
			ITEM : SUB-SYSTEM:		QP NO.: REV. NO.: DATE: PAGE: OF....					
SL. NO.	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	10.
			LEGEND: A = CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY OWNER QUALITY DEPTT., 'B' SHALL BE WITNESSED BY OWNER ERECTION / CONSTRUCTION DEPTT. AND 'C' SHALL BE WITNESSED BY MAIN SUPPLIER (A & B CHECK SHALL BE OWNER CHP STAGES)					DOC. NO.:	REV.....	
MANUFACTURER/ SUB-SUPPLIER		MAIN-SUPPLIER						FOR APGEN CO USE		
SIGNATURE								REVIEWED BY	APPROVED BY	APPROVAL SEAL

