



**TAMIL NADU POWER GENERATION CORPORATION LIMITED
TUTICORIN THERMAL POWER STATION**

"DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING AND COMMISSIONING OF LATEST DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEMS (DDCMIS) FOR OPEN LOOP CONTROL SYSTEMS (OLCS), CLOSED LOOP CONTROL SYSTEMS (CLCS), FURNACE SAFEGUARD SUPERVISORY SYSTEM (FSSS), SOOT BLOWER SYSTEM, TURBINE PROTECTION SYSTEM AND POWER PLANT CONTROLS BY DISMANTLING EXISTING OUTDATED 9020 CONTROL SYSTEMS IN UNIT – III OF TTPS"

**SPECIFICATION FOR
PROCUREMENT / WORKS CONTRACT / ~~SERVICE CONTRACT~~
THROUGH E-TENDERING
(Through NIC Platform)**

**SPECIFICATION NO. CE / TTPS - 4119 -S /2025-26
OPENING DUE ON 08.04.2026.
OPEN TENDER /TWO PART SYSTEM (BLTC)**

**OFFICE OF THE CHIEF ENGINEER
TUTICORIN THERMAL POWER STATION
TUTICORIN - 628 004.
TAMIL NADU.**

**Service Provider: The Tamil Nadu Government e-Procurement System
Website for online bid submission: <https://tntenders.gov.in/nicgep/app>**

INSTRUCTION TO BIDDERS FOR SUBMISSION OF ONLINE BIDS IN E-TENDER

The bidding under this contract is electronic bid submission through website <https://tntenders.gov.in/nicgep/app> only. Detailed guidelines for viewing bids and submission of online bids are given on the website. Any citizens or prospective bidders can logon to this website and view the invitation for Bids and can view the details of works for which bids are invited.

REGISTRATION:

- 1) The prospective bidders can submit bids online, however, the bidders are required to have enrolment/registration in the website by clicking on the link "Online bidder enrolment" which is free of charge.
- 2) As part of the enrolment process, the bidders are required to choose a unique username and assign a password for their accounts.
- 3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These details would be used for any communication from the e-Portal.
- 4) Upon enrolment, the bidders are required to **register their valid Digital Signature Certificate (DSC)** (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.
- 5) Only one valid DSC should be registered +by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.
- 6) Bidder then can login to the site through the secured login by entering their user ID/ password and the password of the DSC / e-Token.

7) **Correspondence details :** For queries related to registration and online bidding (NIC):

e-mail : support.etender@nic.in
Contact No. : 044 – 24466495
24902580 Extn:332
24917850

SEARCHING FOR TENDER DOCUMENTS

- 1) There are various search options built in the Website, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc.
- 2) Once the bidders have selected the tenders they are interested in, they may download the required documents/tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the Tamil Nadu Govt. e-Procurement Portal, to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
- 3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

- 1) Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- 2) Bidders are requested to go through the NIT and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
- 3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document and generally, they can be in PDF / XLS / RAR / DWF/JPG formats. **Bid documents may be**

scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My space or "Other Important Documents" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

5) The completed bid comprising scanned copy of the proof for the payment of EMD or exemption from payment of EMD and necessary technical and commercial documents should be uploaded on the website along with signed and scanned copies of requisite certificates as are mentioned in the different sections in the tender document.

ELECTRONIC SUBMISSION OF BIDS: (OPEN TENDER – TWOPART SYSTEM)

The bidder shall submit online the requirements under qualification criteria and Technical Documents required and Price Schedule/BOQ. All the documents are required to be signed digitally by the bidder. After electronic online bid submission, the system generates a unique bid reference number which is time stamped. This shall be treated as acknowledgement of bid submission.

Procedure for submission of bids:

1) Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

3) Bidder has to select the payment option as "online" to pay the EMD amount through RTGS/NEFT or by way of account transfer as applicable and enter details of the instrument.

i. The online payment Gateway has been enabled for TNPGL in TN Tenders portal (www.tntenders.gov.in). The payment for EMD will be carried out by the Bidders only through online payment mode.

ii. The EMD amount should be the exact amount and no excess or less amount should be transferred through online payment gateway. If excess or short, the tender status will be shown as invalid.

iii. If submitting EMD as E-BG/PEMD/Udayam (SSI) (as mentioned in the specification), then select the exempted from EMD payment as "YES". Then upload the EMD exemption documents only in "pdf" files.

iv. The bidder has to submit the tender document online well in advance before the Prescribed time to avoid any delay or problem during the submission process. If there is any delay, due to other issues, bidder only is responsible.

4) The scanned copy of payment made through RTGS/NEFT or by way of account transfer towards EMD amount has to be uploaded. TNPGL shall not be responsible for any delay in uploading the proof of EMD by any mode.

5) A BOQ format for the price bid has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the BOQ format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the coloured (Unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the file name. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

6) The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

7) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid openers' public keys.

8) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

9) Upon the successful and timely submission of bids, (i.e. after clicking "Freeze Bid submission" in the portal) the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

10) Department or Service Provider is not responsible for any failure such as a bad internet connection or power failure outside of their control. The bidder is responsible to ensure they have sufficient time to submit an electronic bid prior to closing date and time including the payment of any fees including the Bid security and getting e-receipt. In case of a failure in the system within the control of the service provider that may affect a bidding process, the contracting authority on his sole discretion will postpone the closing time at least 24 hours from the time of system recovery to allow bidders sufficient time to submit their bids.

11) The TNPGL may, at its discretion, extend the deadline for the submission of bids by amending the bidding document, in which case all rights and obligations of TNPGL and bidders subject to the previous deadline shall thereafter be subject to the deadline extended.

Late Bids:

The Electronic bidding system would not allow any late submission of bids after due date and time as per server time.

Modification and withdrawal of bids:

1) Bidders may modify their bids online before the deadline for submission of bids.

2) In case a bidder intends to modify his bid online before the deadline, the bidder need not make any additional payment towards the cost of bid processing. For bid modification and consequential re-submission, the bidder is not required to withdraw his bid submitted earlier. Modification and consequential re-submission of bids is allowed any number of times. The last modified bid submitted by the bidder within the bid submission time shall be considered as the bid. For this purpose, modification/withdrawal by other means will not be accepted. The bidder may withdraw his bid by uploading his request before the deadline for submission of bids, however, if the bid is withdrawn, the re-submission of the bid is not allowed.

3) No bid may be modified after the deadline for submission of Bids.

ASSISTANCE TO BIDDERS:

Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

- 1) Any queries relating to the process of online bid submission or queries in general may be directed to the 24x7 Central Public Procurement Portal Helpdesk.

It may be noted by the bidders that NIC is only service provider for conducting the online bidding process against this tender and shall not be a party to any contract between TNPGL and the successful bidder(s) subsequent to the bidding process.

TAMIL NADU POWER GENERATION CORPORATION LIMITED
SPECIFICATION NO. CE / TTPS - 4119 -S /2025-26

1	Tender Specification No.	CE / TTPS - 4119 - S
2	Name of Work	Design, Engineering, Supply, Erection, Testing and Commissioning of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls by dismantling existing outdated 9020 control systems in Unit – III of TTPS
3	Quantity	1 set
4	Method of Tender	Open E-Tender System /Two Part System (Online Part-I – Techno Commercial Bid and Part-II – Price Bid, through Website: https://www.tntenders.gov.in/nicgep/app of NIC.
5	Earnest Money Deposit (EMD)	Rs.23,60,000/-(Rupees Twenty Three Lakhs and Sixty Thousand only) to be paid through online payment gateway. The online payment Gateway has been enabled for TNPGL in TN Tenders portal (www.tntenders.gov.in). The payment for EMD will be carried out by the Bidders only through online payment mode. (or) II) In the form of e-Bank Guarantee with one year validity.
	b. Permanent EMD	Rs.40 Lakhs or above with TNPGL Head quarters or TTPS
	c. EMD Exemption categories	The exempted categories of tenderers as given in Section-I Micro and Small enterprises registered in UDAYAM portal for tendered item located within Tamil Nadu are eligible for EMD exemption against SSI status upon uploading of documentary evidences.
6	Pre Bid Meeting	18.03.2026@ 11.00 Hrs.
7	URL for online bid submission for e-tender	07.03.2026 https://tntenders.gov.in/nicgep/app
8	Last date for submission of EMD	07.04.2026@ 12.00 Hr. (The EMD amount has to be received before closing time of tender)
9	Date of closing of online e-tender for submission of Techno Commercial Bid & Price Bid.	07.04.2026 upto 14.00 Hrs.
10	Date & time of opening of tender electronically	08.04.2026@ 14:30 Hrs.
11	Specification at website	The tender specification will be placed at the following web sites. The prospective bidders may download the same.
		TNPGL www.Tnpgcl.gov.in
		NIC https://tntenders.gov.in/nicgep/app
12	Documents to be uploaded by the Tenderers during e-submission	Schedules "B" to "I" and other documents whichever is applicable.
13	Tenders during e-submission	The Superintending Engineer, Purchase & Administration, SPARES Division , Tuticorin Thermal Power Station, Tuticorin – 628 004.
14	Place at which tenders will be opened	Office of the Superintending Engineer, Purchase & Administration, SPARES Division , Tuticorin Thermal Power Station, Tuticorin – 628 004.

Remarks:

1. If the date of pre bid meeting happens to be declared holiday, then the pre bid meeting will be conducted on the next working day, for which no prior intimation will be given.
2. If the due date for opening the tenders happens to be declared holiday, then the tender will be opened on the next working day, for which no prior intimation will be given.

TENDER SPECIFICATION No. CE/TTPS -4119 -S

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SECTION-I
EARNEST MONEY DEPOSIT

- 1.1 1.Tenderer should pay the specified amount towards Earnest Money Deposit as follows:-

EMD: **Rs.23,60,000/- (Rupees Twenty Three Lakhs and Sixty Thousand Only)**

The Earnest Money Deposit specified above **to be paid through online payment Gateway mode.**

Scanned copy of the E-receipt duly reflecting the EMD Transaction shall be uploaded.

- 1.2 If submitting Earnest Money Deposit as BG/PEMD/Udyam(SSSI) (as mentioned in the specification), then select the exempted from EMD payment as "YES". Then upload the EMD exemption documents only in "pdf" files.

- 1.3 After confirming the EMD paid amount / Exemption uploaded, then only the system /tender portal will allow to submit the technical and financial bids.

- 1.4. **Mode of Payment:**

a) The online payment Gateway has been enabled for TNPGL in TN Tenders portal (www.tntenders.gov.in). All the payments for the tenders like Earnest Money Deposit will be carried out by the Tenderer only through online payment mode. The Earnest Money Deposit amount should be the exact amount and no excess or less amount should be transferred through online payment gateway services of State Bank of India (SBI). If excess or short, the tender status will be shown as invalid. The Earnest Money Deposit payment to be made only single payment.

- 2 The Tenderers who are having valid Permanent EMD with TANGEDCO/TNPGL for an amount as mentioned below are exempted from payment of Earnest Money Deposit and are eligible to participate in the tender.

The PEMD of Rs.40 Lakhs or above deposited on or after **11.11.2021** alone is eligible for EMD exemption in this tender.

If the Tenderer desires to become a Permanent E.M.D. holder, he is advised to deposit the required amount with the TNPGL as Permanent E.M.D. well in advance, obtain a certificate from the Financial Controller/Purchase and upload copy of the same along with the tender.

- 3 **Electronic Bank Guarantee (e-BG):**

a) The EMD in the form of Electronic Bank Guarantee (e-BG) with one year validity (from the date of tender opening) is only acceptable.

b) EMD in the form of Physical Bank Guarantee is NOT acceptable. The Earnest Money Deposit specified above should be paid from Nationalised bank.

Account No. : 0911201022266

Name of the Bank: Canara Bank

IFSC Code : CNRB0000911

The Bank Guarantee (**e-BG**) format shall be as per Schedule - K.

c) EMD in the form of electronic Bank Guarantee (e-BG) submitted in the State e-procurement portal i.e., <https://tntenders.gov.in> through National e-Governance services Limited (NeSL) platform is acceptable. The e-Bank Guarantee should be valid for a period of one year.

Any other mode of payment of EMD other than online/PEMD/e-BG from a nationalized bank shall not be accepted towards EMD and the tenders shall be rejected if EMD is not paid in the prescribed manner.

d) The scanned copy of the e-B.G shall be uploaded with the Bid.

- e) The e - Bank Guarantee shall be valid for one year.
 - f) The Scanned copy of the E-receipt duly reflecting the EMD Transaction shall be uploaded. or the scanned copy of the Bank Guarantee should be uploaded by the bidder during submission of Techno-commercial bid failing which the offer will be summarily rejected.
4. The EMD will not carry any interest.
5. The Earnest Money Deposit will be auto refunded to the unsuccessful tenderers after intimation of the rejection/non-acceptance of their tender.
- 6.0 In respect of the successful tenderer, the EMD remitted by the firm will be carried over as part of the Security Deposit payable by the tenderer.
- 6.1 Any other mode of payment of EMD shall not be accepted towards EMD and the tenders shall be rejected if EMD is not paid in the Government portal.
- 6.2 If the offer is found to be bogus or false during evaluation, TNPGL could invoke the Bank Guarantee to recover the EMD on forfeiture.

Any other mode of payment of EMD other than on line payment/E-BG/PEMD shall not be accepted and the tenders shall be rejected if EMD is not paid in the prescribed manner.

7. Exemption for payment of Earnest Money Deposit.

The following categories of Industries are exempted from payment of EMD subject to ensuring that the tendered item should be covered in their registration certificate showing the materials permitted to manufacture.

- i) **“Micro and Small Enterprises located within the state of Tamil Nadu are exempted from payment of Earnest Money Deposit against the production of a Copy of Udyam Registration certificate or any other valid registration certificate / proof as notified by the Government of India in respect of the items manufactured by them for participation in this tender and whenever it is deemed necessary, the TNPGL may inspect the unit and satisfy themselves with regard to verifying the credentials of the applicants on the line of activity pursued by such manufacturers, quality and production capacity and other relevant factors”.**
- ii. Departments of the Government of Tamil Nadu.
- iii. Undertakings and Corporations owned by the Government of Tamil Nadu.
- iv. Labour Contract Co-operative Societies registered within Tamil Nadu.
- v) **The Micro & Small Enterprises having provisional registration certificate are not eligible for exemption.**
- vi) **Bidders shall submit an undertaking in the form as per Schedule-K that they would pay penalty an amount equivalent to Earnest Money Deposit in the event of non – fulfillment or non – observance of any of the conditions stipulated.**

Note:

- 1. **Central and other State Government Departments/ Undertakings and Corporations other than those in Tamil Nadu shall have to pay Earnest Money Deposit.**
- 2. The industries who are exempted from payment of EMD, subject to the enterprise registered under the ministry of MSME shall register itself under Udyam Registration.
- 3. **Only enterprises which comes under MICRO and SMALL categories are eligible for EMD exemption.**

4. **The MSME Units located outside the State of Tamil nadu are not eligible for exemption from payment of EMD in TNPGL tenders against Udyam Registration Certificate even though registered in Udyam portal for tendered items.**

REGISTRATION OF MICRO, SMALL & MEDIUM ENTERPRISES BY COMPOSITE CRITERIA IN UDYAM REGISTRATION & GUIDELINES:

7.1 Classification of Enterprises:

As per the Ministry of Micro, Small and Medium Enterprises, GOI Notification No S.O 2119 (E) dt.26.06.2020 the enterprises are classified as:

- i) **A Micro Enterprise**, where the investment in Plant and Machinery or Equipment does not exceed Rs. 1 Crore (one crore Rupees) and turnover does not exceed Rs. 5 Cr. (Rupees five Crore);
- ii) **A Small Enterprise**, where the investment in plant and machinery or equipment does not exceed Rs. 10 Cr. (Ten crore Rupees) and turnover does not exceed Rs. 50 Cr. (Rupees fifty Crore);
and
- iii) **A Medium Enterprise**, where the investment in plant and machinery or equipment does not exceed Rs. 50 Cr. (Fifty crore Rupees) and turnover does not exceed Rs.250 Cr. (Rupees Two Hundred and Fifty crore).

7.2 Calculation of Turnover:

In calculation of turnover of an enterprises, Exports of goods or services or both, shall be excluded while calculating the turnover of any enterprise whether micro, small or medium, for the purpose of classification.

The turn over details certified by Chartered Accountant, along with the bid from the bidders whose turnover includes export proceeds, for ascertaining the turnover achieved on export of goods or services or both and included in the total turnover to be uploaded.

7.3 Calculation of Investment:

The Plant and machinery as assigned to the plant machinery in the Income Tax Rules, 1962 framed under the Income Tax Act, 1961 and shall include all tangible assets (other than land and building, furniture and fittings). The cost of certain items specified in the Explanation I to sub section (1) of section 7 of the Act shall be excluded from the calculation of the amount of Investment in Plant and Machinery.

The investment value in Plant and Machinery for the purpose has to be certified by a Chartered Accountant and the same is to be uploaded along with the bid in case the bidder claims EMD exemption.

- a) Central and the State Government Departments/ Undertakings and Corporations other than those in Tamil Nadu shall have to pay Earnest Money Deposit.

The Micro and Small Enterprises satisfying the composite criteria under reclassification notified by MSME with Udyam Registration Certificate for tendered item are only exempted from EMD payment.

Micro and Small Enterprises located outside Tamil Nadu are not eligible for exemption from payment of EMD in this tender against Udyam Registration certificate even though registered in Udyam portal for the tendered item.

8) DOCUMENTS TO BE UPLOADED AS A PROOF OF ELIGIBILITY FOR EXEMPTION FROM PAYMENT OF EARNEST MONEY DEPOSIT:

I. **Copy of Udyam Registration Certificate**

II. **(a) Copy of turnover details certified by Chartered Accountant.**

and

(b) Copy of Investment held in Plant & Machinery certified by Chartered accountant should be furnished for availing payment of EMD exemption.

III. Those tenderers under exempted category from payment of EMD shall upload the Undertaking in lieu of EMD in the tender portal through authorised DSC in the form as per Schedule-K duly filled up and signed in Rs.500/- Non Judicial Stamp Paper by the bidders as acceptance to pay as penalty an amount equivalent to EMD, together with cost if any, in the event of non-fulfillment or non-observance of any of the conditions stipulated in the contract consequent to such breach of contract.

The undertaking in lieu of EMD duly signed by the bidders uploaded in the tender portal through authorized DSC shall be considered as valid.

The State Government, Public Sector Undertakings who are exempted from payment of EMD should also pay as penalty an amount equivalent to the amount fixed as Security Deposit in the event of non-fulfilment or non-observance of any of the conditions stipulated in the contract.

9) CONDITIONS FOR REJECTION OF BIDS OF EXEMPTION CATEGORIES:-

- i) If the documentary evidences towards Exemption from payment of EMD are not uploaded
- ii) Exempted Tenderers are to produce copy of their Registration Certificate showing the materials which they are permitted to MANUFACTURE and the PERIOD OF VALIDITY OF CERTIFICATE.
- iii) Exemption of EMD is allowed to the units for those materials manufactured in their Units. If the tendered items are not on their manufacturing range, the tenderer cannot claim exemption from payment of EMD and such tenders will be rejected straight away.
- iv) If not furnished the details for Investment held in Plant and Machinery certified by Chartered Accountant and another certificate for Annual turnover value certified by Chartered Accountant.
- v) If not furnished the Undertaking in lieu of EMD specified under Sl.No.8 (III).

10) The following should be uploaded by the Vendor during submission of Techno commercial bid for payment of EMD failing which the offer will be SUMMARILY REJECTED.

The proof of Permanent EMD certificate

(OR)

The proof for exemption of EMD and certificate towards Investment held in plant & machinery and certificate for Annual turnover certified by Chartered Accountant and undertaking in lieu of EMD in the format as per schedule - K.

11) REFUND OF EMD:

- (i) The Earnest Money Deposit will be refunded automatically to the unsuccessful tenderers after intimation of the rejection / non-acceptance of their tender. i.e. after technical evaluation
- (ii) The Earnest Money Deposit will be refunded automatically to the eligible tenderer who have not received the detailed Purchase order. i.e. after issue of Award Of Contract.
- (iii) The Earnest Money Deposit will be transferred to TNPGL account in the case of successful tenderer on receipt of detailed Purchase Order and will not carry any interest. The Earnest Money Deposit will be adjusted in the Security cum Performance Guarantee.
- (iv) The refund of EMD will be made to the bank account from which EMD is paid by the bidder through portal.

12) The Earnest Money Deposit / Permanent EMD made by Tenderer will be forfeited on the following conditions :

- i) If he withdraws his tender or backs out after acceptance of the tender or fails to remit the Security deposit.
- ii) If he revises any of the terms quoted during the validity period.

- iii) If he violates any of the conditions of the Tender specification.
- iv) If, the documents furnished with the offer being found to be bogus or the documents contain false particulars.
- v) If, the successful tenderer failing to execute the order placed on them to the satisfaction of the TNPGL Limited.
- vi) In case of tenderers participating on the strength of Exception Categories, an amount equivalent to the EMD for this specification will stand forfeited in the event of such tenderer committing any one of the acts listed above.
- vii) If the Bid Qualification Requirements are found to be fraudulent/ non-genuine, the EMD paid will be forfeited in addition to black listing in future contracts with TNPGL.

13) In respect of the successful tenderer, the EMD remitted by the bidder will be carried over as part of the security deposit payable by the tender. Successful tenderer who had participated in the tenders upon PEMD will have to remit the full amount of security Deposit required for individual contracts.

SECTION-II

The Bidders shall become eligible to bid on satisfying the following Bid Qualification Requirements and uploading of the required documentary evidences.

Required evidence for the following BQR conditions should be furnished along with the tender. Otherwise the offer will be summarily rejected.

1. The bidder should be a manufacturer of Distributed Control System (DCS)/DDCMIS or their authorized dealer.

In case of Manufacturer, valid Evidence such as Copy of license to manufacture/ISO certification or any valid evidences for manufacturing the above should be scanned and uploaded. Memorandum and Articles of Association/Certificate of incorporation shall not be considered towards proof of manufacture. The Manufacturer should have support facility in India and details for the support should be uploaded.

In case of Dealer, in addition to the above manufacturer's certificate, proof for valid Dealership certificate should be scanned and uploaded. **Also an affidavit as per Schedule N shall be obtained from their principal supplier** for their full responsibility for supply and for successful completion of the DCS/DDCMIS works including Guarantee, in all respect as per Tender Specification, and also for spares support for 10 years from the date of commissioning should be enclosed with the offer.

2. **The bidder should have supplied, erected and commissioned at least one complete set of DCS/DDCMIS based Control & Instrumentation package for any infrastructure industry within a period of past 10 years.**

Documentary evidence such as copy of the purchase order/work order in complete shape should be uploaded. The date of purchase order/work order will be reckoned for ascertaining the eligibility of the tender.

3. The Annual Turn Over of the Tenderer should be more than Rs.**7.37** Crores in any one of the preceding three financial years (i.e. 2022-23, 2023-2024 & 2024-25). The bidders should upload the following evidences for annual turnover for all the three said financial years.

In case of companies registered under Companies Act, the copy of the Audited Financial Statements like, P & L Account and Balance Sheet for all the above 3 years may be scanned and uploaded and in case of others, the copy of Annual Turn Over certified by practicing Chartered Accountant for all the above 3 years may be scanned and uploaded as documentary proof to ensure the turnover criteria. The Audited annual Accounts, Annual Turnover Certificate issued by Chartered Accountant should necessarily contain UDIN of the document.

NOTE TO BQR:

- (i) The required BQR evidences shall be scanned and uploaded along with the tender, otherwise the offers will be summarily rejected.
- (ii) In the event of documents uploaded against the above tender being found to be bogus or the documents contain false particulars the EMD paid by the Bidder will be forfeited in addition to blacklisting them for future tenders/contracts in TNPGL, TNPDL & TNEB LIMITED.
- (iii) The offer of the bidders who have furnished details of previous similar order in TNPGL/ TNPDL /TNEB will be considered for further evaluation, even though they have not uploaded copies of Purchase Orders etc., after ensuring with concerned Purchase Order placing authorities.
- (iv) **Joint Ventures /Consortium /Associate /Collaborator are permitted.**

SECTION-III

REJECTION OF TENDERS

- I. Tenders will be SUMMARILY rejected if:
- a). The EMD requirements are not complied with.
 - b). The Bid Qualification Requirements as per Section-II of this Specification are not satisfied.
- II. Tender is LIABLE to be rejected, if it is:
- a) Not covering the entire scope of supply of materials.
 - b) If the declaration as specified in Schedule E (Declaration Form) & I (Tender Acceptance Letter (e-Tender)) is not signed and enclosed.
 - c) With validity period less than that stipulated in this specification.
 - d) Not in conformity with TNPGL's Commercial terms and Technical Specifications (Section V and VII)
 - e) Received from a tenderer who is directly or indirectly connected with Government service or Board Service or services of local authority.
 - f) From any blacklisted Firm or Contractor.
 - g) Received by Telex/Telegram/E-Mail/Fax/ Post.
 - h) From a tenderer whose past performance/Vendor rating is not satisfactory
 - i) Not containing all required particulars as per Schedule A to N.
 - j) Documents furnished by the Tenderers along with their offer being found to be bogus or contain false particulars.
 - k) The offer of bidders who have not furnished the GSTIN Number in the offers.
 - l) Received after tender opening
 - m) Offers giving lump sum price, without giving their breakup as per details required in the Schedule-A **PRICE BID**
 - n) Tender, which is incomplete, obscure or irregular
 - o) Bidder should produce EPF & ESI code number for having registered in the respective statutory bodies and the evidence for the same should be uploaded or otherwise their tender will be liable for rejection. (Implementation of EPF & Misc. Prov. Act 1952).

SECTION-IV

SPECIFICATION NO. CE/TTPS - 4119-S /2025-26

INSTRUCTION TO TENDERERS

1.0. THE TAMILNADU TRANSPARENCY IN TENDERS ACT 1998:

- 1.1 The TamilNadu Transparency in Tenders Act 1998 and the Tamil Nadu Transparency in Tender Rules 2000 and subsequent amendments thereof are applicable to this tender.
- 1.2 THE TENDERERS WHO DO NOT FULLFILL THE "BID QUALIFICATION REQUIREMENT" AS PER SECTION-II NEED NOT PARTICIPATE IN THE TENDER. OFFERS NOT SATISFYING THIS "BID QUALIFICATION REQUIREMENTS" WILL NOT BE CONSIDERED AND WILL BE SUMMARILY REJECTED.
- 1.3 The terms 'tenderer', 'supplier', 'contractor' refer to Bidder. The terms 'Purchaser', 'Board' 'TNEB' refer to TNPGL.

2.0 SCOPE OF SUPPLY:

- 2.1 The Scope of supply(described in Schedule-A)includes Design, Engineering, Supply, Erection, Testing and Commissioning of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls by dismantling existing outdated 9020 control systems in Unit – III of TTPS, and delivery of the materials detailed herein, at TNPGL stores/TTPS/TUTICORIN/Tamil Nadu and erection, testing, commissioning works.

Tamil Nadu Transparency in Tenders Act 1998 and the Tamil Nadu Transparency in Tender Rules 2000 and subsequent amendments there of are applicable to this Tender.

3.0 SUBMISSION OF TENDER OFFER:

- 3.1 The tenderer is expected to examine all instructions, Schedules and Annexure detailed in the Specification and submit the Schedule of Prices and other required particulars in the Schedules and Annexures called for in this Specification, only as per the formats prescribed herein.

4.1 SUBMISSION OF TENDERS:

- 4.1.1. The Tender Offer consisting of Schedules-B to N should be filled up and signed by the Tenderer or any person holding Power of Attorney authorizing him/ her to sign on behalf of the Tenderer before submission of the Tender. The date of signature should invariably be indicated.
- 4.1.2. In the event of tender being submitted by other than a firm, it must be signed by a partner (copy of partnership deed should be closed) and in the event of the absence of any Partner, it shall be signed on his behalf by a person holding a Power of Attorney authorising him/ her to do so, Certified copies of which shall be closed.
- 4.1.3. Tender submitted on behalf of companies registered under the Indian Companies Act, shall be signed by person duly authorised to submit the tender on behalf of the company and shall be accompanied by certified true copies of the resolutions, extracts of the Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the tender on behalf of the company.
- 4.1.4. The tenderer should furnish the GSTIN numbers in the offer.
- 4.1.5 **VENDOR REGISTRATION:** In TNPGL /TANTRANSCO vendor registration has come into effect from 01.02.2021 as per TANGEDCO Proceedings No. 311, Dt. 29.12.2021. The firms must register in the website <http://exam.tnebnet.org/tnebvendore> for vendor registration.

4.2. **Modifications/Clarifications to Tender Documents:**

- 4.2.1. At any time after the commencement of e-Tender and before the closing of the event, TNPGL may make any changes, modifications or amendments to the tender documents and same will be intimated to the concerned Vendors through corrigendum which can be downloaded from the Vendor login .
- 4.2.2. In case any tenderer asks for a clarification to the tender documents before 48 hours of opening of tenders, the Chief Engineer/TTPS/Tuticorin will clarify the same.
- 4.2.3. If any tenderer raises clarifications after the opening of the tender, the clarified reply issued by the Chief Engineer/TTPS/Tuticorin on the clarifications will be final and binding on the Tender.
- 4.2.4. All tender offers shall be prepared by typing or printing in the formats enclosed with this specification.
- 4.2.5. All information in the tender offer shall be in ENGLISH only. It shall not contain interlineations, erasures or overwriting except as necessary to correct errors made by the tenderer. Such erasures or other changes in the tender documents shall be attested by the persons signing the tender offer.

4.5. **QUOTATION OF RATES:**

- 4.5.1. Rates should be quoted in integers.
- 4.5.2. Offers giving lump sum price, without giving their breakup as per details required in the Price Schedule-A shall be liable for rejection.

4.6. **PRINTED TERMS AND CONDITIONS IN TENDERS:**

Supplier's printed terms and conditions will not be considered as forming part of the tender under any circumstances.

4.7. **INCOMPLETE TENDERS:**

Tender, which is incomplete, obscure or irregular is liable for rejection.

4.8. **AMBIGUITIES IN CONDITIONS OF TENDERS:**

In the case of ambiguous or contradictory terms / conditions mentioned in the bid, interpretation as may be advantageous to the purchaser may be taken without any reference to the Tenderer.

- 4.9. The tender offer shall contain full information asked for in the accompanying schedules and elsewhere in the specification.
- 4.10. Tenderers shall bear all costs associated with the participation in the e- Tender and the purchaser will in no case be responsible or liable for these costs.
- 4.11. No offer shall be withdrawn by the Tenderer in the interval between the deadline for submission and the expiry of the period of validity specified / extended validity of the tender offer.
- 4.12. The Tenderers are requested to furnish the exact location of their factories with detailed postal address and pin code, telephone and Fax Nos. etc. in their tenders so as to arrange inspection by the TNPGL, if considered necessary.

4.13. **DESTINATIONS-WHERE MATERIALS ARE REQUIRED:**

The prices quoted should be on FOR Destination basis for delivery at Central Stores/Tuticorin Thermal Power Station/Tuticorin-628004.

5.0. **TENDEROPENING (under Two part system):**

1. a. OPENING OF TENDER - COMMERCIAL & TECHNICAL BIDS without PRICE BIDS (PART-I):

The Tender offers will be opened electronically at 14.30Hrs. on the date notified at the Office of the Superintending Engineer, Purchase & Administration / (Executive Engineer / SPARES) Tuticorin Thermal Power Station, Tuticorin-628004, through <https://tntenders.gov.in/nicgep/app> Tenderers need not to visit TTPS office during tender opening, whereas tenderers can witness the tender opening event through their login.

b. OPENING OF THE PRICE BIDS: (PART - II)

The date and time of opening of Price Bids shall be later notified through registered e-mail to the Bidders who fulfill the BQR criteria and whose bids are found to be commercially and technically acceptable.

5.2. If the last date set for submission of e-tender offers and opening date happens to be a holiday, the tenders will be received and opened on the succeeding working day without any changes in the timings indicated.

6.0. **INFORMATION REQUIRED AND CLARIFICATIONS:**

6.1. In the process of examination, evaluation and comparison of tender offers, the TNPGL may at its discretion, ask the Tenderer for a clarification of their offers. All responses to requests for clarifications shall be in writing to the point only. No change in the price or substance of the offer shall be permitted.

6.2. The TNPGL will examine the tender offers to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed and whether the offers are generally in order.

6.3. The Tender offers shall be deemed to be under consideration immediately after they are opened and until such time official intimation of award / rejection is made by the Tender Accepting Authority to the tenderers.

6.4. The Tenderers shall not make attempts to establish unsolicited and unauthorized contact with the Tender Inviting Authority, Tender Accepting Authority or Tender Scrutiny Committee after the opening of the tender and prior to the notification of the award and any attempt by any tenderers to bring to bear extraneous pressures on the Tender Accepting Authority shall be sufficient reason to disqualify the tenderer.

6.5. Mere submission of any Tender offer connected with these documents and Specification shall not constitute any agreement. The tenderer shall have no cause of action or claim, against the TNPGL for rejection of their offer. The TNPGL shall always be at liberty to reject or accept any offer or offers at its sole discretion and any such action will not be called into question and the Tenderer shall have no claim in that regard against the TNPGL.

7.0. **EVALUATION AND COMPARISON OF THE TENDER OFFERS:**

7.1. The tenders will be evaluated strictly as per the Tamil Nadu Transparency in Tenders Act, 1998 and the Tamil Nadu Transparency in Tender Rules, 2000 and its subsequent amendments till date.

7.2. The tender offers received will be examined to determine whether they are in complete shape, all required Data have been furnished, properly signed and generally in order and conforms to all the terms and conditions of the Specification without any deviation.

7.3. For the purpose of evaluation of tender offers, the following factors will be taken into account for arriving the evaluated price:

**** The rate of CGST, SGST, and IGST as applicable shall be indicated in the***

offer along with HSN code.

- * *The evaluated price shall be arrived in compliance with the provisions of GST on the Transaction value i.e. (Ex works price + P&F+ Freight and Insurance) + GST. In case of import of goods would be treated as inter state supplies and would be subject to IGST in addition to applicable customs duty.*
- * *Since GST is enacted wherein all taxes & duties are subsumed, price evaluation shall be inclusive of applicable GST in all cases, i.e. even if the bidders are only within the State or bidders are within the State and outside TN.*

Note:The lowest tenderer will be arrived based on the total evaluated rate for both Supply and Erection charges.

NEGOTIATION:

Negotiation will be carried out with the L1 tenderer after opening of tenders **through online only**. The L1 bidder has been given time slot for resubmission of Financial Bid (Negotiation) through Online within the due date and time provided.

Tie Breaker:

When more than one bidder have quoted same value during bid submission and accepted in financial evaluation, Evaluator is allowed to select any one combination of bidder value (ie) the L1 bidder) to intimate for finance bid resubmission for Tie break.

8.0. VALIDITY:

- 8.1. The tender offer shall be kept valid for acceptance for a period of **180 days** from the date of opening of offers. The offers with lower validity period are liable for rejection.
- 8.2. Further, the tenderer shall agree to extend the validity of the Bids without altering the substance and prices of their Bid for further periods, if any, required by the TNPGL.

9.0 RIGHTS OF THE BOARD:

9.1 Rights to reject the tenders:

- 9.1.1. After negotiation with the Tenderer and before passing the order accepting a tender, if the Tender Accepting Authority decides that the price quoted by such tenderer is higher by the percentage as may be prescribed over the schedule of rates or prevailing market rates, the tender shall be rejected.
- 9.1.2. The Tender Accepting Authority before passing the order accepting a tender, may also reject all the tenders for the reasons such as changes in the scope of procurement, lack of anticipated financial resources, court orders, accidents or calamities and other unforeseen circumstances.
Notwithstanding anything contained in this Specification, the TNPGL reserves the rights:
 - a). To recover losses, if any, sustained by TNPGL, from the supplier who pleads his inability to supply and backs out of his obligation after award of contract. The security deposit paid shall, be forfeited.
 - b). To cancel the orders for not keeping up the delivery schedule.
 - c). To vary the delivery period based on the requirement and contingencies at the time of placing the order.

- d). To accept the lowest eligible tender.
 - e). To reject any or all the tenders or cancel without assigning any reasons thereof.
 - f). To relax or waive or amend any of the conditions stipulated in the tender Specification wherever deemed necessary in the best interest of the TNPGL.
- 9.2. The purchaser reserves the right to request for any additional information and also reserves the right to reject or accept the proposal of any tenderer, if in the opinion of the purchaser, the qualification data is incomplete or in the opinion of the TNPGL the bidder is found not qualified to satisfactorily perform the contract.

10.0. **DEVIATIONS:**

- 10.1. The offers of the Tenderers with Deviations in Commercial terms and Technical Terms of the Tender Document are liable for rejection.

11.0. **BAR OF JURISDICTION:**

Save as otherwise provided in the Tamil Nadu Transparency in Tenders Act 1998, no action taken by any officer or authority under this Act shall be called in question in any court, and no injunction shall be granted by any court in respect of any action taken or to be taken by such officer or authority in pursuance of any power conferred by or under this Act.

12.0. **APPEAL:**

Any Tenderer aggrieved by the order passed by the Tender Accepting Authority under Section-10 of the Tamil Nadu Transparency in Tenders Act 1998 may appeal to the Government within 10 (Ten) days from the date of receipt of order.

13.0. **TENDER DOCUMENT:**

- 13.1. "All the intending e-tenderers are informed that in the event of the documents furnished with the offer being found to be bogus or the documents contain false particulars, the EMD paid by such tenderers will be forfeited in addition to blacklisting them for future tenders/ contracts in TNPGL" and also cancelling the award of contract issued to them."

14.0. **PRE BID MEETING :**

Pre bid Meeting will be held **on 18.03.2026/11.00 Hrs.** at the office of Superintending Engineer/Purchase and Administration/Tuticorin Thermal Power Station/Tuticorin – 4.

If the date of pre bid meeting happens to be declared holiday, then the pre bid meeting will be conducted on the next working day, for which no prior intimation will be given.

15.0 Registration of Vendors in the IMS online portal:

The vendors shall register in the IMS online portal for online Bill processing system.

The Digital based Statutory Compliance Service Audit will be integrated with the online Bill processing system. All the contract bills which consist of the work portion will be processed only after the Statutory Compliance Clearance Certificate of the Online Compliance Service Providers.

The bidder should obtain the labour license so as to comply with the Contract Labour (Regulation & Abolition) Act 1970 and Rules 1975 and Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 & Rules 1983 for registration of vendors in the IMS online portal.

SECTION - V
SPECIFICATION
COMMERCIAL

1.0. **SCOPE:**

- 1.1. The scope of present work involves Design, Engineering, Supply of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls , packing, forwarding, insuring and delivery of the materials detailed herein, at Tuticorin TPS Stores/Tuticorin/Tamil Nadu and erection, testing, commissioning works including dismantling existing outdated 9020 control systems in Unit – III of TTPS.
- 1.2 The scope of the contract shall be as detailed in SECTION -VI of this Specification.
- 1.3 While claiming of each payment declaration towards remittance of ESI & EPF as per vide Circular memo No 146/CFC/GI/FC/P/DFC/W/AO/W/D.27/2023 dated 14.08.2023 shall be submitted

2.0. **DETAILS OF PURCHASE ORDERS ALREADY EXECUTED:**

- 2.1. The tenderers shall furnish documentary evidence as stipulated in BQR vide Sec. II (BQR Conditions).

3.0. **PRICE:**

- 3.1. The Tenderer's are requested to quote FIRM price in Indian Rupees only.
- 3.2. The Tenderer's shall quote the Ex-works price for supply and price for Erection works, Packing & Forwarding charges and Freight & Insurance charges with applicable rate of GST separately for Delivery to Tuticorin TPS Stores, Tuticorin, Tamil Nadu. A format for price schedule is given in Schedule 'A'.
- 3.3.1. The Freight and Insurance charges shall be applicable for delivery to Tuticorin TPS Stores, Tuticorin, Tamil Nadu.
- 3.3.2. The above breakup details should be clearly indicated in the Schedule-A and in the absence of which the offer shall be liable for rejection.

3.4. **PERMANENT ACCOUNT NUMBER AND GSTIN NUMBER:**

The Tenderer shall indicate the Permanent Account No. issued by the Government of India, Income Tax Department and GSTIN number of the firm and should enclose the same with the Tender.

The L1 bidder shall furnish the declaration in respect of passing of ITC benefit as per sec 171 of CGST Act as rebate in the price offered. In the event of L1 bidder, specifying the ITC benefit as Nil, the same shall be supported with certificate from chartered accountant. A format of declaration will be as stipulated by TNPGL.

4. **RATES ARE INCLUSIVE OF INCIDENTAL ITEMS:**

It will be deemed that the rates quoted by the tenderer are inclusive of all incidental items of work not necessarily mentioned in the schedule but nevertheless essential for the correct and complete execution of the work. The prices should be in Indian Currency.

No variation in price will be accepted and price quoted should be firm till the acceptance of the proposal furnished by the tenderer

The rates quoted for individual items shall be firm and exclusive of GST. The applicability of GST shall be enumerated separately.

5.10 Goods and Services Tax: (GST)

The GST Details in respect of TTPS / TNPGL are as under:

<i>Billing Address</i>	The Superintending Engineer / Purchase and Administration TTPS / Tuticorin
<i>Provisional GSTIN Registration No.</i>	33AAKCT7598K1ZI
<i>PAN</i>	AAKCT7598K
<i>Type of Customer</i>	Company
<i>Name & Address as Registered in GSTIN –Place of Business</i>	Tamil Nadu Generation and Distribution Corporation Ltd, 144 Anna Salai, NPKRR Maaligai, Chennai-600002
<i>State of Registration of GSTIN</i>	Tamil Nadu

The TDS under GST will be recovered at applicable rate on each and every invoice of contract as per GST Act.

The appropriate rate of GST as per GST Act will be levied on Liquidated Damages and EMD, Security Deposit Forfeiture if any and amount will be recovered from the bills.

GST Details:

- a) The latest GST registration details, applicable **GST with input tax credit**, with HSN code No etc., attested by a Gazetted Officer/ Chartered Accountant/ Notary Public valid for the current year shall be enclosed along with the quotation.
- b) Appropriate rate of GST shall be admitted in lieu of (all taxes and levies replaced by GST) Excise Duty, CST and TNVAT Service Tax etc as per provisions of the rules.
- c) Any increase due to statutory variation will be admitted only when the supplies are made within the delivery schedule.
- d) In case of delayed delivery, the GST prevailing on the date of despatch or the GST on the last day of the contractual delivery period whichever is LESS will alone be admitted. For both the cases, the Supplier shall furnish documentary evidence while submitting the bills for payment.
- e) **IMPACT OF GST: Any downward variation in basic price while working due to GST and the benefit of input tax credit must be passed on to TNPGL.**

GST.1 An Overview of Goods and Services Tax [GST]:

- i). Goods and Services Tax [GST] as a modern law, has been brought after Article 366(12A) of the Constitution as amended by 101st Constitutional Amendment Act, 2016. GST is an indirect tax system, commonly used by both the Central Government and the State/UT to final consumption with credit of taxes paid at previous stages available as set off. In a nutshell, only value addition will be taxed and burden of tax Governments on goods and services. GST is a destination based tax on consumption of goods and services. It is proposed to be levied at all stages right from manufacture up is to be borne by the final consumer. GST has been rolled out w.e.f. 01.07.2017, across India.
- ii). The GST to be levied by the Centre on intra-State supply of goods and / or services would be

called the Central GST (CGST) and that to be levied by the States/ Union territory would be called the State GST (SGST)/ UTGST. Similarly, Integrated GST (IGST) will be levied and administered by Centre on every inter-state supply of goods and services.

- iii). Any supplier of goods and service Provider of services who makes a taxable supply with an aggregate turnover of over Rs.20 lakhs in a financial year is required to obtain GST registration. In special category states, the aggregate turnover criteria are set at Rs.10 lakhs. In simple words every business whose taxable supply of goods or services under GST (Goods and Service Tax) and whose turnover exceeds the threshold limit of Rs. 20 lakhs / 10 Lakhs as applicable will be required to register as a normal taxable person.
- iv). GST Registration Number: TNPGL has migrated into GST regime on 15.06.2017 by duly uploading various mandatory data as required by the GST portal. The provisional ID issued to TNPGL is **33AAKCT7598K1ZI**. The details are also posted in TNPGL web portal.
- v). GST Registration Number or GSTIN is 15 Digit identification number which is allotted to each applicant who applied for GST Registration. GST Number is completely based on the Pan Number and State code. First two digits represent the state code and another 10 digit represent the PAN number of the client, one digit represent the entity code (Like proprietorship or partnership etc), one digit is blank and last one is representing check digit.
- vi). Transaction Value: The value of supply of goods or services or both shall be the transaction value, which is the price actually paid or payable for the said supply of goods or services or both where the supplier and the recipient of the supply are not related and the price is the sole consideration for the supply. Sec 15(1) states that value of supply of goods and service shall be the transaction value i.e. the price actually paid or payable.

The conditions for accepting the transaction value are-

- a) Supplier and the recipient of the supply are not related.
 - b) Price is the sole consideration for the supply.
- vii). Composition Scheme: Composition scheme specifies that registered person whose turnover in the preceding financial year is below certain specified limit (Currently RS.75 lakhs) may intimate the proper officer to pay in lieu of tax payable by him an amount calculated at such rate may be specified.

Eligibility for composition scheme: Sec10(2) of the central Goods and Services Tax Act, 2017 states that the registered person shall be eligible to opt under sub- section (1), if-

- * He is not engaged in the supply of services other than supplies referred to in clause (b) of paragraph 6 of Schedule II;
 - * He is not engaged in making any supply of goods which are not leviable to tax under this Act;
 - * He is not engaged in making any inter-State outward supplies of goods;
 - * He is not engaged in making any supply of goods through an electronic commerce operator who is required to collect tax at source under section 52; and
 - * He is not a manufacturer of such goods as may be notified by the Government on the recommendations of the Council.
- viii). Supply of Service and Goods: When there is a combined supply of many goods / services, it has to be determined whether it is a Composite supply or mixed supply of goods or services
- (a) COMPOSITE SUPPLY: A composite supply is one where all the goods or services or a combination has to be supplied together i.e., naturally bundled and there would be a Principal Supply that could be identified (Ex. Supply of Machinery with packaging, insurance and freight – the principal supply is machinery). In this case, the rate of

principal supply will be applied on entire value.

- (b) **MIXED SUPPLY:** A mixed supply is one where the goods or services or a combination thereof which could be individually supplied (like Pizza and Coke) but sold together at a single price. In this case, the highest rate to the good in that mix is applied on all the goods. The GST shall be applicable at appropriate prevailing rates as notified by GST Act. In the event of delay in execution of contract, the GST rate prevailing on the scheduled period or on the actual date of execution, whichever is less only will be admitted.

The bidders should have registered under GST Act and furnish GSTIN. In the event of contractor is within TN, SGST & CGST shall apply and if the contractor is outside TN, IGST shall apply.

GST.2 Goods and Services Tax:

- a) The Goods and Services Tax will be paid extra as applicable. The amount of CGST, SGST, and IGST as applicable shall be indicated in percentage payable and amount separately in the tender offer.
- b) The TNPGL has been registered as a dealer under GST Act 2017 (Registration No. 33AAKCT7598K1ZI)

In case of delayed delivery, the GST prevailing on the date of despatch or on the last day of the contractual delivery period whichever is LESS will be admitted. For both the cases, the supplier shall furnish documentary evidence while submitting the bills for payment.

It is the responsibility of the tenderer to make sure about the correct rates of duty leviable on the material at the time of tendering. If the rates assumed by the Tenderer are less than the current rates prevailing at the time of tendering, the TNPGL Ltd will not be responsible for the mistake. If the rates assumed by the tenderer are higher than the current rates prevailing at the time of tendering, the GST prevailing at the time of tendering will only be paid.

- c) Any Variation in GST due to statutory Variation within the contract delivery date shall be considered by the TNPGL Ltd.
- d) In case of delayed delivery/delayed completion of Works, the GST prevailing on the date of dispatch or on the last day of the contractual delivery period whichever is less will be admitted.

The GST is **not** applicable to liquidated damage, forfeiture of EMD and **GST is applicable to forfeiture** of Security Deposit if any arises and this amount will be recovered from the bills.

GST.3 GST E-way bill system:-

E-Way Bill is an electronic document to be generated to cover **interstate movement** of goods value more than Rs.50,000/- and **intra-state movement** (within state of Tamil Nadu) for consignment value exceeding Rs.1,00,000/- and such generation needs to be done in **e Way Bill portal**.

Consequently, transporters of goods, are required to carry an e-Way Bill under GST provisions for the movement of such goods. The value of goods shall be the value declared in an invoice, a bill of supply or a delivery challan and also includes the Central tax, State or Union territory tax, integrated tax and Cess charged, if any. But, it will not include value of freight charges for the movement charged by transporter.

It is the responsibility of supplier/contractor to ensure the delivery of material at TTPS

stores. Therefore, it is the responsibility of supplier/contractor or their transporters to generate e-way bill before transporting goods for delivery at TNPGL's premises.

GST.4 TDS UNDER 194Q of IT Act :

Any person, being a buyer, who is responsible for paying any sum to any resident for purchase of goods of value (or) aggregate value exceeding Rs. 50 lakhs in any previous year, shall, at the time of credit of such sum to the account of the seller (or) at the time of payment, whichever is earlier shall deduct an amount equal to 0.1% of such sum exceeding Rs.50 lakhs as TDS under section- 194Q of IT Act. The supplier of goods is required to furnish PAN to TNPGL for making the payment. In case the suppliers do not have PAN, TNPGL is required to deduct TAX at a higher rate as per the provisions of Section 206AA. In case of specified person i.e., Any person who has not filed income tax return for two previous years immediately before the previous years in which TDS is required to be deducted and the time limit of filing of Income Tax return u/s 139 (1) of IT Act, 1961 as expired provided that the total TDS and TCS in INR is Rs. 50,000/- (or) more in each of the two previous years the TDS rate u/s 194Q will apply at a higher rate u/s. 206AB.

The provisions of this section shall not apply to the transactions on which tax is deductible under any other provisions of the Income Tax Act 1961 and also on the transactions in which Tax is collectible under the provisions of Section 206C.

On Purchase of goods/materials, TNPGL shall have the primary and foremost obligation to deduct Tax at source and no Tax shall be collected on such transaction u/s 206C (1H). TDS u/s 194Q is also applicable on the advance paid on the purchase of the goods.

In case of works contract wherein supply and erection portions are separable, the value of supply of goods exclusive of GST will be subject to deduction of TDS under section 194Q. On the other charges i.e. erection, testing, commissioning and maintenance charges, TDS under section 194C & 194Q will apply.

The above provisions come into effect from 01.07.2021 onwards, and hence no TCS u/s.206C (1H) has to be paid by TNPGL on purchase of Goods. Accordingly, TNPGL will deduct TDS u/s.194Q on all the purchase of goods exceeding the threshold limit i.e. aggregate credit (or) payment exceeds Rs.50 lakhs. It is mandatory for the bidder to submit a declaration format in Schedule to determine the applicability of the TDS u/s206 AB.

IT TDS is also applicable on erection and commissioning charges.

GST.5 Applicability of GST TDS:

- a) The TDS under GST will be deducted at the time of payment or accounting in the books of accounts whichever is earlier. Once the taxable value of contract exceeds Rs.2,50,000/-, then each and every invoice on that contract shall be subjected to the TDS under GST irrespective of value of such invoice.

Taxable Supply means supply of goods or services or both which is leviable to tax under GST. Thus, TDS under GST is to be deducted only on the Taxable supply of goods or services or both and not on Exempt supply (supply of any goods or services or both which attracts Nil rate of tax or which may be wholly exempt from tax under section 11 of the CGST/ SGST Acts or under section 6 of the IGST Act) and non- taxable supply. Similarly, TDS under GST rate need not be applied on GST component in the invoice. TDS under GST is also applicable for suppliers/ contractors registered under composition scheme also.

- b) Where the location of the supplier and the place of supply are in the same State, it is an intra-state supply and TDS @ 1% under CGST Act and 1% under SGST Act will be deducted. Where the location of the supplier is in State A and the place of supply is in State B, it is an inter-state supply and TDS @ 2% under IGST Act will be deducted.

c) TDS under GST is also applicable in the following cases:-

- Bills of supplier for advance payment.

- Amount of retention from the bills of supplier.
- Supply of goods or services or both by supplier registered under GST as Composition dealer.

Thus Gross value of invoice (Except GST portion) shall be taken while applying TDS under GST rate.

S. No.	Location of Supplier	Location of recipient of supply of goods/services	Place of supply	GST TDS applicability
1	Tamil Nadu	Tamil Nadu (as TNPGL is in Tamil Nadu)	Tamil Nadu	Applicable (CGST TDS @1% and SGST TDS @1%)
2	State other than TN	Tamil Nadu (as TNPGL is in Tamil Nadu)	State other than TN	Not Applicable
3	State other than TN	Tamil Nadu (as TNPGL is in Tamil Nadu)	Tamil Nadu	(IGST TDS @ 2%)

d) TDS under GST is not applicable in the following cases:

1. Total value of taxable supply \leq Rs.2.5 Lakh under a contract.
2. Contract value $>$ Rs.2.5 Lakh for both taxable supply and exempted supply, but the value of taxable supply under the said contract \leq Rs.2.5 Lakh.
3. Receipt of services which are exempted. For example services exempted under notification No.12/2017 – Central Tax (Rate) dated 28.06.2017 as amended from time to time.
4. Receipt of goods which are exempted. For example goods exempted under notification No.2/2017 – Central Tax (Rate) dated 28.06.2017 as amended from time to time.
5. Goods on which GST is not leviable. For Example petrol, diesel, petroleum crude, natural gas, aviation turbine fuel (ATF) and alcohol for human consumption.
6. Where a supplier had issued an invoice for any sale of goods in respect of which tax was required to be deducted at source under the VAT Law before 01.07.2017, but where payment for such sale is made on or after 01.07.2017 [Section 142(13) refers].
7. Where the location of the supplier and place of supply is in a State(s)/UT(s) which is different from the State/ UT where the deductor is registered.
8. All activities or transactions specified in Schedule III of the CGST/SGST Acts 2017, irrespective of the value.
9. Where the payment relates to a tax invoice that has been issued before 01.10.2018.
10. Where any amount was paid in advance prior to 01.10.2018 and the tax invoice has been issued on or after 01.10.2018, to the extent of advance payment made before 01.10.2018.
11. Where the tax will be paid on reverse charge by the recipient i.e., the deductee.
12. Where the payment is made to an unregistered supplier.
13. Where the payment relates to "Cess" component.

e. Value of Supply for Deduction of TDS:

For the purpose of deduction of tax specified above, the value of supply shall be taken as the amount excluding the central tax, state tax, union territory tax, integrated tax and cess indicated in the invoice i.e., without including the amount of GST charges in the bill.

f) Exemption from TDS

According to that provision, TDS under GST need not be deducted in respect of the

supply of goods and Services or both from a Public sector Undertaking (PSU) to another Public Sector Undertaking with effect from 1st day of October 2018. Therefore, no TDS need to be deducted in respect of supplies between Public sector Undertakings Example: NTECL, NTPC, BHEL etc., are owned by Central Government. However TDS provisions will continue to apply for Taxable Supplies from Government and other private agencies with effect from 01.10.2018 as already communicated vide circular 1st cited.

Public sector undertakings (PSU) means Government Companies, Government Company means any company in which not less than 51% of paid up share capital held by the Central Government or by any state Government or Governments or partly by the Central Government and partly by one or more State Governments and includes a company which is a subsidiary of such a Government Company. This notification is with effect from 1st October 2018 itself.

GST.6 Guidelines for releasing of GST on verification of GSTR 2A

- a) The supplier/ contractor should promptly file under GST, to avoid/ minimize the delay in processing/ payment of invoices, since GSTR1 filed by the supplier/ contractor will reflect as GSTR 2A in the portal of the purchasers.
- b) If any discrepancy arises between the value shown in the GSTR-2A and the invoices available, the liability towards GST will be restricted to the lower of the two and GST payment will be made accordingly.
- c) Any lesser GST remittance found in GSTR 2A than claimed from TNPGL, the excess collection of GST will be recovered from suppliers/ contractors, duly adhering regular procedures if there is any difference between GST claimed from TNPGL and remitted to Govt. in GSTR 2A.

d) The suppliers/ contractors whose annual turnover exceeds Rs.10 crores, should raise an e-invoice or e-invoiced debit note or e-invoiced credit note so that TNPGL could avail input tax credit under GST. E-Invoice is a system in which B2B invoices are authenticated electronically by GSTN for further use on the common GST portal. Under the electronic invoicing system, an identification number will be issued against every invoice by the Invoice Registration Portal (IRP) to be managed by the GST Network (GSTN).

Since Tuticorin Thermal Power Station is covered under the EPF Act, the Contractor who desires to take up works contracts for and inside the premises of TTPS is required to comply with all the relevant provisions stipulated in the EPF & MP Act.

2. The Contractor should take separate EPF main code number. The EPF main code Number can be obtained from the Assistant Provident Fund Commissioner, Tuticorin.
3. The workers engaged by the contractors should have EPF – UAN Number (Universal Account Number).
4. The Contractor shall be responsible for the payment of necessary EPF contributions, both Employer's and Employee's contributions as per the provisions of the EPF Act in respect of the actual workers engaged for the specified works.
 - a TNPGL will not reimburse (or) pay the Employer contribution towards ESI & EPF under any circumstances as over and above the accepted rates. The Contractors have to absorb the Employer contribution towards EPF and ESI in the price offered.

5. The Contractor shall submit necessary returns to the EPF organization with in the stipulated time as required under the said EPF & MP Act.
6. The Contractor shall produce the proof of payment of contributions both Employer's and Employee's contributions made to EPF Organization in order to claim the works bill for the respective works. The works bill should be claimed only after ensuring the remittance of both the employer's and employee's PF contributions by the contractors.
7. The contractor shall be fully liable to meet and fulfill all the relevant provisions of the EPF Act in respect of the execution of the tendered work.
8. In case the Contractor fails to fulfill any of the statutory provisions of the EPF & MP ACT and consequently it happens that TNPGL / TANTRANSCO has to meet such requirements of the said ACT or Statutory provisions in the capacity of Principal Employer, TNPGL / TANTRANSCO shall make good such requirements, out of money due and payable to the said contractor and further the performance of the said Contractor in this regard will be noted for all future Contracts of TNPGL / TANTRANSCO.
9. The EPF Employer contribution remitted by the contractors for the Works contract executed in TNPGL could be claimed/ reimbursed, limiting the EPF Employer contribution amount pertaining to the employees of the contractor who have not been covered under PMPRY Scheme.
10. The provision of the Pradhan Mantri Rojgar Protsahan Yojana (PMRPY) Scheme is "Government of India will pay the full employer's contribution (EPF and EPS both) as admissible from time to time w.e.f. 01.04.2018 for a period of three years to the new employees and to the existing beneficiaries for their remaining period of three years through EPFO.
11. The contractors shall remit the EPF contribution separately (by separate Challan) for each and every work.
12. Shall mention the acceptance order / formal order reference number in the remarks column of the ECR Challan (Electronic Challan Cum Return) of the EPF and to submit the same.
13. Shall submit the payment confirmation receipt (the Payment confirmation date is mandatory).
14. Shall submit the combined Challan of Account No.1, 2, 10, 21 & 22.

THE COMPLIANCE OF ESI ACT

1. Since Tuticorin Thermal Power Station is covered under the ESI Act, the Contractor who desires to take up works contracts for and inside the premises of TTPS is required to comply with all the relevant provisions stipulated in the ESI & MP Act.
 2. The Contractor should take separate ESI main code number. The code number can be obtained from the Joint Director, ESI Corporation, Municipal shopping complex, Salai Street, sindupoondurai, Tirunelveli 627001.
 3. The Contractor shall be responsible for the payment of necessary ESI both Employer's and Employee's contributions and for the payment of necessary Employee's contributions of ESI as per the provisions of the ESI Act in respect of the actual workers engaged for the specified works.
- a** TNPGL will not reimburse (or) pay the Employer contribution towards ESI & EPF

under any circumstances as over and above the accepted rates. The Contractors have to absorb the Employer contribution towards EPF and ESI in the price offered.

4. The Contractor shall submit necessary returns to the ESI Corporation with in the stipulated time as required under the said ESI Act.
5. The Contractor shall produce the proof of payment of contributions both Employer's and Employee's contributions made to ESI Corporation in order to claim the works bill for the respective works. The works bill should be claimed only after ensuring the remittance of both the employer's and employee's ESI contributions by the contractors.
6. The contractor shall be fully liable to meet and fulfill all the relevant provisions of the ESI Act in respect of the execution of the tendered work.
7. In case the Contractor fails to fulfill any of the statutory provisions of the ESI ACT and consequently it happens that TNPGL / TANTRANSCO has to meet such requirements of the said ACT or Statutory provisions in the capacity of Principal Employer, TNPGL / TANTRANSCO shall make good such requirements, out of money due and payable to the said contractor and further the performance of the said Contractor in this regard will be noted for all future Contracts of TNPGL / TANTRANSCO.

It is incumbent on the part of the Contractor to see that it shall be his sole responsibility to protect the public and his employees, against any accident from any cause and he shall indemnify the Tamil Nadu Generation and Distribution Corporation against any claim for damages for injury to person or property resulting from any such accident and shall also where the provisions of workmen's compensation act apply take steps to properly insure against any claim there under by way of accident, risk, insurance, demand for all purposes of relief, failing the same or otherwise, Contractor alone will be responsible to meet the compensation awarded under the said act.

8. The Contractor should satisfy the field Superintending Engineer that 'Accident Risk Insurance Policy' is taken before taking over the site for taking up the work and also to satisfy the field Superintending Engineer, that the policy/ policies is/ are kept in force till the contract is completed and the works are taken over by the TNPGL, on the issue of completion certificate.
9. Shall to submit the Monthly Contribution Challan Form (Transaction status field – completed successfully is mandatory).
10. Shall submit the contribution history of the respective months.
11. Shall submit the month wise statement duly signed with seal, showing the details of the employees utilized by the contractors for the specific work and the contribution remitted as per the below format.

Sl. No.	IP No.	IP Name	No. of days	Wages	IP Contributions

12. The contractor shall indemnify TNPGL against all actions, suits, claims, compensation towards accidents/ death, cost of expenses arising in connection with injuries suffered by persons employed by the contractor whether under the general law of ESI scheme &

EPF scheme or any other statutory in force during the period of contract/ and to undertake steps properly to insure against any claims there under.

13. For any safety violation and non-compliance of the statutory acts and rules prescribed respectively under factories act 1948 and TNF Rules 1950 made there under the contractor is solely liable for the imposition of penalty. It is to be clearly understood by the contractor that as per the section 101 of the Factories Act, where the occupier and or the manager of TTPS is charged by the officials of the Inspector of Factories with offence punishable under the factories act 1948 and TNF rules 1950 for any safety violation by the contractor and his workmen while working, the concerned contractor shall be charged as the actual offender and brought before the court at the time appointed for hearing the charge and shall be convicted of the offence and the occupier and the Manager of TTPS will be discharged from liability under this Act, in respect of such offence.
14. The contractor shall furnish the undertaking towards ESI & EPF in Rs.500/- stamp paper as in the enclosed Annexure for this work while claiming the Part Bill / Final Bill.

THE COMPLIANCE OF DIGITAL BASED STATUTORY COMPLIANCE SERVICES AUDIT/CONTRACT COMPLIANCE AUDIT

As the Digital Based Statutory Compliance Services Audit/Contract Compliance Audit through Online Platform will be integrated with on line Bill processing system in TNPGL from 01.04.2021, the contractor have to obtain the statutory compliance clearance certificate for the works contracts from Online Compliance Service Providers and the same should be submitted through online by the respective contractors.

All the contract bills which consist of the work portion will be processed only after the statutory compliance clearance certificate of the Online Compliance Service Providers.

GENERAL CONDITIONS (STATUTORY COMPLIANCES)

1) The Contractor shall employ labour in sufficient numbers to maintain the required rate of progress and of quality to ensure workmanship of the degree specified in the Contract and to the satisfaction of the Engineer-in-Charge. The Contractor shall not employ in connection with the Works any person who has not completed his eighteen years of age.

2) The Contractor shall pay to labour employed by him either directly or through digital transfer. The wages should not be less than fair wages as defined in the current PWD Schedule rates (or) Minimum Wages Act (if applicable).

3) The Contractor shall in respect of labour employed by him comply with or cause to be complied with the Contract Labour Regulations in regard to all matters provided therein.

4) The Contractor shall comply with the provisions of the payment of Wages Act, 1936, Minimum Wages Act, 1948, Employers' Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit Act, 1961, Employees Provident Fund & Miscellaneous Provisions Act, 1952, Employees State Insurance Act, 1948, Payment of Bonus Act, 1965 and Mines Act, 1952, Contract Labour Regulation & Abolition Act, 1970 or any modifications thereof or any other law relating thereto and rules made thereunder from time to time.

5) The Engineer-in-Charge shall on a report having been made by an Inspecting Officer as defined in the Contractors Labour Regulations have the power to deduct from the moneys due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the Conditions of the Contract for the benefit of workers, non payment of wages or of deductions made from his or their wages which are not justified by the terms of the Contract

or non-observance of the said Contractors Labour Regulations.

6) The Contractor shall indemnify the Corporation against any payments to be made under and for observance of the Regulations afore said without prejudice to his right to claim indemnity from his sub-contractors. (if permitted)

7) In the event of the Contractor committing a default or breach of any of the provisions of the aforesaid Contractors Labour Regulations as amended from time to time or furnishing any information or submitting or filling any Form/ Register/Slip under the provisions of these Regulations which is materially incorrect then on the Report of the Inspecting Officers as defined in the Contractors Labour Regulations the Contractor shall without prejudice to any other liability pay to the Corporation a sum not exceeding Rs. 50.00 as liquidated damages for every default, breach or furnishing, making, submitting, filling materially incorrect statement as may be fixed by the Engineer-in-Charge and in the event of the Contractor's default continuing in this respect, the liquidated damages may be enhanced to Rs. 50.00 per day for each day of default subject to a maximum of ten percent of the estimated cost of the Works put to tender. The Engineer-in-Charge shall deduct such amount from bills or security deposit of the Contractor and credit the same to the Welfare Fund constituted under Regulations. The decision of the Engineer-in-Charge in this respect shall be final and binding.

1.0 CONTRACT LABOUR REGULATIONS :

- (i) Notice of commencement: The Contractor shall, within SEVEN days of commencement of the work, furnish in writing to the Inspecting Officer of the area concerned the following information :
- (a) Name and situation of the work.
 - (b) Contractor's name and address
 - (c) Particulars of the Department for which the work is undertaken,
 - (d) Name and address of sub-contractors as and when they are appointed.
 - (e) Commencement and probable duration of the work.
 - (f) Number of workers employed and likely to be employed.
 - (g) 'fair wages' for different categories of workers.
 - (h) Number of hours of work which shall constitute a normal working day:-
 - (i) The number of hours which shall constitute a normal working day for an adult shall be NINE hours. The working day of an adult worker shall be so arranged that inclusive of intervals, if any, for rest it shall not spread over more than twelve hours on any day, when an adult worker is made to work for more than NINE hours on any day or for more than FORTY EIGHT hours in any week he shall, in respect of overtime work, be paid wages at double the ordinary rate of wages.
- (ii) Weekly day of rest : Every worker shall be given a weekly day of rest which shall be fixed and notified at least TEN days in advance. A worker shall not be required or allowed to work on the weekly rest day unless he has or will have a substituted rest day, on one of the five days immediately before or after the rest day. Provided that no substitution shall be made which will result in the worker working for more than ten days consecutively without a rest day for a whole day.
- (a) Where in accordance with the foregoing provisions a worker works on the rest day and has been given a substituted rest day he shall be paid wages for the work done on the weekly rest day at the overtime rate of wages.
 - (b) Note: The expression 'ordinary rate of wages' means the fair wage the worker is entitled to.
 - (c) Display of notice regarding Wages, Weekly Day of Rest etc. The Contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the works, notice in English and in the local Indian Language, spoken by majority of workers, giving the rate of fair wages, the hours of work for which such wages are payable, the weekly rest

days workers are entitled to and name and address of the Inspecting Officer. The Contractor shall send a copy each of such notices to the Inspecting Officers.

- (iii) Register of Workmen: A register of workmen shall be maintained in the Form appended to these regulations and kept at the work site or as near to it as possible, and the relevant particulars of every workman shall be entered therein within THREE days of his employment.
- (iv) Employment Card : The contractor shall issue an employment card in the Form appended to these regulations to each worker on the day of work or entry into his employment. If a worker already has any such card with him issued by the previous employer, the contractor shall merely endorse that Employment Card with relevant entries. On termination of employment the Employment Card shall again be endorsed by the Contractor and returned to the worker.
- (v) Register of Wages etc. : A Register of Wages-Cum-Muster Roll in the Form appended to these regulations shall be maintained and kept at the work site or as near to it as possible.
- (vi) Fines and deductions : Wages of a worker shall be paid to him without any deductions of any kind except the deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money which he is required to account for, where such damage or loss is directly attributable to his neglect or default;
 - (a) No fine shall be imposed on a worker and no deductions for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.
 - (b) The Contractor shall maintain a register of fines and the register of deductions for damage or loss in the Forms appended to these regulations which should be kept at the place of work.
- (vii) Register of Accidents : The Contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:--
 - a) Full particulars of the labourers who met with
 - b) Rate of Wages.
 - c) Sex
 - d) Age
 - e) EPF UAN number
 - f) ESI number
 - g) Aadhaar number
 - h) Nature of accident and cause of accident.
 - i) Time and date of accident.
 - j) Date and time when admitted in hospital.
 - k) discharge from the hospital.
 - l) Period of treatment and result of treatment.
 - m) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
 - n) Claim required to be paid under Workmen's Compensation Act.
 - o) Date of payment of compensation.
 - p) Amount paid with details of the person to whom the same was paid.
 - q) Authority by whom the compensation was assessed.
 - r) Remarks.

[Note: k,l,m,n for the workmen not covered under the ESI provisions]
- (viii) Preservation of Registers : The Register of workmen and the Register of Wages-cum-Muster Roll required to be maintained under these Regulations shall be preserved for 3 years after the date on which the last entry is made therein.

- (ix) Enforcement: The Inspecting Officer shall either on his own motion or on a complaint received by him carry out investigations, and send a report to the Engineer-in-Charge specifying the amounts representing Workers' dues and amount of penalty to be imposed on the Contractor for breach of these Regulations, that have to be recovered from the Contractor, indicating full details of the recoveries proposed and the reasons there for. It shall be obligatory on the part of the Engineer-in-Charge on receipt of such a report to deduct such amounts from payments due to the Contractor.
- (x) Disposal of amounts recovered from the Contractor : The Engineer-in- Charge shall arrange payment to workers concerned within FORTY FIVE days from receipt of a report from the Inspecting Officer except in cases where the Contractor had made an appeal under Regulation 16 of these Regulations. In cases where there is an appeal, payment of workers dues would be arranged by the Engineer-in-Charge, wherever such payments arise, within THIRTY days from the date of receipt of the decision of the competent authority.
- (xi) Welfare Fund : All moneys that are recovered by the Engineer-in- Charge by way of workers dues which could not be disbursed to workers within the time limit prescribed above, due to reasons such as whereabouts of workers not being known, death of a worker etc. and also amounts recovered as penalty, shall be credited to a Fund to be kept under the custody of the Corporation for such benefit and welfare of workmen employed by Contractors.
- (xii) Appeal against decision of Inspecting Officer : Any person aggrieved by a decision of the Inspecting Officer may appeal against such decision to the competent authority concerned within THIRTY days time stipulated from the date of the decision, forwarding simultaneously a copy of his appeal to the Engineer-in-Charge. The decision of the competent authority shall be final and binding upon the Contractor and the workmen.
- (xiii) Inspection of Books and other Documents : The Contractor shall allow inspection of the Registers and other documents prescribed under these Regulations by Inspecting Officers and the Engineer-in- Charge or his authorized representative at any time and by the worker or his agent on receipt of due notice at a convenient time.
- (xiv) Interpretation, etc.: On any question as to the application interpretation or effect of these Regulations, the decision of the Commissioner of Labour (or) Director/ Industrial Safety and Health shall be final and binding.
- (xv) Amendments: Government may, from time to time, add to or amend these Regulation and issue such directions as it may consider necessary for the proper implementation of these Regulations or for the purpose of removing any difficulty which may arise in the administration thereof.

2.0 Compliance of EPF& MP Act, 1952:

- (a) The Contractor who take up works contract for TNPGL/TANTRANSCO is required to comply with all the relevant provisions stipulated in the EPF & MP Act;
- (b) The Contractor should have a separate EPF main code number.
- (c) The Contractor should be responsible for the payment of necessary EPF contributions both Employer's and Employee's contribution as per the provisions of the EPF Act in respect of the actual workers engaged for the specified works.
- (d) The contractor should submit necessary returns to EPF Organisation within the stipulated time as required under the said EPF & MP Act.
- (e) The Contractor should produce the proof of payment of contribution - both Employer's and Employee's contributions made to EPF Organisation in order to claim the Bills for the respective works.
- (f) The contractor should be fully liable to meet and fulfill all the relevant provisions of the EPF act in the respect of the execution of the Tendered work.

(g) In case the Contractor fails to fulfill any of the statutory provisions of the EPF & MP Act and consequently it happens that TNPGL/TANTRANSCO Ltd has to meet such requirements of the said Act or Statutory provisions in the capacity of Principal Employer, TNPGL/TANTRANSCO shall make good such requirements out of the money due and payable to the said Contractor and further the performance of the said Contractor in this regard will be noted for all future Contracts of TNPGL/TANTRANSCO.

1.1 In respect of the category of employee for whom the wages are fixed at the rate of Rs.500/- and above in the current PWD Schedule rates (or) say the monthly wages of Rs.15,000/- above. The EPF employer contribution will be restricted upto Rs.15,000/- only.

1.2

3.0 Compliance of ESI Act 1948 :

- (a) The contractor who take up the works contract for TNPGL & TANTRANSCO is required to comply with all the provisions stipulated to ESI Act 1948.
- (b) The contractor should have a separate ESI main code number.
- (c) The contractor should be responsible for the payment of necessary ESI contributions - both Employer's and Employee's contributions as per the provisions of the ESI Act in respect of the actual workers engaged for the specified works.
- (d) The contractor should submit necessary returns to the ESI Organization within the stipulated time as required under the said ESI Act.
- (e) The contractor should produce the proof of payment of contributions - both Employer's and Employee's contributions made to ESI Organization in order to claim the Bills for the respective work.
- (f) The contractor should be fully liable to meet and fulfill all the relevant provisions of the ESI Act in respect of the execution of the Tendered work.
- (g) In case the Contractor fails to fulfill any of the statutory provisions of the ESI Act and consequently it happens that TNPGL & TANTRANSCO has to meet such requirements of the said Act or Statutory provisions in the capacity of Principal Employer, TNPGL & TANTRANSCO shall make good such requirements out of money due and payable to the said Contractor and further the performance of the said Contractor in this regard will be noted for all future Contracts of TNPGL & TANTRANSCO.
- (h)
 - (i) The contractor who claims exemption under the ESI Act should produce the exemption order obtained from the Government/ESI organization.
 - (ii) The contractor who claims exemption for those areas that are not covered under the purview of the ESI Act, necessary evidences should be submitted by the contractor to ensure that the revenue village where the work is being carried out has not been covered under the implemented area of ESI.
 - (iii) The category of employees (Technical Assistant II Grade) and above for whom the wages are fixed at the rate of Rs. 700/- and above in the PWD Schedule rates (or) the monthly wages of Rs.21,000/- above. Such employees will not be covered under the ESI Act. In all such conditions, the Contractor has "to ensure the medical benefits for the Workers engaged by the Contractors for the works and has to take relevant group insurance policies with the applicability for giving compensation to the workers" under the Employee's Compensation Act.

4.0 STATUTORY COMPLIANCE CLEARANCE CERTIFICATE:

- (a) The Contractor executing the works contract in TNPGL/TANTRANSCO should obtain the Statutory Compliance Clearance Certification from the Online Compliance Service Providers engaged by TNPGL/TANTRANSCO, the required documents should be submitted by the contractors to the respective Online Compliance Service Providers.
- (b) The charges for Statutory Compliance Clearance Certification will be at the rate of Rs.2.00/- per man day per month with minimum charges of Rs.400/- and maximum charges of Rs. 3200/- and Rs.300/- for re-audit due to reasons attributable to the contractor. The charges should be paid by the respective contractors to the service provider through online.

5.0 The Building and Other construction Workers Act:- (other than the circle/station registered under the Factories Act)

- (a) The contractor should obtain the Registration certificate under the Building and Other construction Workers (Regulation of Employment and Condition of Service) Act, 1996 from the Competent Authority (the Joint Director/Industrial Safety and Health (BOCW)).
- (b) The contractor should comply all the provisions of the Building and Other construction Workers (Regulation of Employment and Condition of Service) Act, 1996.

6.0 The Contract Labour (Regulation & Abolition) Act 1970 & Rules 1975 and Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 & Rules 1983.

- (a) The Contractor who take up works contract for TNPGL/TANTRANSCO should deploy sufficient number of workmen for the work and the contractor should deploy 20 or more workmen on a day of emergency (or) in necessity.
- (b) The Contractors should comply with all the provisions of the Contract Labour (Regulation & Abolition) Act, 1970 and Tamilnadu Contract Labour (Regulation & Abolition) Rules 1975 as modified from time to time and shall also indemnify TNPGL/TANTRANSCO from all and against any claims under the aforesaid Act and the Rules. The contractors should also submit the copy of the labour licence before executing the works.
- (c) The Contractors who desires to engage the migrant workmen (workmen from other states) for the works contracts of TNPGL/TANTRANSCO is required to comply with all the provisions of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 and Tamilnadu rules, 1983 as modified from time to time and shall also indemnify TNPGL/TANTRANSCO from all and against any claims under the aforesaid Act and the Rules The contractors should also submit the copy of the migrant labour licence before executing the works.
- (d) The contractors should maintain the following records as per section 78 of Contract Labour (Regulation & Abolition) central rules 1971.
 - (i) Muster Roll in Form - XVI.
 - (ii) Register of Wages in Form - XVII.
 - (iii) Register of overtime in Form - XVIII.
 - (iv) The contractor shall issue an photo identity card to his employees.

7.0 Wages:-

- (a) The Wages prescribed for the contractor/ industry/ establishment as per rates of Minimum Wages notified by the Government of Tamilnadu under the Minimum Wages Act, 1948 or the current PWD rates of wages, whichever is higher is to be paid by the contractor to their employees.
- (b) The contractor should pay the wages before the expiry of seventh day as per section 65 and shall issue wage slip in Form - XXVIII to the workmen as per section 78(b) of The Tamil Nadu Contract Labour Rules, 1973. The copies of the wage slip so issued to the workmen should be maintained by the contractor and produced as when called for.
- (c) The contractor should pay the wages to their employees only though digitally (i.e.,) paid directly to the bank account of the employee.

8.0 EPF DOCUMENTS TO BE PRODUCED FOR CLAIMING BILLS:

- (a) The EPF contribution should be remitted separately (by separate Challan) for each and every work. The acceptance order/ formal order reference number should be entered in the remarks column of the ECR Challan (Electronic Challan Cum Return) and the same should be submitted.
- (b) The payment confirmation receipt should be submitted (the payment confirmation date is mandatory)
- (c) The combined Challan of Account No. 1,2,10,21& 22 should be submitted.
- (d) All the documents should duly signed with seal by the contractor.

9.0 ESI Documents for While Claiming Bills:-

- (a) The Monthly Contribution Challan Form should be submitted (Transaction status field - completed successfully is mandatory).
- (b) The contribution history of the respective months should be submitted.
- (c) The month wise statement should be submitted showing the details of the employees utilized by the contractors for the specific work and the contribution remitted as per the below format.

S.No	IP.No	IP.Name	No. of days	Wages	IP Contributions
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- (d) All the documents should duly signed with seal by the contractor.

10.0 Tamil Nadu Rationlisation of Forms and Reports under Certain Labour Laws Rules, 2020.

The contractor should comply/ maintain the applicable new combined forms introduced vide the following Acts/ Rules.

- (a) The Tamil Nadu Contract Labour (Regulation and Abolition) Rules, 1975.
- (b) The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) (Tamil Nadu) Rules, 1983.
- (c) The Tamil Nadu Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2006.

New Forms:

FORM I	Certificate of Registration of Principal Employer/Employer (under 3 Rules)
FORM II	Application for Licence/ Renewal of Licence (under CLRA and ISMW Rules)
FORM III	Form of Certificate by Principal Employer (under CLRA and ISMW Rules)
FORM IV	Certificate of Initial and Periodical Test and Examination of Various Appliances (under BOCW Rules)
FORM V	Application for Adjustment of Security Deposit (under CLRA and ISMW Rules)
FORM VI	Licence and Renewal (under CLRA and ISMW Rules)
FORM VII	Notice of commencement/ completion of work (under CLRA and BOCW Rules)
FORM VIII	Service Certificate (under 3 Rules)
FORM IX	Certificate of Medical Examination (under BOCW Rules)
FORM X	Report on recruitment and employment of migrant workmen and cessation of employment of migrant workmen (under ISMW Rules)
FORM XI	Report of Poisoning or Occupational Notifiable Diseases/ Accidents and Dangerous Occurrences (under BOCW Rules)
FORM XII	Application for Registration of Establishments Employing Contract Labour or Migrant Workmen or Building Workers (under 3 Rules)

11.0 Agreement and Undertaking to be furnished by the contractors in respect of the Statutory Provisions:-

- (a) An undertaking as specified in Annexure-A should also be obtained from the contractors to ensure the remittance of EPF & ESI, Employee and Employer contribution for the respective works while claiming the bills.
- (b) The TNEB (TNPGL/ TANTRANSCO) registered contractor, who wants to execute the works in a circle shall be instructed to execute an agreement [Annexure- I] with respective Superintending Engineer's of the circle.

12.0 SAFETY CONDITION:-

- (i) All the relevant personal protective equipments like safety helmets, safety shoes, safety belt, goggles, nose mask, face mask, dust respirator, asbestos sult, apron, leg guards, rubber gloves, face shield hand sleeves, ear plug, ear muff, fiber helmet, fall net etc., should be supplied by the contractors to their workmen and ensure for proper usage by their workers without fail.
- (ii) Proper welding machines with accessories, good and sound construction of hand tools, power tools such as grinding machines, cutting machines, chipping tools, scaffolding materials, etc., should be used. Proper earthing to be provided wherever necessary.
- (iii) The contractor shall not allow his workmen to wear loose garments, like lingoes, dhotis, watches, loose jewels and bangles, etc., while at work and smoke cigarettes, beedies etc., inside the power house premises.
- (iv) The contractor shall ensure that his workmen to wear tight full or half pant while at work inside the

powerhouse premises.

- (v) Technically skilled and also safety-oriented supervisor should supervise the work at all time.
- (vi) If any accident occurs, it should be informed to the concerned officer of TNPGL in writing by the concerned contractor immediately.
- (vii) For any safety violation and non-compliance of the statutory provisions and rules the contractor is sole responsible and the contractor is liable for any prosecution and imposition of penalty as per the rules in force.

(a) Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 meter.

(b) All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion, or flooding. No floor, roof, or other part of a building shall be so overloaded with debris or materials as to render it unsafe.

All necessary personal safety equipment as considered adequate by the Engineer-in-Charge shall be available for use of persons employed on the Site and maintained in a condition suitable for immediate use; and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.

(i) When workers are employed in sewers and manholes, which are in use the Contractor shall ensure that manhole covers are opened and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.

(a) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

(b) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

(ii) Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following :-

(a) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good working order and properly maintained.

(b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

(iii) The Contractor shall at his own expense arrange for the safety provisions as appended to these conditions or as required by the Engineer-in-Charge, in respect of all labour directly employed for performance of the works and shall provide all facilities in connection therewith. In case the Contractor fails to make arrangements and provide necessary facilities as aforesaid, the Engineer-in-Charge shall be entitled to do so and recover the cost thereof from the Contractor.

(iv) Failure to comply with Safety Code shall make the Contractor liable to pay to the Corporation as liquidated damages an amount not exceeding Rs. 50.00 for each default or materially incorrect statement. The decision of the Engineer-in-Charge in such matters based on reports from the Inspecting Officers as defined in the Contract Labour Regulation as appended to these conditions shall be final and binding and deductions for recovery of such liquidated damages may be made from any amount payable to the Contractor.

- (a) All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.
- (b) These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. Persons responsible for ensuring compliance with the Safety Code shall be named therein by the Contractor.
- (c) To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer-in-Charge or his representatives and the Inspecting Officers as defined in the Acts/Rules applicable.
- (d) The Contractor is not exempted from the operation of any other Act or Rule in force.

5.0. INSURANCE:

5.1. Contracting firms shall arrange insurance for the equipment/materials and all its accessories being supplied by them, through any of the Nationalised Insurance Companies. The equipment/ materials shall be insured to cover transport (from Warehouse) and 60 days storage risk at site. The damages, if any, during transit will be reported within 30 days of receipt of materials. It will be the responsibility of the supplier to replace the defective/damaged materials and make good the shortages and other losses in transit, free of cost, lodge and recover claim from Insurance, Under writers/Carriers.

It is incumbent on the part of the CONTRACTOR to see that it shall be his sole responsibility to protect the public and his employees, against any accident from any cause and he shall indemnify the TNPGL against any claim for damages for injury to the person or property resulting from any such accident and shall also where the provisions of workmen's compensation act apply take steps to properly insure against any claim there under any way of accident, risk, insurance demand for all purpose of relief, failing the same or otherwise, CONTRACTOR alone will be responsible to meet the compensation awarded under the said act.

2) RISK INSURANCE:

It is incumbent on the part of the Contractor to see that it shall be his sole responsibility to protect the public and his employees, against any accident from any cause and he shall indemnify the Tamil Nadu Generation and Distribution Corporation against any claim for damages for injury to person or property resulting from any such accident and shall also where the provisions of workmen's compensation act apply take steps to properly insure against any claim there under by way of accident, risk, insurance, demand for all purposes of relief, failing the same or otherwise, Contractor alone will be responsible to meet the compensation awarded under the said act.

The Contractor should satisfy the field Superintending Engineer that 'Accident Risk Insurance Policy' is taken before taking over the site for taking up the work and also to satisfy the field Superintending Engineer, that the policy/ policies is/ are kept in force till the contract is completed and the works are taken over by TNPGL, on the issue of completion certificate.

Recoveries will be made from Contractor's bill for any liability for the accidents and refund of the same considered later after the claim is fully settled by the Insurance Authorities.

3) Transit Insurance: Transit Insurance to be borne by the contractor covering loss or damage occurring while in transit from the Contractor's or Subcontractor's works or stores until arrival at

the Site, to the Plant (including spare parts there for) and to the Contractor's Equipment.

- 4) **Automobile Liability Insurance:** Covering use of all vehicles used by the Contractor or its Subcontractors, whether or not owned by them, in connection with the execution of the Contract.
- 5) **Installation All Risks Insurance:** Covering physical loss or damage to the Facilities at the Site, occurring prior to Completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the guarantee period while the Contractor is on the Site for the purpose of performing its obligations during guarantee period.
- 6) **Other Insurances:** If any other insurance is required for this contract shall be borne by the Contractor.

6.0. PACKING AND FORWARDING:

- 6.1. The packing shall conform to relevant packing standards. The contractor should however, ensure that the packing is such that the materials reach their destination without damage/loss during transit by Rail or Road and subsequent storage. The words "Handle with care" should be printed on the cartons.
- 6.2. The equipment/materials and all its accessories shall be securely packed and despatched, freight paid, duly insured, at supplier's risk and cost. The packing may be in accordance with the manufacturer's standard practice. The supplier is responsible for ascertaining the facilities that exist for Road Transport to site. Each package shall be clearly marked and contain detailed packing list, such as gross weight, net weight etc. The supplier is solely responsible for any loss or damage during transport. The despatch of materials shall be made only after the approval of routine test certificates by the TNPGL Ltd. The equipment/ Materials shall be unloaded at Destination Stores/Sites by the supplier at free of cost.

7.0. DESPATCH INSTRUCTIONS:

- 7.1. The materials should be despatched as per Despatch Instructions.

8.0 PAYMENT TERMS:

8.1 Payments for the supplies will be made by way of NEFT/RTGS/Fund Transfer to the supplier's account on any one of the Nationalised Banks/Scheduled Banks approved by Reserve Bank of India, in Tamil Nadu. The bank charges involved in making the payment will be to the account of the supplier.

8.2 Payments will not be made for equipment's/materials damaged during transit. All defective materials shall be replaced by the supplier free of charge.

SUPPLY AND WORK EXECUTION WITHIN THE DELIVERY PERIOD:

80% of all inclusive prices (Including GST) for supply portion on receipt of materials of each consignment in good condition at Central Stores/TTPS will be paid within 90 days against submission of Bills with required documents and after deducting recoveries, if any.

10% Payment for supply and 90% of payment for execution portion will be paid within 90 days on successful execution, testing and Commissioning of the DDCMIS, field instruments etc., against presentation of invoices and after removal of old System, field instruments system and handing over the same to stores at TTPS and after deducting recoveries, if any.

Balance 10% each for supply and execution portion will be paid within 90 days on satisfactory performance of the new system after commissioning against presentation of invoices and recovery of any dues to board and after receipt of performance report from SE/ES/TTPS and after closure of the Purchase Order.

FOR BELATED SUPPLY AND EXECUTION:

80% of all inclusive prices (Including GST) for supply portion on receipt of materials of each consignment in good condition at Central Stores / TTPS will be paid within 90 days against submission of Bills with required documents after deducting L.D and other recoveries, if any.

10% payment for supply and 90% of payment for execution portion will be paid within 90 days on successful execution, testing and Commissioning of the DDCMIS, field instruments etc., against presentation of invoices and after removal of old System, field instruments system and handing over the same to stores at TTPS after deducting the appropriate amount of L.D of each consignment and receipt of confirmation report towards successful completion of erection and after deducting recoveries, if any.

Balance 10% each for supply and execution portion will be paid within 90 days on satisfactory performance of the new system after commissioning against presentation of invoices and recovery of any dues to board and after receipt of performance report from SE/ES/TTPS and after closure of the Purchase Order.

In the event of TNPGL failing to keep the stipulated time frame for releasing payment, simple interest for the delayed payment shall be paid by TNPGL to the bidder at the SBI three months MCLR rate on the date of P.O for the delayed period beyond 90 days.

The simple interest shall be calculated for the delayed period by adopting the 3 months MCLR of SBI prevailed at the time of signing of agreement and in the cases where no agreement is signed, only P.O/WCT is issued, the date of the P.O/WCT shall be taken as base date to ascertain the interest rate. Our Banker's address M/s. CANARA BANK, Tuticorin Thermal Power Station, Tuticorin -628 004.

Exchange commission for the issue of Bank Draft and other Bank charges will be to your accounts.

In case of delay in supply, the materials will be accepted subject to the following conditions:

- i) There should be no declining trend in prices
- ii) Payment will be released as per the latest purchase order rates or lowest rates obtained during the recent tenders opened subject to levy of liquidated damage for belated supplies.
- iii) TNPGL reserves the right to accept or reject the delayed supplies without assigning any reason thereof and take action as per the other terms and conditions of this Specification.

IV. 80% payments will be made only after the approval of the test certificates and on receipt of the supplier's bills in duplicate, duly certified by the consignee. If the supplier dispatches materials without prior approval of competent authority and if any demurrage or wharfage or both are incurred by the purchaser they will be debited from the supplier.

8.3 The bills for payment will be passed only after the approval/acceptance of the following.

- 1) Security deposit cum Performance Guarantee for 5% of value of order.
- 2) Attested copy of IT PAN/ GST Registration certificate.
- 3) Guarantee & Test Certificates
- 4) Supply of manuals, Spares as stipulated in Section – 5 Technical.

8.4 The Supplier should dispatch only after getting dispatch instruction from the consignee Superintending Engineer. If the supplier dispatches the materials without the prior approval of the purchaser, then the purchaser shall not be responsible for any demurrage of wharfage or both and only the supplier should bear any expenditure arising out of such unapproved dispatches.

9.0. SECURITY DEPOSIT CUM PERFORMANCE GUARANTEE:

- 9.1 The successful tenderer will have to pay 5% value of the Purchase order (all inclusive Taxes) as combined Security Deposit cum performance guarantee in the form as follows within 15 days from the date of receipt of this Purchase order. The EMD amount if paid already, shall be deducted from the SD cum PG amount to be paid. The SD cum PG amount will not carry any interest.

In the event of failure to remit security deposit cum performance guarantee within 15 days, EMD may be forfeited and the purchase order may be cancelled.

The SD cum PG amount will not carry any interest.

If Security Deposit cum performance guarantee is paid belatedly, the same may be accepted with a penal interest at 12% per annum for the delayed period.

- (i) For value of Purchase order up to Rs.10 Lakhs, SD cum PG by way of cash at cash counter TTPS (if SD is less than Rs.10,000/-)/ Demand Draft / Banker's cheque / pay order or by way of NEFT / RTGS/ Account transfer to TTPS account.
 - (ii) For value of Purchase order exceeding Rs.10 Lakhs, SD cum PG in the form of Demand Draft / NEFT / RTGS / Banker's Cheque / pay order / Account transfer to TTPS account/ Irrevocable Bank Guarantee. If the SD cum PG is paid by means of Bank Guarantee, it will be accepted only after the due verification from the Banks.
2. The security Deposit cum performance Guarantee furnished shall be towards proper fulfilment of the contract as well as towards performance guarantee of the materials supplied. In case of BG, the SD cum PG shall be valid for the entire period of Guarantee. If required, BG shall be extended to cover the extended period of guarantee".
 3. The Security deposit cum Performance Guarantee against this contract will be released to the contractor only if the contract is completed to the satisfaction of the purchaser.
 4. The Security Deposit cum Performance Bank Guarantee will be returned to the supplier after the expiry of guarantee period after ensuring that defects/ damages during the guarantee period are rectified/ replaced to the satisfaction of the purchaser. If the purchaser incurs any loss or damages on account of breach of any of the clauses or any other amount arising out of the contract becomes payable by the supplier to the purchaser, then the purchaser will in addition to such other dues that he shall have under the law, appropriate the whole or part of the security deposit cum Performance bank guarantee and such amount that is appropriated will not be refunded to the supplier.
 5. If the performance period of the supplied material is over and some quantity of within guarantee period defective material are still pending for want of repair/replacement then fresh BG equal to the cost of such defective material is to be furnished by the supplier for releasing original SD cum PBG by TNPGL (purchaser).

10.0. **DELIVERY / COMPLETION PERIOD:**

The delivery schedule for the Supply, erection and pre commissioning of the work will reckoned from the date of receipt of PO by the contractor as below.

10.1. **Supply :**

Tentative schedule for execution of major work suggested by TNPGL to the Bidder, after getting the Purchase Order is given below.			
Clause No	Name of the Work	Clause	Period
1	DCS System	Sec 1E-01.01.01	100 th Day from the date of P.O
2	DCS Hardware	Sec 1E-01.01.02	110 th Day from the date of P.O
3	DCS Software	Sec 1E-01.01.03	150 th Day from the date of P.O
4	NON- DCS Hardware:		
		Sec 1E-01.01.04 Sl.No 1,2	75 th Day from the date of P.O
		Sec 1E-01.01.04 Sl.No 3,4,5	100 th Day from the date of P.O
		Sec 1E-01.01.04 Sl.No 6 to 26 and 28 to 33,	120 th Day from the date of P.O
		Sec 1E-01.01.04 Sl.No 27	150 th Day from the date of P.O
5	Lab Instruments	Sec 1E-01.01.05	120 th Day from the date of P.O

6	Cables	Sec 1E-01.02.01 Sl.No I to IV	110 th Day from the date of P.O
7	Cable Trays , Iron & Steel	Sec 1E-01.02.01 Sl.No V	60 th Day from the date of P.O
8	Control Desk and Panel	Sec 1E-01.02.02	150 th Day from the date of P.O
9	Start Up and Essential Spare		
	i) DCS spare	Sec 1E-02.01.01	150 th Day from the date of FAT
	ii) Non DCS spare	Sec 1E-02.01.02	150 th Day from the date of FAT

Note: The materials which are not covered in the above schedule shall be supplied within the **150 days** from the date of P.O.

Erection:

The Vendor shall furnish detailed erection schedule which shall be finalised with the TNPGL keeping in view of the overhaul schedule. The Vendor shall strictly adhere to the erection schedule as agreed with the TNPGL.

Erection Schedule

Sl.No	Description	Completion Period
01	Open site office, appoint site in charge	30 Days from the date of P.O
02	Erection of Cable trays, JB's & Push buttons.	120 Days from the date of P.O
03	Successful erection of all DCS panel	120 Days from the date of P.O
04	Laying of all cables	170 Days from the date of P.O
05	Loop checking and completion of Pre Shut Down works.	180 Days from the date of P.O

However the contractor may submit the flowchart for this project **within 30 days** after getting the purchase order.

- 10.2. The contractual delivery period will not be extended. Hence all efforts shall be taken to deliver the materials within the contractual delivery period. TNPGL also reserves the right to cancel the order if the delivery schedule is not kept up, without any further notice to the supplier.
- 10.3. TNPGL Ltd reserves the right to cancel the quantities not supplied as per delivery schedule.
- 10.4. TNPGL Ltd also reserves the right to cancel the order if the delivery schedule is not kept up, without any further notice to the supplier.
- 10.5. TNPGL Ltd reserves the right to revise this delivery schedule depending on the actual requirement at the time of placing the purchase order.
- 10.6. The TNPGL Ltd will be at liberty to cancel the contract if the supply is not made as per the delivery schedule specified in the indent, notwithstanding its right to claim liquidated damages for the belated supplies and the quantity outstanding to be supplied as on the date of cancellation. The defaulting contractors will be liable to pay to the TNPGL Ltd in addition to the liquidated damages for delay, the actual difference in price whenever the TNPGL Ltd orders the delayed quantity to be supplied / executed by other agencies at higher rate.
- 10.7. The actual date of receipt of each material with all accessories at TTPS Stores will be reckoned as the date of delivery for the purpose of calculation of liquidated damages in respect of that material.
- 10.8. It is the responsibility of the supplier to give 30 days' advance information for inspection, dispatch of materials and other obligations under the terms and conditions of this contract in order to deliver the units within the contractual delivery period quoted /agreed.

- 10.9. After the issue of Despatch Instruction, if any delay is caused by the supplier in arranging timely despatches, their poor performance will be taken note of while ordering in future.
- 10.10. It is the responsibility of supplier / contractor or their transporters to generate e-way bill before transporting goods for prompt delivery at TTPS Stores.

11.0 PLACING OF ORDERS:

- 11.1. The award of contract will be issued to the successful tenderer with all TNPGL Ltd's terms and conditions, duly indicating the approved unit rates and the approximate quantity allotted to them. The approved rates will be FIRM.

12.0. LOSS OR DAMAGE:

- 12.1. External damages or shortages that are prima facie, the results of rough handling in transit or due to defective packing will be intimated within fortnight from the date of receipt of the materials at site. Internal defects, damages or shortages of integral parts which cannot ordinarily be detected on a superficial visual examination by bad handling in transit or defective packing, would be intimated within 2 months from the date of receipt of materials. In either case, the defective materials shall be replaced/rectified by the supplier, free of cost.
- 12.2. If during the period of supply, it is found that goods already supplied are defective in material or workmanship or do not conform to specification or unsuitable for the purpose for which they are purchased, then it will be open to the purchaser either to reject the goods or repudiate the entire contract and claim such loss that the purchaser may suffer on that account require the supplier to replace the defective goods, free of cost.
- 12.3. Similarly, if during the guarantee period any of the goods found to be defective in materials or workmanship or do not conform to specification or are unsuitable for the purpose for which they are purchased, it will be open to the purchaser either to repudiate the entire contract and claim damages or accept such parts of the goods that are satisfactory and require the supplier to replace the balance or to claim compensation for the entire loss sustained by the purchaser on that account.
- 12.4. In the event of supplies being received damaged or any shortages at the destination stations, the cost of such materials, GST (if payable) and other charges payable thereof will be paid only proportionate to the value of materials received in good condition, unless the damaged goods or short supplies are made good free of cost by the suppliers.
- 12.5. For all legal purposes, the materials shall be deemed to pass into the TNPGL Ltd's ownership at the destination Stores, where they are delivered and accepted.

13.0. LIQUIDATED DAMAGES:

- 13.1. The delivery as specified should be guaranteed by the supplier under the liquidated damages clause given below :
- 13.1.1. It is the responsibility of the supplier to arrange for inspection, despatch etc. in time to keep up the delivery schedule.
- 13.1.2. If the supplier fails to deliver the equipments/ materials within the time specified in the indent or any extension thereof, the purchaser shall recover from the supplier as liquidated damages, a sum of HALF PERCENT (0.5%) of the All inclusive price of the undelivered equipments/ Materials for each completed week of delay. The total liquidated damages shall not exceed Ten percent (10%) of the All-inclusive price of the equipments / materials so delayed. Only the date of actual receipt of materials at stores will be reckoned as date of delivery for this purpose. Liquidated damages will also be recovered for the quantity not

supplied as is done for the belated supply. It is the responsibility of the suppliers to arrange for inspection, despatch etc. in time to keep up the delivery schedule.

In case of delay in completion of work (either by Supplying the materials in time or with delay), the LD will be deducted from the bills at 0.5% of total value of contract for each completed week of delay. The total LD shall not exceed 10% of total value of contract.

- 13.1.3. It should be noted that if a contract is placed on the higher tenderer in preference to the lowest acceptable tender in consideration of the offer of earlier delivery, the said contractor will be liable to pay the TNPGL Ltd the difference between the contract rate and that of the lowest acceptable tender in case of failure to complete the supplies in terms of such contract within the delivery period specified in the tender and incorporated in the contract. This is without prejudice to other rights under the terms of contract.
- 13.2. Equipment will be deemed to have been delivered only when all its component parts and its accessories are also delivered. If certain components and accessories are not delivered in time the whole equipment will be considered as delayed unless, the missing parts are delivered.
- The Liquidated damages will also be levied for the quantity not supplied as is done for the delayed supplies. If supplies effected in part could not be beneficially used by the TNPGL Ltd (due to such incomplete supply), liquidated damage will be worked out on the basis of contract price and not on the value of delayed portion only.
- 13.3. If supplies to be rendered against the rate contract are made by the supplier beyond the period of delivery stipulated in the indent and if they are accepted by the TNPGL Ltd, such acceptance is without prejudice to the TNPGL Ltd's rights to levy liquidated damages for the delay in supply.
- 13.4. The suppliers are liable to pay the amount of loss sustained by the TNPGL Ltd in the event of non-execution of orders, if any placed on them either in full or part to the satisfaction of the TNPGL Ltd under the terms and conditions of contract and in the event of placing orders for such quantities on some others at a higher price.
- 13.5. Tenderer's not giving clear and specific acceptance to the above clauses is liable to be rejected.
- 13.6. If there is any downward trend in prices on account of belated supplies, the tenderers have to accept the same with the levy of liquidated damages, for belated supplies.
- 13.7. The defaulting suppliers will be made liable to pay to the TNPGL Ltd in addition to liquidated damages for delay, the actual difference in price, wherever TNPGL Ltd orders the delayed quantity to be supplied/executed by other agencies at a higher rate. This is without prejudice to other rights under the terms of contract.
- 13.8. The TNPGL Ltd will also be at liberty to cancel the order if the supply is not made as per the delivery schedule specified in the order, notwithstanding its rights to claim Liquidated Damages for the belated supplies and quantity outstanding to be supplied as on the date of cancellation.
- 13.9 The actual date of receipt of each material at TTPS Stores with all accessories will be reckoned as the date of delivery for the purpose of calculation of liquidated damages in respect of that material.
- 13.10 The penalty, if any, will be recovered from any amount due to the contractor either in this purchase order / contract or any other Purchase Order / contract placed on him, including SD, Retention amount, Balance amount etc.

14.0. FORCE MAJEURE:

14.1. The supplier shall not be liable for delay in performing his obligations resulting directly or from any force majeure conditions herein defined as:

- a). Any cause which is beyond the reasonable control of the supplier or purchaser as the case may be.
- b). Natural phenomena, such as floods, drought, earthquakes and epidemics.
- c). Act of any Govt. Authority, domestic or foreign, such as wars declared or Undeclared quarantines, embargoes licensing control on production or distribution restriction.
- d). Accident and disruptions such as fire, explosion, increase in power cut with respect to date of tender opening, break down of essential machinery or equipments etc.
- e). Strikes, slow down, and lockouts.
- f). Failure or delay in the supplier's source of supply due to force majeure causes enumerated at 'b' to 'e' above shall be considered, provided the supplier produces documentary evidence to show that there were no other alternative source of supply available to him or if available the lead time required was likely to be longer than the duration of the force majeure at the normal source of supply.

All the provisions of this clause shall apply whether the disruption cause is total or partial in its effect upon the ability of the supplier to perform.

NOTE: The cause of force majeure condition will be taken into consideration only if the supplier notifies within 15 days from the occurrence of such delay.

The purchaser shall verify the facts and grant such extension as the facts justify. For extension due to force majeure conditions, the supplier shall submit his representation with documentary evidence for scrutiny by the purchaser and decision of the purchaser shall be binding on the firm.

14.2. Provided that if the performance in whole or part by the supplier on any obligation under this contract is prevented or delayed by reasons of any eventuality for a period exceeding 60 days, the TNPGL Ltd may at its option terminate the contract by a notice in writing.

14.3. The Power cut shall not be considered under force majeure condition. The period of extension shall be decided only by the authority who placed the order, after verifying the evidence for the cause of delay.

15.0. GUARANTEE:

15.1. The entire materials should be guaranteed for satisfactory performance in the operation and workmanship for a period of **36 months from the date of supply or 24 months from the date of commissioning whichever is LATER** within an overall guarantee period of 36 months from the date of supply.

Any defects noticed during this period shall be rectified free of cost to the TNPGL on intimation of failure. Irrespective of number of failures and repairs the suppliers are responsible for free replacement of the defective materials till the guarantee period over.

In case of any hardware failure which hampers normal operation, the Bidder during the warranty period must provide on-site technical expertise to repair/rectify the problem within a week and if any component is not available at site, the Bidder must arrange to supply these

components at site within additional 48 hours. If a software problem is identified, this problem shall be corrected within one weeks.

After six months of DDCMIS operation the Bidder shall provide the list of parts and expendables utilized for the period. The same information will be provided at the conclusion of the Guarantee.

The incidental expenses, transport and freight charged for the replacement of defective materials within the Guarantee period may also be borne by the supplier till such time as said above.

Contractor shall guarantee that he will support all system hardware and software with spare parts and service for a period of 10 years from the date of successful commissioning of the system.

15.2. The tenderers shall guarantee among other things, the following:

- i) Quality and Strength of materials used.
- ii) Safe electrical and mechanical stresses on all parts of the equipments/ materials under all specified conditions.
- iii) Performance figures given by the tenderers in the Schedule of Guaranteed technical particulars.

16.0. REPLACEMENT OF DEFECTIVE / DAMAGED MATERIALS:

16.1. Notwithstanding anything contained in the above liquidated damages clause when the whole or part of the materials supplied by the supplier are found to be defective/damaged or are not in conformity with the specification or sample, such defects or damages in the materials supplied shall be rectified within two months from the date of intimation of defect/damage either at the point of destination or at the supplier's works, at the cost of supplier, against proper security and acknowledgment. In the alternative, the defective or damaged materials shall be replaced free of cost within two months from the date of receipt of the intimation from the purchaser of such defects or damages. If the defects or damages are not rectified or replaced within this period, the supplier shall pay a sum towards liquidated damages at the rate of (0.5%) half percent value (all inclusive price of such material for each completed week of delay subject to maximum of (10%) Ten percent for the delay from the date of receipt of intimation of the defects or damages.

16.2. In the event of supplies being received damaged or short at the destination stores, the cost of such materials will be paid only proportionate, to the value of the materials received in good condition unless the damaged goods or short supplies are made good free of cost to the TNPGL Ltd by the supplier.

16.3. If during the period of supply, it is found that goods already supplied are defective in materials or workmanship or do not conform to the Specification or are unsuitable for the purpose for which they are purchased then it will be open to the purchaser either to reject the goods or repudiate the entire contract and claim such loss that the purchaser may suffer on the account or require the contractor to replace the defective goods free of cost.

16.4. Similarly, if during the guarantee period stipulated under Guarantee clause subsequent to the date of receipt of the goods, any of the goods be found defective in materials or workmanship, or do not conform to the rate contract or are unsuitable will be open to the purchaser either to repudiate the entire contract and claim damages or accept such part of the goods that are satisfactory and required the contractor to replace the balance or pay compensation to the extent of the loss sustained by the purchase on that account.

16.5. Notwithstanding any other remedies available, the purchaser shall be entertained to dispose off the defective / damaged materials in "as is where is condition" without further notice, if the contractor / supplier fails to rectify the defect and / or replace the damaged materials and / or fails to remove defective/ damaged materials within two months period as per PO terms, from the date of receipt of intimation from the purchaser, TNPGL Ltd reserves right to dispose of such materials. This is without prejudice to the imposition of Liquidated Damages, Ground rent, forfeiture of security deposit etc.,

17.0. FAILURE TO EXECUTE THE CONTRACT:

17.1. Suppliers falling to execute the order placed on them to the satisfaction of the TNPGL Ltd under the terms and conditions set-forth therein, will be liable to make good the loss sustained by the TNPGL Ltd, consequent to the placing of fresh orders elsewhere at higher rate, i.e. the difference between the price accepted in the contract already entered into and the price at which fresh orders have been placed. This is without prejudice to the imposition of penalty under the Liquidated Damages clause and forfeiture of security deposit etc.,

18.0. NON-ASSIGNMENT:

18.1. The supplier shall not assign or transfer the contract or any part thereof without the prior approval of the Purchaser.

19.0. EFFECTING OF RECOVERIES:

19.1. Any loss, arising due to non-fulfilment of this contract or any other contract, will be recovered from the Security Deposit held and / or any other amount due to the supplier from the TNPGL Ltd from this Contract as well as from other contracts.

20.0. PATENT RIGHTS ETC:

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

21.0. JURISDICTION FOR LEGAL PROCEEDINGS (AFTER AWARD OF CONTRACT):

21.1. No suit or any proceedings in regard to any matter arising in respect of this contract shall be instituted in any court, save in Madras the High Court, Madurai Bench or District Court at Tuticorin or Sub-Court at Tuticorin or at the District Munsif Court at Tuticorin. It is agreed that no other court shall have jurisdiction to entertain any suit or proceedings even though, part of the cause of action might arise within the jurisdiction. In case any part of the cause of action might arise within the jurisdiction of any other courts in Tamil Nadu and rest within the jurisdiction of courts outside the state of Tamil Nadu, then it is agreed to between the parties that such suits or proceedings shall be instituted in a court within the state of Tamil Nadu and no other court outside the state of Tamil Nadu shall have jurisdiction even though any part of the cause of action might arise within the jurisdiction of such courts. The successful tenderer shall furnish an undertaking as per schedule in non-judicial stamp paper of **Rs.500/-** agreeing to the above condition.

22.0. ARBITRATION ACT NOT TO APPLY:

22.1. The TNPGL Ltd will not accept any arbitration in case of disputes arising in any respect under this contract. Any dispute arising out of this contract shall not be subject to arbitration under the provisions of Arbitration and Conciliation Act 1996 in the event of any dispute between the parties.

23.0. TEST AT SITE:

23.1. The purchaser reserves the rights of having such tests or may decide up on being carried out at site at his own expenses to satisfy himself that the materials have not suffered any damage during transit.

24.0. RESPONSIBILITY:

24.1. The Tenderer is responsible for delivery of the materials at the destination station in good condition. The tenderer shall include and provide for securely protecting and packing the materials as per relevant packing standards to avoid damages or loss in transit. All risks connected with the supply of these materials should be borne by the supplier.

25.0. MAXIMUM WEIGHTS AND DIMENSIONS OF PACKING :

- 25.1. The supplier is responsible to make sure about the facilities that exist for Road and Rail transport to site, the maximum packages which can be conveyed by the railways and crane lift available at the destination railway station. The supplier is also responsible for any loss or damage during transport and storage for 60 days.
- 25.2. Each case or package should be clearly marked and should contain detailed packing list.

26.0 INSPECTION:

- 26.1. The authorized representatives of the purchaser shall have access to the supplier's or sub-vendor's works at any time during working hours, for the purpose of inspecting the manufacture of the materials and for testing the selected samples from the materials covered by this specification. The supplier or the sub-vendor shall provide facilities for the above.
- 26.2. Tenderers are requested to furnish in their tenders the exact location of their factory with detailed address to enable inspection by TNPGL Ltd if considered necessary.
- 26.3. Not less than 15 days advance intimation shall be given about the quantity of materials that will be ready for inspection to the TNPGL Ltd's Officers. The arrangement for inspection shall be made by supplier in such a way that the delivery schedule is kept up. The materials shall not be despatched without instruction from TNPGL Ltd.
- 26.4. Factory inspection will be done by the TNPGL Ltd's officers to assess the genuineness in manufacturing the tendered materials and to assess whether the firm have infrastructural facilities to manufacture the same.

26.5 Site visit shall be arranged to near by installation where the offered items are in service.

27.0. COMPLETENESS OF TENDER:

- 27.1. The tender should be complete with all details of illustrative and descriptive literature and drawings. The tenderers shall furnish the complete technical details of the equipment/materials. Information regarding the country of manufacture or origin of materials used in the manufacture of the articles should be furnished. The tenderer should include all minor accessories even though not specifically mentioned in this specification but which are essential for the completeness of the materials ordered. The tenderer shall not be eligible for extra charges in respect of such minor accessories though not included in the tender.

28.0. INTERCHANGEABILITY:

- 28.1. All similar parts and removable parts of similar items shall be interchangeable with each other.

29.0. ELECTRICITY RULES:

- 29.1. All works shall be carried out in accordance with the latest provisions of the Indian Electricity Act/Electricity Supply Act and the Indian Electricity Rules there-under unless modified by this specification.

30.0. MATERIALS AND WORKMANSHIP:

- 30.1. All materials, equipments and spare parts thereof shall be new, unused and originally coming from manufacturers' plant to the destination stores. Those including used, rebuilt or overhauled materials/equipments will not be accepted.
- 30.2. All the materials shall be of best class and capable of satisfactory operation in the tropics with humid atmospheric condition. Unless otherwise specified, they shall conform to the requirements of appropriate India Standards. Where these are not available, IEC and American / British Standards shall be followed.

- 30.3. The design shall incorporate every reasonable precautions and provisions for the safety of all those concerned in the operation and maintenance of equipment/ materials.
- 30.4. The materials should be designed to facilitate inspection and repair and to ensure satisfactory operation under atmospheric conditions prevailing at site and under sudden variations of and voltages as may be met with under working conditions in the system including those due to faulty synchronizing and short circuits within the rating of the apparatus.
- 30.5. The design shall incorporate every reasonable precautions and provisions for the safety of all those concerned in the operation and maintenance of equipment.
- 30.6. All the equipments should operate without undue vibration and with the least practicable amount of noise.

31.0. RECOVERY OF DUES:

31.1. The TNPGL Ltd is empowered:

- a). To recover any dues against this contract in any bills/ Security Deposit/ Earnest Money Deposit due to the suppliers either in this contract or any other contract with TNPGL Ltd.
- b). To recover any dues against any other contracts of the suppliers with TNPGL Ltd, with the available amount due to the supplier against this contract.

32.0 SPECIAL SAFETY CONDITIONS:

1. The Contractor shall provide all necessary personnel protective equipments (as per ISI standard) to their workers like safety helmets, safety goggles, welding screen, hand gloves, safety belts, safety shoes, face mask etc. depending upon working condition & nature of job/work and shall be worn by the Contractor and his workmen while at work.
2. All the appropriate and relevant safety measures stipulated under the Factories Act 1948 and Tamil Nadu Factories Rules 1950 made there under shall be scrupulously followed by the Contractor and his workmen.
3. In case of any accidents/ injuries to the contract workers takes place due to non supply (or) Non-ISI standard safety equipments or due to careless working or due to improper handling of the equipment/tools etc., the same shall be at the risk and cost of the Bidder only. TNPGL will not be responsible in any way either legally or financially to the same and the Bidder will have to pay compensation to his labourers in such cases.
4. The Contractor should not allow his workmen to wear loose garments like lungies, dhotis, and smoke cigarettes, beedies etc. while at work inside the plant premises.
5. No workmen below the completed age of 18 years should be engaged by the Contractor for any works TTPS except between hours of 6AM to 6PM.

32.1 Work:

1. The work should be done carefully and without hindrance to other agencies/ TNPGL who are on the work in the area.
2. For any damage/ misusing or theft to TNPGL equipment during work, the Bidder will be solely responsible and the loss due to this shall be borne by the Bidder.
3. If the Contractor does not carry out the work to the entire satisfaction of TNPGL Engineers in-charge, the Contractor will be liable for termination without assigning any reasons there for.

4. The tenderer should inspect the site and take out a thorough assessment of the nature of the work and satisfy him before tendering. Any representation at a later date under any circumstances on any account will not be entertained.
5. Only with appropriate welding electrodes as per the direction of TNPGL Engineer in-charge should carry out high pressure welding work.
6. Based on the actual works undertaken, the bill will be claimed and paid.
7. The work shall be carried out continuously and completed within a period as directed by TNPGL Engineer in charge of work.
8. Any modification (or) alteration required in the existing arrangement shall be at Contractor's scope.

32.2 General Safety:

1. Safety precautions shall be adopted strictly during the work.
2. The area shall be cleaned after completion of work.
3. The Contractor shall adhere to all safety precautions and statutory provisions for the workmen. TNPGL cannot be held responsible for any accidents due to the carelessness of the workers. TTPS will not be responsible in any way either legal or financial to the same. The bidder will have to pay compensation in such cases. Insurance policy should be submitted to TTPS before starting the work.
4. Only 24V hand lamp shall be used for internal works. Floor lights, if required have to be arranged by the Contractor.
5. Every portable electrical tool to be used shall be with three pin plug and three wire system only to avoid electrical shock during work. Proper earthing shall be provided for both at supply point and at equipment before commencement of the work.
6. IGBT welding sets shall be used for welding purpose.

32.3 LABOUR LAW:

The contractor should fulfill strictly all the conditions as stipulated in the Contract Labour (R&A) Act 1970 and the Rules 1975 made there under and Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 & Rules 1983.

- 1) The Contractor who desires to take up works contracts for TNPGL/TANTRANSCO should deploy 20 or more workmen on a day of emergency (or) in necessity.
- 2) The Contractors shall comply with all the provisions of the Contract Labour (Regulation & Abolition) Act, 1970 and Tamil Nadu Contract Labour (Regulation & Abolition) Rules 1975 as modified from time to time and shall also indemnify TNPGL/TANTRANSCO from all and against any claims under the aforesaid Act and the Rules. The contractors should also submit the copy of the Labour License before executing the works.
- 3) The Contractors who desires to engage the migrant workmen (workmen from other states) for the works contracts of TNPGL/TANTRANSCO is required to comply with all the provisions of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 and Tamil Nadu Rules, 1983 as modified from time to time and shall also indemnify TNPGL/TANTRANSCO from all and against any claims under the aforesaid Act and the Rules. The contractors should also submit the copy of the migrant Labour License before executing the works.
- 4) The contract shall be terminated if the contractor fails to obtain a license under section 12 of the

Contract Labour (R&A) Act 1970 within 10 days of award of contract. The contractors are advised to maintain the records as per section 78 of Contract Labour (R&A) Rules 1971 in respect of each work for which labours are engaged as detailed below:

1. Muster roll in Form XVI.
2. Register of wages in Form XVII
3. Register of Over Time in Form XVIII
4. Every contractor should ensure that all the workers engaged by the contractors are paid the minimum wages as per the PWD schedule of rates.
5. Every contractor should pay the wages before expiry of seventh day as per Section 65 and shall issue wage slip in Form XIX to workmen as per section 78 (b).
6. Every contractor shall issue a photo identity card in Form 25C as per Rule 103C and time card in 25B as per section 103B of Tamil Nadu Factories Rules 1950.
7. The tenders of the tenderer/ tenderers who do not follow the Minimum wages as contemplated in Point 4 above will be summarily rejected.

33.0. PAST PERFORMANCE:

33.1. The intending tenderers shall furnish the details of various supply orders/work contracts executed by them for the past three years as on the date of Tendering in the proforma enclosed in the Tender Specification as per Schedule-D along with end user Certificate for satisfactory performance of the materials supplied.

33.2. The details furnished by the tenderers shall be in complete shape and if it is found that any information is found omitted, suppressed, incomplete or incorrect, the same will be taken note of while dealing with the Tenders in future. Tenders furnished by the tenderers without these accompanying details of their past performance are liable for rejection.

34.0. CLIMATIC CONDITIONS:

The materials are for use in T.T.P.S, Tamil Nadu and should be satisfactory for operation under tropical conditions in Tuticorin.

- a. The ambient temperature will be within the range of +10°C to +50°C
- b. Maximum atmospheric humidity will be in the range of 95%.
- c. Average number of thunder storm days per annum is 65.
- d. Average number of dust storm days per annum is 5.
- e. Average number of rainy days per annum is 65.
- f. Average annual rainfall is 10.00 cm.
- g. Climatic conditions are prone to wide variation in ambient condition and equipments offered under this specification shall be suitable for installation at the Sub-Station in TTPS or other P.H.
- h. All electrical devices shall be given tropical and fungicidal treatment. Fog, smoke and mild acids are also present in the atmosphere.

35.0. RAW MATERIALS:

34.1 It is the responsibility of the tenderer to make his own arrangement to procure the necessary raw materials required for the manufacture.

36.0 TEST CERTIFICATES:

The test certificates in triplicate for the materials furnishing the results of the tests as per latest issue of ISS shall be forwarded and got approved before the materials are dispatched. In addition to the tests called for in the specification, the purchaser reserves the right of having such tests as he desires carried out at his own expenses to satisfy himself that the materials conform to the requirements of this specification. The materials may be rejected if the test results are not satisfactory. The type test certificates (Photostat Copies) as per latest ISS / International Standards such as IEC shall be furnished with the tender for reference (if required).

SPECIFICATION NO. CE / TTPS - 4119 -S/2025-26
SECTION - VI - FORMATS
SCHEDULE-A
PRICE BID
(Price to be quoted in BOQ Excel Sheet by downloading
and the same should be uploaded)

Name of Work:

Sl. No.	Description	Qty.	Unit Price in Rs.				FOR (D) ** PRICE IN Rs.
			Ex-Works	*P&F (in INR)	F*I (in INR)	GST in % (Percentage)	Unit Total (including, P&F, F&I and applicable GST)
1.	Design, Engineering, Supply of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls as per technical Specification enclosed. As per SECTION-VII TECHNICAL SPECIFICATION	1 set	To be quoted on-line in BOQ				
2.	Dismantling existing outdated 9020 control systems and Erection, Testing and Commissioning of New Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls in Unit-III as per Scope of Work, Special & Safety conditions and ESI & EPF conditions. As per SECTION-VII TECHNICAL SPECIFICATION	1 set	Basic Rate (Lum sum in INR)	GST in % (percentage)	Total (including GST)		
			To be quoted on-line in BOQ				

Company Seal:

Signature :

Designation :

Company :

Date :

- NOTE: 1) The lowest tenderer will be arrived based on the total evaluated rate for both Supply and Erection charges.
- 2) If required, the thermal power stations/power utilities mentioned in the purchase orders/work awards uploaded by the bidder for satisfying the BQR condition will be inspected by the purchaser in order to ascertain the technical suitability of the offer and post-performance of the DDCMIS commissioned.
- 3) The evaluation will be done only based on the prevailing rules for the Supply and Erection as per GST Act.

- 4) The all inclusive price shall be considered for evaluation of bidders. The all inclusive price shall include (Ex works price + P&F+ Freight and Insurance) + GST + any other charges (if any)
- 5) In respect of works contract where both supply of goods and services are involved, the respective GST for supply of Goods and Services to be rendered shall be taken for evaluation purpose.
- 6) The employer contribution of EPF will not be reimbursed. The contractor should register their establishment under Pradhan Mantri Rojgar Protsahan Yojana (PMRPY) Scheme with the Employees provident Fund Organization.
- 7) While quoting the rates the bidder shall indicate the HSN Code (Harmonized System Nomenclature code) and SAC (Service Accounting Code) for all the tendered items as per GST Act.
*P&F – Packing and Forwarding; F*I – Freight and Insurance;
** For supply at the Destination stores at TTPS / TUTICORIN in Tamil Nadu.

SCHEDULE-B1
SCHEDULE OF MATERIALS AND DELIVERY PERIOD
 (To be filled in by the Tenderer)

Sl.No.	Description	Qty.	Delivery Period
			From the Date of Receipt of Purchase Order.

Company Seal:

Signature :
 Designation :
 Company :
 Date :



SCHEDULE-B2

SCHEDULE OF ERECTION & COMMISSIONING PERIOD

(To be filled in by the Tenderer)

Sl. No.	Description / Activity	Erection & Commissioning From the Date of Receipt of Purchase Order

Note: Requirement of unit shutdown should also be mentioned along with the period.

Company Seal:

Date:

Signature :

Designation :

Company :



SCHEDULE – 'C-1'
DEVIATION FROM TECHNICAL SPECIFICATION

All Technical Deviation from the Specification shall be filled in by the Tenderer, Clause by Clause, in the Schedule.

SECTION NO.	CLAUSE NO.	DEVIATION

The tenderer hereby certify that the above mentioned are the only deviations from the technical Specifications and confirms to the specification in all other aspects.

Company Seal:

Signature :
Designation :
Company :
Date :



SCHEDULE – 'C2'
DEVIATION FROM COMMERCIAL SPECIFICATION

All Deviations from the Commercial terms shall be filled in by the Tenderer, Clause by Clause, in this Schedule.

SECTION NO.	CLAUSE NO.	DEVIATION

The tenderer hereby certify that the above mentioned are the only deviations from the Commercial terms of the Specification.

Company Seal:

Signature :
Designation :
Company :
Date :

SCHEDULE-D

STATEMENT OF SUPPLY ORDERS - EXECUTED / UNDER EXECUTION DURING THE PAST TEN YEARS AS ON THE DATE OF TENDER

NAME OF EQUIPMENT / MATERIAL:

Sl. No.	Name & Address of the Organization	PO No. & Date and whether copy Enclosed	Qty.	Value of Order in Rs. Lakhs	Schedule Date of Completion of Order.	Actual Date of Completion of Order.	Date of Successful commissioning	Whether End User Certificate enclosed yes/No If yes Date of issue of End user certificate	Period of satisfactory Performance as per End User Certificate
1	2	3	4	5	6	7	8	9	10

Company Seal:

Signature :
Designation :
Company :
Date :



SCHEDULE – E

DECLARATION FORM
(To be signed by the tenderer)
Strike off, whichever is not applicable:

To
The Chief Engineer,
Tuticorin Thermal Power Station,
Tamil Nadu Generation and Distribution Corporation,
Tuticorin - 628004, Tamil Nadu

Dear Sir,

Having examined the above specification together with the accompanying schedules etc., we hereby offer to manufacture and supply the equipments/ materials covered in this Specification at the rates entered in the attached schedule of prices.

We hereby guarantee the particulars entered in the schedules attached to the Specification.

1. In accordance with the Security cum Performance guarantee Clause 9.0 Section-V, of the specification, we agree to furnish security cum performance in the form of DD/Bankers Cheque/Bank Guarantee to the extent of 5% of the Contract value (All-inclusive price) of each and every indent issued during the contract period till the expiry of the Guarantee.
2. Our company is not a potentially Sick Industrial Company or a Sick Industrial Company in terms of Section-23 of Section-15 of the Sick Industrial Companies (Special Provisions) Act, 1985.
3. Our company is not blacklisted by Government or public sector undertaking.

Yours faithfully,

PLACE	:	SIGNATURE	:
DATE	:	DESIGNATION	:
COMPANY SEAL	:	COMPANY	:

SCHEDULE-F

UNDERTAKING FOR PAYMENT OF DUES TO TNPGL

THIS DEED OF UNDERTAKING EXECUTED AT..... ON THIS
THE.....DAY OF..... (MONTH) TWO THOUSAND TWENTY SIX BY
M/s.

Hereinafter called the "TENDERER" (Which expression where the context so admits mean and include their agents, representatives, Successors – in – office and Assigns)

TO AND IN FAVOUR OF..... THE TAMIL NADU POWER GENERATION CORPORATION LIMITED, a Body Corporate, incorporated under Companies Act 1956, having its office at TTPS, Tuticorin-628004, herein called the "TNPGL" (which expression shall where the context so admits mean and include its successors in office and Assigns.)

WHEREAS the Board has called for an undertaking from the Tenderer empowering the Board to recover the dues if any.

NOW THIS UNDERTAKING WITNESSETH that the Board is empowered to recover any dues against this contract in any bills / Security Deposit / E.M.D. due to the Tenderer either in this contract or any other contracts with the Board. Further, the Tenderer hereby authorizes the Board to recover, any dues against any other contract of the Tenderer with the Board with the available amount due to the Tenderer against this contract.

IN WITNESS WHERE OF Thiru._____ acting for and behalf of the Tenderer has signed this deed on the day, month and year herein before first mentioned.

SIGNATURE OF THE TENDERER.

NAME :
DESIGNATION :
DATE :
COMPANY SEAL :

IN THE PRESENCE OF WITNESSES:

- 1) Signature :
Name in Block Letters :
Full Postal Address with Pin code :
- 2) Signature :
Name in Block Letters :
Full Postal Address with Pin code :

SCHEDULE-G

UNDERTAKING IN LIEU OF E.M.D.

(To be furnished in non-judicial stamp paper of value not less than Rs.500.00)

THIS DEED OF UNDERTAKING EXECUTED AT..... ON THIS THE.....DAY OF..... (MONTH) TWO THOUSAND TWENTY SIX BY M/s. Hereafter called "Tenderer" (Which expression shall where the context so admits mean and include their Agents, Representatives, Successors-in-office and Assigns).

TO AND IN FAVOUR OF..... THE TAMIL NADU POWER GENERATION CORPORATION LIMITED, a Body Corporate, incorporated under Companies Act 1956, having its office at TTPS, Tuticorin-628004, herein called the "TNPGL" (which expression shall where the context so admits mean and include its successors in office and Assigns.)

WHEREAS THE tenderer is required to pay Earnest Money Deposit of Rs..... for participation in the tender for supply of in terms of Specification No.

AND WHEREAS the tenderer is exempted by the TNPGL from payment of EMD in the form of cash, subject to the tenderer executing an undertaking to the value of Rs..... (Rupees.....) representing the amount equivalent to the amount of EMD specified to be paid to the TNPGL in the event of non-fulfilment of breach of any of the conditions of the tender by the Tenderer as mentioned hereunder.

AND WHEREAS in consideration of the acceptance by the TNPGL of the above proposal, the Tenderer has agreed to pay to the TNPGL the said amount of Rs..... in the event of:

- 1) Withdrawing his tender before the expiry of validity Period (OR)
- 2) Withdrawing his tender after acceptance (OR)
- 3) Violating any of the conditions of the tender issued by the competent Authority

NOW THIS UNDERTAKING WITNESSES that in pursuance of the said agreement the Tenderer hereby doth convenient with the TNPGL that in consideration of the "TNPGL" waiving the condition of payment of EMD in cash in terms of the said Specification, the Tenderer has agreed to pay to the TNPGL Rs..... (Rupeesonly) in the event of:

- i) Withdrawing his tender before the expiry of validity period.
- ii) Withdrawing his tender after acceptance
- iii) Violating any of the conditions of the tender issued by the Competent Authority.

NOW THE CONDITION OF THE above written undertaking is such that if the tenderer shall duly and faithfully observe and perform the conditions specified as above, then the above written undertaking shall be void, otherwise it shall remain in full force.

The tenderer undertakes not to revoke this guarantee till the contract is completed under the terms of contract.

The expression, 'tenderer' and the ' TNPGL ' hereinafter before used shall include their respective successors and assign in office.

IN WITNESS WHEREOF THIRU..... acting for and on behalf of the Tenderer has signed this deed on the day, month and year herein before first mentioned.

SIGNATURE
 NAME IN BLOCK LETTERS
 SEAL OF THE COMPANY

IN THE PRESENCE OF WITNESSES:

1) Signature
 Name & Address

2) Signature
 Name & Address

*** **

SCHEDULE- H

UNDERTAKING TOWARDS JURISDICTION OF LEGAL PROCEEDINGS

This undertaking executed at on this..... (Date)..... (Month) TWO THOUSAND TWENTY SIX by M/s. Registered under Companies Act, 1956 having its registered office at hereinafter called the contractor (which expression shall where the context so admits mean and include its successors in office and in favour of Tamil Nadu Generation and Distribution Corporation Limited, a Body Corporate, incorporated under Companies Act 1956, having its registered Office at No.144, Anna Salai, NPKRR Maaligai, Chennai - 600 002 herein after called the Purchaser (Which expression shall where the context so admits means and includes its successors in Office and assigns).

WHEREAS a contract for the supply of..... has been awarded in favour of the contractor under the Purchase Order No. Dated.....

AND WHEREAS in accordance with terms of the above mentioned Purchase Order, the contractor has to furnish an undertaking to the effect that no suit or any proceedings in regard to any matter arising in any respect under this contract shall be instituted in any court other than in the Madras High Court, Madurai Bench or District Court at Tuticorin or Sub-court at Tuticorin or at the District Munsif Court at Tuticorin as the case may be.

IN CONSIDERATION of the TNPGL having agreed to accept the undertaking the contractor hereby undertakes that no suit or any proceedings in regard to any matter arising in respect of this contract shall be instituted in any Court, save in the Madras High Court, Madurai Bench or District Court at Tuticorin or Sub-Court at Tuticorin. Or at the District Munsif Court at TUTICORIN as the case may be. It is agreed that no other court shall have jurisdiction to entertain any suit or proceedings, even though, part of the cause of action might arise within their jurisdiction. In case any part of the cause of action might arise within the jurisdiction of any other Courts in Tamil Nadu, and rest within the jurisdiction of Courts outside the State of Tamil Nadu, then it is agreed to between the parties that such suits on proceedings shall be instituted in a Court within the State of Tamilnadu and no other Court outside the State of Tamil Nadu shall have jurisdiction.

IN WITNESS WHEREOF Thiru..... of M/s..... hereby put his hand and seal for due observance of the Undertaking in the presence of the following witnesses.

COMPANY SEAL:

SIGNATURE :

DESIGNATION:

COMPANY :

DATE :

WITNESSES:

1)

2)

SCHEDULE-I
TENDER ACCEPTANCE LETTER (e-tender)

To be signed with company seal on letter head and uploaded in the technical Bid

TENDER ACCEPTANCE LETTER (To be given on Company Letter Head)

Date:

To

The Chief Engineer,
Tuticorin Thermal Power Station,
Tamil Nadu Generation and Distribution Corporation,
Tuticorin - 628004, Tamil Nadu.

Dear Sir,

Sub: Acceptance of Terms & Conditions of Tender.

Tender Ref. No: **4119-S , OPENING DUE ON 08.04.2026.**

Name of Tender/Work: **Design, Engineering, Supply, Erection, Testing and Commissioning of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls by dismantling existing outdated 9020 control systems in Unit – III of TTPS.**

1. I/We have downloaded / obtained the tender document(s) for the above mentioned Tender/Work' from the web site(s) namely:
As per your advertisement, given in the above mentioned website(s).
2. I/We hereby certify that I/We have read the entire terms and conditions of the tender documents from page No.----- to -----(including all documents like annexure(s), schedule(s), etc.,) which form part of the contract agreement and I/We shall abide hereby the terms / conditions / clauses contained therein.
3. The corrigendum(s) issued from time to time by your department/ organization too has also been taken into consideration, while submitting this acceptance letter.
4. I/We hereby unconditionally accept the tender conditions of above mentioned tender document(s) corrigendum(s) in its totality / entirety.
5. We hereby guarantee the particulars entered in the schedules attached to the Specification.
6. In accordance with the Security cum Performance guarantee clause-9.0, Section-V, of the specification, we agree to furnish security cum performance guarantee to the extent of 5% of the contract value (All-inclusive price) valid till the expiry of the Guarantee.
7. Our company is not a potentially Sick Industrial Company or a Sick Industrial Company in terms of Section-23 of Section-15 of the Sick Industrial Companies (Special Provisions) Act, 1985.
8. In case any provisions of this tender are found violated, then your department/organization shall without prejudice to any other right or remedy be at liberty to reject this tender/bid including the forfeiture of the full said earnest money deposit absolutely.

Yours Faithfully,

(Signature of the bidder, with official Seal)

SCHEDULE-J

Declaration to be submitted by the L1 bidder in Non Judicial Stamp Paper of value not less than Rs.500/-

To

Date :

The Chief Engineer,
Tuticorin Thermal Power Station,
Tuticorin – 4.

We hereby declare and confirm that we are registered vendor under GST Act having GSTIN _____ in State of _____. Our applicable GST @ _____ % Extra / GST @ _____ % Inclusive against this Tender specification No. / Enquiry No _____, dt. _____ is under HSN / SAC code _____.

We hereby declare and confirm that we are registered vendor under composite scheme having GSTIN.

We are aware that as per Sec 171 of CGST Act, any reduction in rate of tax on any supply of goods or services or the benefit of input tax credit should be passed on to TNPGL by way of commensurate reduction in prices and as such we hereby declare that we are extending of _____% as rebate in my awarded price against input tax credit benefit.

(OR)

We hereby declare that we do not have any input tax credit benefit on account of GST applicable against this Tender specification No. /Enquiry No _____,dt. _____. If it is established that we have availed input tax credit benefit against this job, the differential tax benefit will be returned to TNPGL failing which TNPGL may take appropriate action.

Signature of bidder with Company Seal

Note :

1. Each page should be signed.
2. Bidder may strike out the para not applicable.

SCHEDULE-K

e-BANK GUARANTEE FOR EMD

(B.G for EMD shall be executed on Non judicial stamp paper of Rs. 500/-)

Beneficiary:-----

Date:-----

Bid Guarantee No:_____

We have been informed that (insert name of bidder) (herein after called „the bidder“) has submitted to you its bid dated (insert date) (herein after called „the bid“) for the execution of **Design, Engineering, Supply, Erection, Testing and Commissioning of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower System, Turbine protection System and Power plant controls by dismantling existing outdated 9020 control systems in Unit – III of TTPS** at Tuticorin Thermal Power Station, Thoothukudi Dist., Tamil Nadu.

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the bidder, we (name of the Bank) hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of (amount in figures)_____(amount in words) _____ upon receipt by us of your first demand in writing accompanied by a written statement stating that the bidder is in breach of its obligation(s) under the bid conditions ,because the Bidder:

- a) has withdrawn its bid during the period of bid validity specified by the Bidder in the Form of Bid; (or)
- b) having been notified of the acceptance of its Bid by the Employer during the period of validity (i) fails or refuses to execute the Contract Form, if required, or ii) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders.

This guarantee will expire:(a) if the bidder is the successful Bidder, upon our receipt of copies of the contract signed by the Bidder and the Performance Security issued to upon the instruction of the Bidder and (b) if the bidder is not successful Bidder, upon the earlier of (i) our receipt of copy of your notification to the Bidder of the name of the successful Bidder; or (ii) twenty eight days after the expiration of the Bidder’s Bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC publication No 758.

Signature

With seal of the Bank
(Name in block letter)

In the presence of witness:

- 1 . (Name in capital and address)
- 2 . (Name in capital and address)

SCHEDULE- L

Declaration towards EPF & ESI remittances

Name of the contractor:

EPF Main code number:

ESI Main code number:

Nature of the work:

Contract /K2 agreement No:

1. I/We hereby state that (Name of the contractor) has been duly registered under EPF Act and ESI Act vide main code number _____ and _____ respectively.
2. I/We hereby declare that the EPF & ESI employee and employer contribution has been remitted for all the workers engaged for execution of the subject contract entered with TNPGL.
3. I/We hereby certify that there are no EPF & ESI dues to be remitted in respect of the period of execution of the subject contract and in case, any shortfall of discharging the EPF & ESI obligations is found on our part (contractor) at later date, TNPGL shall not be responsible for the consequent legal/financial obligations.
4. In the event of EPF & ESI obligations are found on our part (contractor) in respect of subject contract, the same will be duly discharged by me/us to the respective authorities.

Authorized Signatory of the Contractor
(With name, designation, seal and company seal)

Date:

Place:

SCHEDULE-M
DECLARATION PURSUANT TO SECTION 206AB
(To be obtained from applicable Suppliers)

This is to declare that..... (Name of the Supplier) have filed the Return of Income (ROI) under the relevant provisions of the Income Tax Act, 1961 for the Assessment Year 2022-23 and 2023-24 (FY 2021-22 and 2022-23) and we shall file the ROI for Assessment Year 2025-26 (Financial Year 2023-24) which the due date as per the provisions of the said Act.

Permanent Account No. (PAN) of our Company/Firm/individual isThe details of Return of Income filed are as below:

Sl.NO	Assessment year	Acknowledgement No	Date of Filing
1	2022-23		
2	2023-24		

Place:

Date:

(Authorized Signatory)

Signature & Seal

SCHEDULE N
FORMAT FOR AFFIDAVIT

(To be submitted by bidder on non-judicial stamp paper of Rs.100/-(Rupees Hundred only) duly attested by Notary Public)

AFFIDAVIT

This affidavit is executed by Bidder company name on day ----- for the tender of TNPGL / Tuticorin Thermal power station for the bid "Design, Engineering, Supply, Erection, Testing and Commissioning of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for open loop Control Systems (OLCS), Closed Loop Control Systems (CLCS), Furnace Safeguard Supervisory System (FSSS), Soot Blower system, Turbine Protection systems and Power Plant Controls by dismantling existing outdated 9020 control systems in Unit-III of TTPS" vide enquiry no. We / I hereby declare and undertake on oath as follows.

1. We / I shall have for their full responsibility for supply and for successful completion of the DCS/DDCMIS works including, Guarantee, in all respect as per Tender specification and for spares, support as mentioned below for 10 years from the date of commissioning.

The Distributed control system (DCS) spares are

- 1) DCS Controllers
- 2) DCS Communication modules
- 3) DCS Input and output modules
- 4) DCS Engineering software.
- 5) DCS Operation software.
- 6) Any other DCS related OEM's proprietary related materials.

I..... the proprietor / Authorised signatory of M/s do hereby confirm that the contents of the above affidavit are true to my knowledge and nothing has been concealed there from and that no part of it is false.

DEPONENT
SEAL AND SIGNATURE OF THE TENDERER

Verified at this day of DEPONENT
Attested By (Notary Public)

ANNEXURE-I

INDEMNITY BOND AND CERTIFICATE FOR EPF & ESI

The contractor should indicate and produce the following certificate with list (Annexure) of employees employed by them for the works of the month and their contribution towards EPF/ESI.

EPF Code No. of the firm:

ESI Code No. of the firm:

ANNEXURE

Sl. No.	Name with father's name of the labour engaged	Wages paid in Rs.	EPF Amount Paid			ESI amount paid		
			Employer contribution	Employee contribution	Date of payment	Employer contribution	Employee contribution	Date of payment

Summary:

- 1.Date of payment made to the employee.
- 2.Date of payment for EPF/ESI subscription along with the copy of challan.

Certified that I have remitted the monthly subscription of EPF (Employee Contribution) / ESI (both employers and employee) to all the workers employed by me in TNPGL/ MTPS for works, for the month of

Certified that all necessary returns to the EPF/ESI organization have been submitted within the stipulated time as required under the said EPF/ESI & MP Act 1952.

Certified that the employer's contribution of the mentioned workers in respect of EPF will be availed from PMRPY scheme or it would be borne by us.

INDEMNITY BOND:-

Agree to comply the provisions of the EPF/ESI& MP Act 1952 or any modification there of any other law relating thereto and rules made there under from time to time.

Signature of bidder with Company Seal

ANNEXURE – II

CERTIFICATE

To

(Name and address of the selling
Dealer)

.....
.....

GST NO.

**It is hereby certified that the goods listed below are purchased by us for use in
generation, transmission and distribution of electrical energy.**

Sl.No.	Invoice No./Date	Description of Goods	Qty.	Value (Rs.)

(Rupees only).

Place : Date :

(SIGNATURE)

Name :

Status :

Seal of Office :

CHECK LIST

"Check List" on specific documents to be furnished in tender/ "Questionnaire" on particulars

1. EMD: Rs.23,60,000/- (Rupees Twenty Three Lakhs and Sixty Thousand Only)

- a. The-receipt of payment of emd through NEFT/RTGS through Account Transfer/E-BG.
- b. The proof of exemption of EMD i.e SSI or NSIC/MSME/ Acknowledgment Part – II
- c. Undertaking in lieu of EMD along with two witnesses
- d. E-Bank Guarantee for EMD.
- e. Copy of PEMD certificate for **Rs.40 Lakhs** or above with TNPGL Head quarters or TTPS

2. For BQR Requirement:

- a. Manufacturer proof i.e ISO certification / License to manufacture / any other valid evidence for manufacturing.
- b. Experience proof i.e Order copies.
- c. End user certificate if required
- d. Copy of Profit and Loss account for the year 2021-22
- Copy of Profit and Loss account for the year 2022-23
- Copy of Profit and Loss account for the year 2023-24
- e. Copy of Balance Sheet for the year 2021-22
- Copy of Balance Sheet for the year 2022-23
- Copy of Balance Sheet for the year 2023-24
- f. Attested copy of Annual Turn Over certified by practicing Chartered Accountant

4. Technical Bid

5. Financial Bid

6. Furnishing of Schedule A to N (Relevant Schedules only)

Note: All the boxes should be marked

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Technical Specification

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**TAMIL NADU POWER GENERATION CORPORATION LIMITED
TUTICORIN THERMAL POWER STATION
SPECIFICATION NO: CE/TTPS -4119- S / 2025-26**

**SECTION-VII
Technical Specification**

Name of work:

Sl. No.	DESCRIPTION	QTY
1.	Design, Engineering, Supply of latest Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control System (CLCS), FSSS, Soot Blower Systems, Turbine Protection Systems and Power Plant Controls in Unit-III as per technical Specification enclosed.	1set.
2.	Dismantling of the existing Old System and Erection, Testing and Commissioning of New Distributed Digital Control Monitoring and Information Systems (DDCMIS) for Open Loop Control Systems (OLCS), Closed Loop Control System (CLCS), FSSS, Soot Blower Systems, Turbine Protection Systems and Power Plant Controls in Unit-III as per Scope of Work, Special & Safety conditions and ESI & EPF conditions.	1set.

Note:1)The lowest tenderer will be arrived based on the total evaluated rate for both Supply and Erection charges (i.e., Sl.No. 1+2).

2) If required, the thermal power stations/power utilities mentioned in the purchase orders/work awards uploaded by the bidder for satisfying the BQR condition will be inspected by the purchaser in order to ascertain the technical suitability of the offer and post-performance of the DDCMIS commissioned.

Encl.: Drawing 8 Nos.

**Sd/-
CHIEF ENGINEER (FAC),
TUTICORIN THERMAL POWER STATION,
TUTICORIN – 628 004.**

SECTION – IA TECHNICAL SPECIFICATION	
01.00.00	General
01.01.00	Tuticorin Thermal Power Station (TTPS) of TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGL) is coal/ oil fired 5 x 210 MW Power Plant. In unit -III (210MW), Control & Instrumentation system supplied by M/s keltron 9020 close Loop Control System (CLCS) and relay based open loop control system(OLCS), FSSS, Soot Blower System etc., supplied by M/s. BHEL are in service since 1982. It is proposed to take the renovation and Modernization of the CLCS, OLCS, BMS and Peripheral instrumentation system with a suitable latest DCS system. The technical specification covers the requirement of the proposed DCS package for the CLCS,OLCS, BMS system and Peripheral instrumentation system in Unit III.
01.02.00	This specification is intended to cover:
01.02.01	a. Dismantling of the existing Open Loop Control System, Close loop control system, BMS and peripheral instrumentation system and other sub systems including system cabinets, cables & field instruments etc., b. To provide new Close loop control system, Open Loop Control System, BMS and Peripheral instrumentation system to make it as a common platform for OLCS,CLCS and BMS shall be provided by the Bidder.
01.02.02	Design, Engineering, manufacturing, fabrication, assembly, pre-shipment testing at manufacturers' works including Factory Acceptance Test (FAT), supply and delivery, (properly packed for transportation) on FOR site basis, Storage at Site, Installation, supervision, testing at site including Site Acceptance Test (SAT), commissioning the Distributed Control System (DCS), other field Instruments etc., with all spares, accessories, auxiliaries, interfaces and documentation, training, guarantee, etc. and the whole system shall be handed over in a fully operational condition acceptable to the TAMIL NADU POWER GENERATION CORPORATION LIMITED(TNPGL) Engineers.
01.02.03	The DCS system shall be of latest version, based on Microprocessor and a well proven one in the field of Control & Instrumentation in Coal/ Oil fired power plant capacity of 210 MW and above in India. The workstation based DCS (or) Client server based DCS (Dual redundant with cold server total 3 Nos) shall be accepted. PLCs, Safety PLCs are not acceptable. All the controllers of DCS including BMS shall be in same controller. This controller must be in service for BMS purpose for at least one year in any one of 200 MW coal & oil fired Boiler in India.
01.02.04	The requirements for Distributed Digital Control Monitoring and Information System (DDCMIS) are indicated on functional basis in this specification. Bidder shall be responsible for engineering, selection and connection of all components and sub-systems to form a complete system whose performance is in accordance with functional, hardware, parametric and other requirements of this specification. It is not the scope of the specification to specify each and every component of individual system/ equipment, since the bidder have full responsibility for the Engineering, Design and furnishing a complete system.
01.03.00	INSTRUCTION TO VENDORS
01.03.01	Bidders shall submit their bids for the complete scope of work as per the detailed specification, general condition and requirement based on single line diagram ref. Drawing "System configuration diagram", inclusive of field erection materials, spares and according to the site requirement indicating clearly the price break-up.

01.03.02	The vendor shall visit the site and check the existing systems, location of the various systems, proposed location of the systems to be supplied against this specification, check the location of the field instruments to be replaced, cable gallery and bid accordingly.
01.03.03	As this is a Retrofit job, the Bidder shall make necessary provision for works, which shall be essential for the completion of the contract, though not explicitly mentioned in this specification without additional cost.
01.03.04	Bidder shall confirm the delivery schedule for DCS & other Field instruments etc., in accordance with this specification.
01.03.05	The work shall be carried-out in the tentative Annual Overhaul Program of Unit- III will be in the month of September 2026 . However the exact date shall be confirmed from TAMIL NADU POWER GENERATION CORPORATION LIMITED(TNPGCL)
01.03.06	This work shall be consistent with modern power plant practice and shall comply with all applicable codes, standards, statutory Regulation, safety requirements in force on the date of the award of this contract. The equipment and installation shall confirm to high standard of engineering design and workmanship in all respects and shall be capable of performing reliable continuous operation in a manner acceptable to the TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGCL).
01.03.07	It shall be the responsibility of the Bidder to co-ordinate with the TAMIL NADU POWER GENERATION CORPORATION LIMITED(TNPGCL) Engineers and offer a complete system as per the scope of work outlined in this specification and also in accordance with the single line diagram and the write-up thereon. In the event of conflict between any two clauses of this specification the more stringent requirement shall apply, unless otherwise confirmed in writing by the TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGCL)-Engineers before the award of the contract based on a written request by the bidder.
01.03.08	Substitution: Shall, in the better performance of the work, the Bidder finds it necessary or desirable to make a substitution for either material or function, he shall request to make the substitution in writing. No substitution shall be made without the written approval of TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGCL).
01.03.09	No price adjustment will applicable for <ul style="list-style-type: none"> • Any change in specification, which results in changes in calibration, scale, range or other minor modification. • Any requirements that are specified on a system basis where the functional requirement of the TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGCL) remains unchanged.
01.03.10	The words 'Bidder', 'Vendor', and 'Contractor' have been used interchangeably in this document. Generally, the words 'Vendor', 'Contractor' will mean the successful bidder.
01.03.10.01	Bidders shall have in their manufacturing range major components/ Items of the total system, specially control system, analog and digital inputs scanning equipment. They shall have the facility to engineer, assemble, integrate and test the total system at one place to ensure complete system functioning before dispatch of the system/components to site.
01.03.10.02	Bidders shall have developed standard application software packages and have the capability to customize these packages as per TAMILNADU POWER GENERATION CORPORATION LIMITED (TNPGCL)'s specifications.

01.03.10.03	If a Bidder is a licensee of a collaborator, who meets the above specified bid qualification requirements, the critical components of the instrumentation and control system must be manufactured at the works of the collaborator. Otherwise bought from a sub vendor meeting the bid qualification requirements and with prior approval of TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGL). These critical components are deemed to include controllers, and electronic modules. Total backup guarantee for design, manufacture, engineering, supply, erection, testing and commissioning must be provided by either the collaborator or the sub Vendor, meeting the bid qualification requirements. The guarantee shall include support for a minimum of 15 years from the date of taken over.
01.03.10.04	The vendor shall make arrangement for the TAMILNADU POWER GENERATION CORPORATION LIMITED (TNPGL) Engineers (minimum of Six Nos.) to visit a commissioned and satisfactorily working power plant of capacity 200 MW or above coal & oil fired Thermal station in India, in which the system quoted is installed.
01.03.11	All the works shall be carried out to the entire satisfaction of the TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGL).
01.03.12	The vendor shall take care of the complete requirement of the system. The additional instruments required due to the modifications to be made by the vendor shall also be taken care off. And this shall not be limited to the quantity specified in the bid, but shall fully meet the requirements at the time of execution of the job, without any additional cost implication to TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGL).
02.00.00	TRAINING REQUIRED FROM THE BIDDER
02.00.01	Bidder's experienced engineers shall provide training course on offered DDCMIS in all aspects to T.T.P.S. maintenance and operation Engineers in the following areas. <ol style="list-style-type: none"> 1. Operator Training 2. Hardware Maintenance Training 3. Software Training 4. Any other specialized training as required for system operation & maintenance <p>a. Maintenance Engineer's Training: The training shall be for a minimum of Ten Maintenance Engineers in Four groups (Totally 40 Nos.) at the works of the original manufacturer of the DCS. The training shall be split into Initial level, Advanced level and special training on Historian etc. one week. Initial level training shall be of minimum of 10 engineers within 60 days from the date of P.O.</p> <p>b. Operation Engineer's Training: The training shall be for a minimum of Forty Five Engineers at TTPS site for one week in the DCS System. The training shall be given in minimum of six groups and for each group the training shall be at least for one week.</p>
03.00.00	General specification of Distributed Control System (DCS):
03.01.00	SCOPE
03.01.01	This document provides the general technical specification for Renovation & Modernization of C&I system supplied by M/s Keltron 9020 controls/Kerala and relay based CLCS, OLCS, FSSS, Soot Blower System etc supplied by M/s. BHEL system in Unit - 3 at TTPS, 210 MW on the following areas: <ol style="list-style-type: none"> 1. Closed loop control system (CLCS) along with replacement of field transmitters, control room indicators and recorders. 2. Open loop control system (OLCS) and sequential Operation of main

	<p>equipments like ID/FD/PA Fans, Mills, Air Pre Heater, Boiler feed Pumps, Condensate Pumps, SOP, Cooling Water pumps, HP/LP Heaters, Hydrogen system, Seal Oil/Stator Water system, TG oil system, Cooling Water Pump House etc,</p> <ol style="list-style-type: none"> 3. Burner Management System. 4. Soot Blower System 5. Generator Electrical Parameters with transducers for monitoring and Turbo-Generator Auto Synchronizer with all accessories and Switch Yard parameters. 6. Turbine Protection System 7. Annunciation system 8. Balance of plant consisting of measurement of parameters of Boiler, Turbine and Generator peripheral instruments. This includes Stator water system, Seal oil system, Hydrogen gas System and provision of Transmitters etc. <p>It is intended to include all the above systems in the proposed DCS System. Vendor has to quote for latest DCS system in field of power plants of capacity 210 MW and above. This specification is intended to define the minimum requirements for design, installation and operation of the system, as well as define the requirements for reliability, environment and testing. The operator work stations (OWS) of the DCS proposed are of WINDOWS-10 or Latest Version of WINDOWS based system.</p> <p>The offered system shall be OPC complaint. OPC server and all other hardware/Software license for the complete TAGs shall also be supplied so that the system can be readily connected to any third party OPC complaint device.</p> <p>The offered system shall be suitable for environmental conditions of TTPS.</p> <p>New cables and cable trays required are to be supplied and erected by the Vendor.</p>
03.01.02	<p>The functions of these systems are to provide the operator with the ability to perform all the control functions from the Operator stations and Engineering stations, online performance calculations and all other operator interface and control functions. In addition, the system have to provide the facilities for log reports, system self-diagnostics, process engineering analysis, process modeling, trouble shooting and to include advance controls in future. The vendor's scope of work described in the specification includes, but is not limited to the following item:</p> <ul style="list-style-type: none"> • Project Management • Detailed work plan consistent with the schedule and the program. • Detailed engineering and design. • Hardware and software design. • Quality Assurance Programs. • Instruction Manuals. • Packing, transport and delivery will be under the Scope of bidder. • Engineering Design, Installation testing, Commissioning, documentation including field erection of all transmitters, recorders, indicators in Unit control board, junction boxes, laying of cables and other related works.
03.02.00	DESIGN PHILOSOPHY
03.02.01	<p>The design philosophy is Microprocessor based Distributed Digital Control Monitoring and Information System (DDCMIS), which shall be configured to meet the following basic requirements.</p> <ul style="list-style-type: none"> • High Availability. • High Reliability. • Flexibility in maintenance. • Compact design. • The controllers shall be offered with the maximum capability in order to minimize the numbers of the same without sacrificing the performance criteria and prescribed maximum loading. • Expandability, Modularity and Scalability.

	<ul style="list-style-type: none"> • Future application capability using Advanced Process Control techniques and Optimization solution for plant operation. • Seamless integration capability with Asset Management/ CMMS, ERP and plant wide MIS network. • Adherence to industry accepted open standards and protocols. • The workstation based DCS (or) Client server based DCS (Dual redundant with cold server total 3 Nos) shall be accepted. PLCs, Safety PLCs are not acceptable.
03.02.02	<p>DCS shall be complete with following sub-systems with associated software and hardware interconnected with each other.</p> <ul style="list-style-type: none"> • Engineering Subsystem and Centralized Historian. • Fully redundant Controller, I/O subsystem for Closed loop control, Open Loop Control (Sequential/ Protection/ Interlocking), 2 out of 3 Controller for turbine protection system, BMS, Data Acquisition & SOE. • Operator interface (HMI). • Fully redundant Communication and Data Highway • Subsystem for Foreign Device Interface <p>All the controllers shall directly sit on the Main data Bus without the use of any intermediate device for interfacing. All the controllers of DCS including BMS shall be in same controller. This controller must be in service for BMS purpose for atleast one year in any one of 200MW coal and oil fired Boiler in India</p>
03.02.03	<p>The Controller and I/O subsystem shall be capable of performing the following functions using the same family of hardware and same control strategy development software to formulate the control/ DAS strategies:</p> <ul style="list-style-type: none"> • Closed Loop Control System (CLCS) • OLCS (Sequential/ Protection and Interlocking) • Burner Management System • Soot Blower system • Data Acquisition • SOE (for selected digital inputs) with 1 msec resolution and it shall be necessarily integrated one. <p>Operator interface sub system forms the interface between operator/engineer with the automated control system. It shall be possible to integrate any 3rd party devices seamlessly with system using standard serial open standard protocols like MODBUS Master-Slave/ MODBUS RTU (OR) through Ethernet to the plant data highway. Necessary hardware and software shall be supplied.</p> <p>The control system must allow for direct communication with major PLC makes used in Power Plants and shall support peer-to-peer communication between the DCS control processor and the PLCs. This communication network shall be capable of being able to communicate with an open protocol that is both redundant and deterministic.</p>
03.02.04	<p>The control system must have a centralized (with global database) fully redundant historian nodes (i.e., redundant instances of identical data base with automatic redundancy). Operator station based distributed history databases shall not be acceptable.</p>
03.02.05	<p>The DCS shall be designed and built for continuous operation and shall be of adequate size and flexibility to perform the functions described in this specification. The number of types and sizes of modules shall be kept to a minimum in order to reduce the extend and cost of spare parts required. Equipment shall be provided with status/operation indicating lights and other features required to facilitate testing. A</p>

	<p>means of checking the operation of the entire system shall be included and online self-checking diagnostic routines shall run automatically. Such routines will not only notify the operator of a malfunction, but also indicate the module / area in which the malfunction is located.</p> <p>Vendor's equipment and circuit designs shall follow industry accepted design practices. All components, including solid state devices, transformers, resistors, relays, etc. shall be of a premium quality and shall be used in the equipment in a way that will ensure high reliability, minimum maintenance requirements and low failure rates. Ease of maintenance shall be primary consideration in the equipment design. All components designed into the equipment shall be operated below their electrical and thermal rated values, taking into account all possible combinations of operating environments, power source ranges and transient conditions as described in this specification.</p>
03.02.06	<p>The MMIPIS as specified shall be based on latest state of the art of Workstations and technology suitable for industrial application & power plant environment. The Workstation employed for MMIPIS implementation shall be based on industry standard hardware and software, which will ensure easy connectivity with other systems and portability of Employer developed and third party software. These will be 32/64 bit or higher machines.</p> <p>It shall be noted that the specification for MMIPIS hardware mentioned elsewhere in this document is indicative. The PC to be provided by the bidder shall be branded one with latest configuration available in the market at the time of supply and shall be subject to Employer's approval. The software packages to be included with the PC shall also be the latest version available at the time of supply.</p> <p>Redundant sets of communication controllers shall be provided to handle all the communication between the MMIPIS and redundant system bus and to ensure specified system response time and parametric requirements. Each communication controller shall have message checking facility. Power Fail Auto Restart (PFAR) facility with automatic time update shall be provided.</p> <p>The keyboard shall be qwerty type. (Standard ASCII Key board) The LAN to be provided under MMIPIS shall support TCP/IP protocol (Ethernet connectivity) and shall have data communication speed of 10 MB Baud or more. All network components of LAN and Workstations shall be compatible to the LAN, without degrading its performance. It shall be ensured that failure of this network component(s), shall in no way affect unit's operation, monitoring & control.</p>
03.02.07	<p>Use of standard Procedures:</p> <ul style="list-style-type: none"> • The system shall be composed of manufacturer's standard hardware and systems software, which can be configured to meet the open system configuration. The system shall be OPC compliant. OPC server, all other hardware and Software license for the complete TAGs shall also be supplied so that the system can be readily connected to any third party OPC complaint device. • Vendor's standard operating system software shall not be modified to meet any of Project's requirements. • The Vendor's system shall be designed in a manner such that the implementation of application software requires no modification to the system operating software.
03.02.08	<p>Field Proven Systems</p> <p>All the hardware and the software supplied with the system shall be field proven in Power Plant prior to placement of order. Field Proven is defined as successful</p>

	<p>operation of the quoted hardware & software at a field installation for a minimum period of 1 year trouble free operation.</p> <p>Vendor shall guarantee that he will support all system hardware & software with spare parts and service for a period of 15 years from the date of successful commissioning of the system.</p>
03.02.09	<p>Distributed/Open Architecture:</p> <p>The system shall be a distributed microprocessor based system. It shall permit data acquisition and control functions to be performed at remote locations while providing the capability to monitor and control the functions from an operating station in a control room. The system shall be sufficiently flexible that it can be configured to a wide range of requirements at the loop and component level. The system shall have hardwired backup for control of OLCS/CLCS/BMS/TPS etc for emergency operation.</p> <p>In addition, the system shall be based on "open" system architecture to enable easy integration with Management Information System (MIS) for plant wide automation. The open capabilities shall also allow third party software (such as optimization software or expert systems) to be an integral part of the systems. Communications with other devices shall be via industry standard protocols. The system shall be OPC compliance.</p>
03.02.10	<p>RESPONSE TIME:</p> <p>The system shall have adequate speed of response through all regimes of system loading. The minimum conditions to be ensured are as follows:</p> <ul style="list-style-type: none"> • Keyboard command to field equipment shall be executed in less than 1 second from the last operator action commanding the change under worst loading condition and confirmation of the same shall be displayed on the screen within 1.5 seconds. The worst loading condition can be explained in Clause 04.02.16. • For operator requested display, the response time shall be 1 - 2 seconds under all loading conditions. This time is defined as the time between pressing of the last key and appearance of last character on screen. • The digital inputs except for those connected for SOE shall be scanned and the database updated at an interval of 100 milliseconds. The digital inputs of SOE shall be monitored at 1 millisecond resolution. • The interlock and protection control loop response time shall be less than 100 milliseconds. • Cycle time for all closed loop controls, shall be of the order of 250 milliseconds for selected critical loops and 500 milliseconds for other closed loops. • Cycle time for Analog measurements shall be in the order of 1 second. (For monitoring parameters only). • On the LED MONITOR, the dynamic parameters shall be updated in 1 second interval.
03.02.11	<p>SPARE CAPACITY AND SYSTEM EXPANDABILITY:</p> <p>Over and above, the equipment and accessories required to meet the fully implemented system as per specification requirements, DDCMIS shall, have spare capacity and necessary hardware/ equipment accessories to meet following requirement for future expansion at site:</p> <p>Spare capacity</p> <ol style="list-style-type: none"> a. Redundant capacity is not considered to be spare capacity. b. Process I/O racks shall contain 20% installed spare I/O channels fully wired upto marshalling cabinets and ready for the usage in all respects. Other system components to support the spare I/O such as process I/O power supply capacity,

	<p>terminal block, I/O cables, I/O communications, etc., shall also be installed with 20% spare capacity.</p> <ul style="list-style-type: none"> c. Process I/O racks shall have an additional 10% spare rack space only, without installed modules. d. Process control device shall be sized such that not more than 60% of processing capability and memory is utilized including installed capacity of 20% as indicated in (b) above. e. 20% spare relays of each type and rating, mounted and wired in relays cabinets. All contacts of relays shall be terminated in terminal blocks of relay cabinets. In each of the relay cabinets 20% spare terminal blocks shall be provided so that additional relays can be mounted and wired. f. The spare capacity as specified above shall be uniformly distributed throughout all cubicles. The system design shall ensure that above-mentioned additions shall not require any additional controller/ processor/ peripheral drivers in the system delivered at site. Further, these additions shall not deteriorate the system response time/ duty cycle, etc. from those stipulated under this specification. <p>SYSTEM EXPANDABILITY:</p> <ul style="list-style-type: none"> a. Modular system design shall be adopted to facilitate easy system expansion. The system design shall include the capability and facility for atleast 25% future hardware expansion (relative to bid), which shall be achieved by the addition of controller modules, process I/O cards, drive control modules, auto/manual stations, push button stations, peripherals like LED MONITOR/Keyboards, printers etc., without modifying or replacing existing equipment, communication cables or system operating software, while the existing system is fully operational. b. Each installed communication system shall have 25% node expansion capability for future development and still be capable of meeting the requirements of this specification. The Bidder shall provide estimated loading of the communication systems to substantiate this requirement. c. The system shall have the capability to add any new control loops groups/ subgroups, in control system while the existing system is fully operational.
03.02.12	<p>ON LINE MAINTENANCE:</p> <p>It shall be possible to remove/replace online various modules (like I/O module) from its slot for maintenance purpose without switching off power supply to the corresponding rack. System design shall ensure that while doing so, undefined signaling and releases do not occur and controller operation in any way is not affected (including controller trip to manual, etc) except that information related to removed module is not available to controller. Further, it shall also be possible to remove/replace any of the redundant controller module without switching off the power to the corresponding rack and this will not result in system disturbance or loss of any controller functions for main controller. The on-line removal/insertion of controller, I/O modules etc. shall in no way jeopardize safety of plant and personnel.</p>
03.02.13	<p>Fault Diagnostics</p> <p>The DDCMIS shall include on-line self-surveillance, monitoring and diagnostic facility so that a failure/malfunction can be diagnosed automatically down to the level of individual channels of modules giving the details of the fault on the programmer station LED MONITOR displays and printers. The faults to be reported shall include fault in main & standby power supplies, sensor fault, any channel fault in 2 out of 3 channels etc.</p>

	These faults on LED MONITORS as well as local indication on the faulty channel/ module and on corresponding rack/ cubicle shall be available. The diagnostic system shall ensure that the faults are detected before any significant change in any controller output has taken place. Failure of any I/O modules, Controller etc. shall be suitably grouped and annunciated to Annunciation facia and to OWS.
03.02.14	Fault Tolerance: The DDCMIS shall provide safe operation under all plant disturbances and on component failure, so that under no condition the safety of plant, personnel or equipment is jeopardized. Control System shall be designed to prevent abnormal swings due to loss of Control System power supply, failure of any Control System component, open circuits/ short circuits, instrument air supply failure etc. On any of these failures, the controlled equipment/ parameter shall either remain in last position before failure or shall come to fully open/close or on/off state as required for the safety of plant/ personnel/equipment and as finalised during detailed engineering.
03.02.15	DDCMIS shall meet all requirements stipulated under other Sub-sections/sections of the specification including General Technical Conditions, General Technical Requirements, Quality assurance, parametric requirements etc.
03.02.16	Signal Exchange All the signal exchange between various functional groups of each control group (i.e., within CLCS, OLCS, BMS, SB etc) shall be implemented through redundant Main system bus (The main bus connecting various sub-systems) and local system bus within a subsystem as per the standard practice of the Bidder. It shall be ensured that any single failure in electronics involved for such communication, e.g., communication controllers, bus interface modules, physical communication media, etc. does not result in loss of such signal exchange and there in no deterioration in specified system response and system parametric requirements. In case a controller utilizes some inputs generated/ processed by any other controllers/ functional group and the requirement of controller response time as specified in Clause 3.02.10 is not met due to inadequate communication rate/ procedure, then the Bidder shall provide hardwired signal exchange for such inputs. Bidder shall furnish documentary evidence through its standard catalogues and drawings explaining as to how this requirement is being met by them. Bidder shall also furnish along with the above documents, list of coal fired thermal power stations where the proposed scheme for such signal exchange is already working. Further, Bidder to note that if his offered system cannot meet the above requirement of communication redundancy and specified system response & parametric requirements then all the signal exchange, analog as well as binary among various functional groups shall be carried out through hardwiring only and not through bus system. However, if in the opinion of the TNPGL, a few signal exchanges are found required to be hardwired, the same shall be provided by the Bidder. Control and protection signal exchange between control system of OLCS, CLCS, BMS, SB etc shall be hard wired only. Protection signals like MFT/TPS shall necessarily be hardwired even for exchange within the same sub-system.
03.02.17	No single failure either of equipment or power source shall be capable of rendering any part /system/sub-system of DDCMIS in-operative to any degree.

03.02.18	Redundancy Requirements
03.02.18.01	<p><u>General Requirements</u></p> <ul style="list-style-type: none"> <li>a. Failure of any one redundant part shall not interrupt other system functions. A failure can be a hardware failure, software failure, power supply failure, or the loss of the AC feeder in a dual feeder system. <li>b. Redundant equipment hardware and software shall be continuously monitored for errors. Switchover to the backup device shall occur automatically upon failure of the primary device. It shall be possible to manually switchover (change from backup to active status) any redundant module. <li>c. Automatic / manual switchovers shall not interrupt other system operations. <li>d. Current operating parameters shall be continuously updated on backup equipment. <li>e. Switch back to required equipment shall be by manual command. <li>f. It shall not be possible for an external or third party system connected through a communications interface to interrupt the operation of any device within the system. There shall be security in these interfaces to limit access of external systems and suitable fire wall shall be offered. <li>g. Redundant devices shall have two independent paths to the redundant data communication system. <li>h. System shall have inherent feature of auto rebooting after power restoration. <li>i. Software shall be automatically loaded in CPU, whenever it is removed and inserted and also in case power interruptions. <li>j. Separate (DUAL) feeders shall be provided for each Controllers / cabinet section.
03.02.18.02	<p>Redundancy Equipment:</p> <p>Process controllers shall be offered in fully redundant configuration. Both controllers in the redundant configuration shall be connected to the same I/O bus such that no single failure shall shutdown the operation of the plant.</p> <p>All communications equipment shall be redundant. This includes equipment required for process controllers and process interface units to communicate with I/O nests and power supplies etc. The I/O cards for the critical input/ output of OLCS shall also be redundant.</p> <p>Critical process functions of a system shall dictate that redundant equipment configuration be provided to achieve required system reliability levels. The system shall require redundant input modules, output modules, regulatory controllers and other parts of the system.</p>
03.02.18.03	<p>System redundancy</p> <p>All nodes of the system shall be interconnected with a redundant high throughput communication bus. Provision shall be made for connection of redundant data highways through two independent ports. Communication redundancy shall be provided in the form of dual data highways and interface electronics such that no single failure can degrade communications between nodes in any way. Both data highways shall operate simultaneously so that any failure is reported to the system immediately.</p> <p>Failure of any system or component, which interfaces with data communication system, shall not cause failure to the data communication system or any of its other components.</p>

	<p>Failure or planned shutdown of any one device connected to the communications network shall not affect the ability of the system to communicate with any other device on the network.</p> <p>Separate data highway redundant communication processors in each node shall handle all inter-node communication and data transmission.</p>
03.02.19	<p>SOFTWARE PROTECTION:</p> <p>The licenses of the software packages of the proposed DCS & associated sub systems shall not be locked through any Computer Hardware IDs, dongles, USB locks, keys, etc. If such license locking is used for prevention of piracy, then the vendor shall guarantee to provide replacement license at free of cost throughout the entire life of the supplied systems, in the event of failure of such locks/ computer components. The replacement licenses for failures shall be supplied at site within 48 hours.</p> <p>The software licenses shall be provided for the project (e.g organization or site license) and shall not be hardware/machine specific. That is if any hardware/machine is upgraded or changed, the same license shall hold good and it shall not be necessary for TNPGL to seek a new license/renew license due to upgradation / change of hardware/machine in</p> <ul style="list-style-type: none"> i) OWS&EWS ii) HISTORIAN STATION iii) SOE <p>Every operator workstation shall be licensed to view, operate entire plant regardless of particular section of the plant it may belong.</p> <p>In case of failure of license locks, the DDCMIS system shall be continuously and fully functional without any performance degradation, for which temporary license until replacement of the defective locks shall be provided at the time of main supply itself.</p> <p>The vendor shall also provide details regarding the effect of failure of such license locks on the working of the system.</p>
03.02.20	<p>SOFTWARE REVISION LEVELS</p> <p>The Vendor's standard system operating software delivered to the installation site shall be the most recent field proven revision level available at the beginning of the Factory Acceptance Test (FAT) which is applicable to the system hardware. The Year of release with evidence should be submitted at the time of FAT. All future up gradation/ improvement shall be updated in the system without any extra cost implication.</p> <p>The system shall allow for upgrading of system operating software on all redundant modules of the system without necessity of shutting down the process, without losing the window to the process (operator interface) and without losing any control functions.</p>
03.02.21	<p>THIRD PARTY EQUIPMENT:</p> <p>Equipment provided as part of this system but not manufactured by the Vendor shall be of current manufacture by the original Vendor at the time of placement of contract or order and TNPGL's approval shall be obtained for bought out system/ equipments. i.e. it shall be currently available for sale from the original manufacturer at the time of placement of contract or order. All such equipment shall meet all applicable project specifications and standards referenced in this specification.</p>
03.02.22	<p>ENVIRONMENTAL CONDITIONS:</p> <p>Location : TTPS/Tuticorin</p>

	<p>Nearest airport : Madurai/ Tuticorin</p> <p>Nearest railway station : Tuticorin</p> <p>Nearest major port : Tuticorin</p> <p>Altitude above MSL : Sea Level.</p> <p>Approach Road : 12Kms from Tuticorin</p> <p>Ambient Temperature</p> <p>Max : 41 deg C</p> <p>Min : 15.2 deg C</p> <p>Max daily Avg : 33 deg C</p> <p><i>Relative Humidity</i></p> <p>Maximum during Monsoon : 100 %</p> <p>Minimum : 21 %</p> <p>Average : 75 %</p> <p>Rain fall</p> <p>Annual Average : 64 Cm</p> <p>Period : 75 % occurs during October to December</p> <p>Climatic Condition : Tropical</p> <p>Seismic Data</p> <p>a. Zone as per IS 1893 : Zone II</p> <p>b. Basic Horizontal seismic co-efficient : 0.02</p> <p>c. Importance factor : 1.5</p> <p>The system shall be designed to meet the power plants environmental conditions and shall be dust proof (due to Coal and Ash dust prevailing in the plant). Necessary hardware required to protect the system electronics shall be offered as a minimum. All the hardware of the controllers and I/O modules as minimum shall adhere to Corrosion resistant, suitable for harsh environment.</p>
03.02.23	<p>EQUIPMENT NOISE:</p> <p>The maximum acceptable noise level for each piece of equipment installed in the control room (CR) shall be 55-db noise level.</p>
03.03.00	<p>ELECTRICAL REQUIREMENTS:</p>
03.03.01	<p>This section defines the minimum electrical requirements for the system.</p>
03.03.02	<p>GENERAL:</p> <p>Safety requirements:</p> <p>All the equipment covered in this specification for DCS shall be located in general-purpose non-hazardous area, normally in control/computer room. However, the field instruments such as transmitters, process switches and final control elements including I/P converters shall be located in the field and shall be specified as per the electrical area classifications.</p>
03.03.03	<p>TRANSIENT STATIC AND EMI PROTECTION:</p> <p>a) Transient/ Surge and Fault Protection:</p> <p>All electrical equipment shall incorporate electrical transient protection on the power input and on all interface to inputs and outputs. As a minimum, the system shall meet test requirements of IEEE C 37.90.1. (Tests for electrical Transient Protection) or to similar EN standards - IEC801EN50082-2 1996.</p> <p>As a minimum, the system shall be able to withstand applied surges without damage to components and without operating errors according to the requirements of IEEE standard C 37.90.1. Surge withstand capability (SWC) or to similar EN standards - IEC801EN50082-2 1996.</p>

	<p>The system shall be internally protected against system errors and hardware damage resulting from connecting and disconnecting devices or removing of inserting printed circuit board in the system parameter condition.</p> <p>b) Electrostatic Discharge Protection: As a minimum, the system shall be capable of withstanding electrostatic discharges in accordance with IEC 801-2, Level 3 tests. This assumes that system is properly grounded according to manufacturers' recommended practices.</p> <p>c) EMI Protection: The bidder shall ensure the system performance specified herein and shall satisfactorily meet electromagnetic interference (EMI) susceptibility testing.</p> <ol style="list-style-type: none"> 1. REF. Sources such as commercial UHF and VHF hand held personal radio equipment operating at 6 watts nominal output power, in the 150 to 170 and 450 to 470 MHz bands at a distance of three meters shall not cause neither a signal disturbance more than 0.1 percent of range for controllers nor cause a system error for other components, upon keying or transmitting. 2. For the EMI sources, the DCS system shall be rated for radiated electromagnetic emission susceptibility test of 2-dB: 0.5% span for controllers and not cause a system error for other devices. The equipment design shall incorporate techniques such as isolation, shielding, grounding, gasketing, filtering and bonding as necessary to meet this requirement. 												
03.03.04	<p>Power Systems:</p> <p>a) AC Electrical Power: AC power required for UPS will be provided by TTPS from the existing system. This shall be 3-phase 415VAC \pm 20%, 50 Hz \pm 3 Hz. The Bidder shall design and supply suitable Parallel Redundant UPS system with Valve Regulated Lead Acid Battery backup for 30 minutes. TTPS/TNPGCL shall provide three different electrical source of three phase supply of 415 volts and this will fed to the UPS as normal input for UPS-I, UPS-II and Bypass supply for UPS-I & UPS-II. Converting these supplies to the DCS system requirement shall be designed and provided by the vendor. The requirement of power for the DCS and other subsystem equipment through distribution panels with required power cable shall be under vendor's scope. Except, the above three (3) input feeders, interconnection cables related to UPS and other distribution panel shall be vendor's scope.</p> <p>b) Power Supplies and Distribution:</p> <ol style="list-style-type: none"> 1. The DCS system shall be capable of operating at the following power supply specifications: <table> <tr> <td>Voltage</td> <td>:</td> <td>110 V \pm 10% A.C.</td> </tr> <tr> <td>Frequency</td> <td>:</td> <td>50 Hz \pm 3 Hz</td> </tr> <tr> <td>Harmonic content</td> <td>:</td> <td>Less than 5%</td> </tr> <tr> <td>Static Transfer Time</td> <td>:</td> <td>Max 5 Millisecond</td> </tr> </table> 2. Various main load centers of distributed control systems shall be Sequentially started whenever the starting current is high. The requirement of sequential starting shall be specified in job specification. The sequential starting circuit shall be designed using hardware timers and contactors of adequate rating. 3. All cubicles lighting shall be of LED with 230 V, A.C. 50HZ normal power supply (UPS)/Non UPS. 4. Enough redundant power supplies/battery banks shall be provided which shall take 	Voltage	:	110 V \pm 10% A.C.	Frequency	:	50 Hz \pm 3 Hz	Harmonic content	:	Less than 5%	Static Transfer Time	:	Max 5 Millisecond
Voltage	:	110 V \pm 10% A.C.											
Frequency	:	50 Hz \pm 3 Hz											
Harmonic content	:	Less than 5%											
Static Transfer Time	:	Max 5 Millisecond											

	<p>over automatically in case of main common power source failure. All power supplies shall have one to one redundancy and shall be sized for full load.</p> <p>5. Any other supply requirement shall be arranged by the Vendor from the TNPGL's main distribution board.</p>
03.03.05	<p>GROUNDING:</p> <ol style="list-style-type: none"> 1. AC safety ground and instrumentation circuit ground shall confirm to NEC, Article 250. 2. The "AC safety Ground" bus shall be directly bolted to the cabinet without the use of insulators. 3. A 35 Sq mm screw type compression connector shall be provided on either end of each ground bar for inter connecting with other ground buses or to the Instrument System Ground Node (ISGN). 4. Ground buses inside termination cabinets shall be made of solid copper flat measuring normally 25 x 6mm flat, suitably drilled and tapped for screw terminals and wire lugs, or fitted with screw-type compression lugs. 5. The ground bus bars shall be labeled as follows: <ol style="list-style-type: none"> a. "AC Safety Ground" for all exposed metal surfaces of cabinets, racks, and chassis GND connections, etc. Individual wiring interconnections shall be minimum 1.5 Sq mm copper wire, green or green with yellow tracer insulation. b. "Shield Connection" for connecting cable and wire shields Interconnections between shield consolidation points and the bus bar shall be minimum 1.5 Sq mm copper wire, green or green with yellow tracer insulation. c. "DC Reference Ground" (i.e. for all DC analog / digital commons) Interconnections between DC common consolidation points and the bus bar shall be minimum 1.0 Sq mm copper wire, insulation to be green or green with yellow tracer.
04.00.00	<p>SYSTEM CONFIGURATION</p>
04.01.01	<p>The DDCMIS shall be of workstation based system/Client server based system (hot redundant and cold server (3Nos)) will be accepted. DDCMIS shall basically consist of Control System of Boiler, Turbine & Balance of plant (namely CLCS, OLCS Electrical System, BMS, SB including their respective Measurement system), Man-Machine Interface and Plant Information System (MMIPIS), System Programming & Documentation Facility, Data Communication System, Integrated Sequence of Events Recording System (SERS), Annunciation system, UPS system and GPS Satellite Radio clock system. The basic configuration of DDCMIS shall be as indicated in the DDCMIS configuration drawing "System configuration diagram" DRA.NO:01.</p> <p>The DDCMIS shall work in full integration and conjunction with field equipment/drives like pumps, motors, valves, actuators, dampers, and the field instruments to be provided by the Bidder. The DDCMIS hardware (controllers, modules/ cards etc.) shall be housed in cabinets located in control equipment room (CER) except for operation interfaces located in Unit Control Desk (UCD) and Unit Control Panel (UCP) in unit Control Room (UCR).</p>
04.01.02	<p>Semi-circular arc type PC based Operator console for accommodating Six (6) nos. operator stations with Dual 24", latest version LED monitor shall be located in control room and one (1) number operator workstation shall be located in CLCS console. The complete UCB console should be as per DRA.NO:06.</p>
04.01.03	<p>Six (6) nos. Large video screens (LVS), complete with projectors screens, control units for each LVS, (graphical generators) & associated accessories shall be supplied.</p>
04.01.04	<p>Five (5) numbers of engineering work stations with 24", latest version LED monitor shall</p>

	<p>be located in computer room, one each exclusively for the following application.</p> <ul style="list-style-type: none"> • Turbine Protection& Annunciation system • Closed loop control system • Open loop Control system • Burner Management System • Soot Blower & Other system <p>It shall also be possible to view and modify logics & database of other area with relevant passwords from any Engineering Station.</p>
04.01.05	Fully Redundant Historian Stations as per section 1A-04.10.00 shall be supplied
04.01.06	Sequential Event Recorder system having approximately 700 pts. shall be offered as an integrated one. It shall be possible to scan these 600 tags at 1 m.sec rate and alarm message to be printed in a dedicated High Speed Line printer (136 col.). Separate SER PC with 24", latest version LED color monitor shall be supplied for this purpose.
04.01.07	The system shall have Two (2) High Speed Line Printers – 136 Col., 500 LPM, with acquits cover, for logging connected to the Engineering, Operator Stations through Print Server network. The system shall also have Six (6) nos. A4 size colour ink Tank printer with scanner, and Three (3) nos. 24 Pin Dot matrix printer connected to the engineering stations / stations through Print Server network. All the above printers shall be in latest version.
04.01.08	Two (2) Nos. Management Information System latest version PCs with 24" LED color monitor shall be interfaced with the TCP/IP Network.
04.01.09	Redundant GPS Satellite Radio clock shall be provided for DDCMIS system.
04.01.10	<p>Furniture:</p> <p>The Bidder shall provide the following furniture:</p> <ul style="list-style-type: none"> Operator Stations – Consoles & Ergonomically designed Chairs Engineering & Historian Stations & Other PCs (SER),MIS PCs– High Quality PC Table & Ergonomically designed Chairs For all printers – Printer tables.
04.01.11	<p>Annunciation: The existing annunciation field contacts shall be acquired through the DCS and the annunciation system shall be implemented as an in-built function of DCS. All the annunciation shall be incorporated in the LVS with audible alarm. Further 48 Nos. of UCD annunciation facia windows shall be provided for critical alarms.</p>
04.01.12	<p>UCD: Two Nos Back panels 800X800mm for emergency operation, One No 1200X800 mm Electrical System panel, One No. Turbine operation panel 800X800mm shall be provided as per the DRA.NO:06.</p>
04.01.13	Performance calculation shall be available in any one operator Station and at the Engineering / Historian stations.
04.01.14	One lot of pre-fabricated coloured cables; inter panel cables, wires, communication cables and all the erection hardware shall be offered by the Bidder for DCS.
04.01.15	<p>One lot of complete licensed system and application software shall be offered from the Original principle with their licenses for each Operator Stations, Engineering Stations, Historian Stations, LVS (6Nos.), and other PCs. All installed software and drivers shall be in original hardware media like CD .</p> <p>One lot of required licensed development of application software including online performance calculation software shall be offered.</p> <p>One lot of complete original Disk image software for complete operating system for back up like Norton ghost for easy reinstallation of system.</p>
04.01.16	One no. latest state of art numerical based Turbo- Generator Auto synchronizer shall be

	supplied.
04.01.17	One Lot of latest state of art numerical based Trip circuit supervision relays shall be supplied
04.01.18	One lot of mandatory spares as listed in section -1-E (scope of supply) clause no 2.00.00 shall be supplied.
04.02.00	System Design Requirements
04.02.01	The System shall be based on latest state-of-the art technology that has reached a reasonable level of stability. The following aspects shall be necessarily taken care by the bidders in design of their system, which is aimed at maximizing benefits to the TNPGL. Failure to properly design and suite the requirements shall be subject to rejection.
04.02.02	The system shall be modular in nature and facilitate easy expansion/ up gradation of modules to enhance its functionality or performance, if required, at a future date. It shall be possible to expand the system to include at least 10 more Operating Stations (HMI) and additional support to of up to 15,000 control process tags without any requirement of adding any further additional Operator/ Engineering stations. It shall be possible to extent the system further to more than 1,50,000 tags as an integrated system.
04.02.03	The design shall include a wide range of self-diagnostic routines in the repertoire of the system functions to detect and warn the operator about impending or actual system failures. Depending on the nature of the diagnostic, each test can be performed at startup, during operation or on a periodic basis.
04.02.04	The list of self-diagnostics shall include but not be limited to the following: <ul style="list-style-type: none"> a. Input Diagnostics : A/D converter check, sensor out of range check, excessive rate of change check, open T/C detection. b. Configuration Diagnostics : I/O hardware check, Memory check. c. Memory Diagnostics : ROM/EPROM sum check, Memory check. d. Output Diagnostics : D/A converter check, output register check. e. External hardware check : Using Watchdog timer. f. Power System Diagnostics : Monitoring various voltage levels. g. Once a diagnostic test has detected a failure, the failure shall be reported to the operator in the form of an alarm message in the LED MONITOR. The details of the fault shall also be printed with time of occurrence in the alarm printer. h. LED for DI/DO channel status shall be made available on the front interface of the module.
04.02.05	Each device with a direct AC power input shall be protected by suitably rated miniature circuit breaker and fuse installed in the phase line MCBs and fuses for all the devices shall be mounted in the Power Distribution Panels.
04.02.06	I/O hardware must be designed to withstand high-level voltage surges where the field equipment is subject to lightning strikes or large induced voltage spikes. AI/A0 modules shall have signal isolators.
04.02.07	I/O hardware must be designed to render the installed system immune to Radio Frequency Interference (RFI) or other RFI-generating equipment such as motor starters or relays.
04.02.08	Any system hardware shall not generate radiated electromagnetic emissions excess of 1 volt/meter/MHZ at 1 meter from the equipment enclosure. Design shall incorporate such techniques as isolation, shielding, grounding, gasketing, filtering and bonding as necessary to meet this requirement.

04.02.09	<ul style="list-style-type: none"> ➤ The system shall be provided with a shared communication facility over which the various sub-systems can communicate with each other to meet all functional requirements. ➤ The communication facility shall be expandable for future applications without requiring major restructuring. ➤ The communication facility shall be designed in such a way that the failure of any one of its components will not affect the performance. ➤ The communication facility must have provision for interfacing the DCS with other computer systems and peripherals using standard MODBUS protocol.
04.02.10	The Communication speed between the controller and I/O cards shall not be a function of distance and devices connected and shall be truly deterministic in nature. The Network shall be designed such that network traffic levels in no way affect the speed, robustness or viability of the Network data transfer.
04.02.11	Control Logic building (CLCS/OLCS) shall follow Control Drawing/Control Module Concept, wherein relevant functional blocks for a loop shall be contained in a Control Drawing/Module. Loop drawings shall automatically be generated while building the logics (CLCS/OLCS logic/sequence) and the same shall be available for "Run-time" view for diagnostics from all Operators workstations without any duplicate engineering.
04.02.12	Reports/Logs/Messages shall be available for configuration/view/print from all Operator Stations.
04.02.13	Operators shall be able to add/modify the assignment of trend/chart points. No engineering efforts shall be required for that.
04.02.14	All software required for converting the graphics to html format shall be included and the same shall be accessible from any Operator Stations.
04.02.15	Remote Access of DCS through Ethernet for at least 2 concurrent users (exact replica of plant Real Time graphics etc.) through thin client non proprietary software (like web browser-Internet Explorer/Netscape Navigator) shall be supplied. This shall not be done through any PC desktop replicating software and shall not result in any functional degradation of any of the Operator Station in Control Room.
04.02.16	<p>The following parametric tests shall also be conducted under worst case loading conditions as defined below to this sub-section – (details of which shall be as approved by Employer during detailed engineering.)</p> <p>(i) For control system</p> <ul style="list-style-type: none"> - CPU loading, Cycle time/controller reaction time <p>(ii) For MMIPIS</p> <ul style="list-style-type: none"> - CPU loading, spare duty cycle, Memory Spare Capacity <p>(iii) Spare duty cycle for system bus</p> <p>(iv) Various display response time</p> <p>(v) System accuracy</p> <p>(vi) Display update time</p> <p>Worst Case Loading Conditions for Control System (Definition)</p> <p>The worst case loading conditions shall include the following tasks.</p> <ul style="list-style-type: none"> • All process inputs coming to Control System including SOE/annunciation inputs are being scanned, acquired, conditioned and processed. • All closed loop controls are in operation during a disturbed (non-steady) state of the process. • All open loop controls of DDCMIS are in operation during a disturbed (non-steady)state.

	<ul style="list-style-type: none"> • All data being transferred between control system, system bus and HMIPIS. • Four (4) alarms are being generated per second from each of the functional groups of Control System. • Twelve (12) Control command from HMIPIS are being executed in one(1) Minute. • All processors (including hot standby) health being monitored. • All standby processors status being updated. <p>HMIPIS Worst Case Loading Conditions (See note below)</p> <p>The worst case loading conditions shall include the following tasks.</p> <ul style="list-style-type: none"> • Continuous data transfer between System Bus & HMIPIS. • All calculations including performance calculations being performed at the specified rates. • Alarms being reported at the rate of four (4) alarms per second for each of the Control System functional groups. • Two control operator commands for control/ information within a base period of one minute from each OWS & each LVS. • Data collection for all logs/reports in progress. • OWS/LVS displays are in operation as follows: <p>LVS – 1, 4 - Sequence chain display with maximum number of dynamic data items.</p> <p>LVS - 2, 5 - Individual display with maximum number of dynamic data items.</p> <p>LVS – 3, 6 - Plant mimic display with one hundred and twenty (120) numbers of dynamic data items.</p> <p>OWS - 1 - Overview display with max. no. of dynamic data items.</p> <p>OWS - 2 - Group display (twenty points, current data).</p> <p>OWS - 3 - Alarm display of twenty (20) points.</p> <p>OWS – 4 - 4 Nos. Windows each running current trend.</p> <p>OWS – 5 - 8 Nos. Windows each previous trend display.</p> <p>Unit In-charge - Plant overview display OWS</p> <p>All historian Stations X-T plots are displayed & updated.</p> <p>All printers connected to HMIPIS are in operation at rated speed.</p> <p>HMIPIS processors and all peripherals health being monitored.</p> <p>Data collection for trend function and historical data storage in progress.</p> <p>Four alarm acknowledgements within a base period of one minute from each OWS & LVS.</p> <p>Calculations for long term storage of data being performed. SOE printing in progress.</p> <p>Data transfer with other DDCMIS sub-systems, all PLCs and OLCS,CLCSC&I Systems in progress for controls (commands) as well as for information.</p> <p>The Worst Case Loading Conditions For System Bus</p> <p>The worst case loading condition shall mean continuous data transfer between the distributed modules (Control System/HMIPIS), at their individual worst case loading conditions defined above respectively.</p>
04.02.17	The Control System shall have on-line simulation & testing facility.
04.02.18	The system shall have the flexibility to easily reconfigure any controller at any time without requiring additional hardware or system wiring changes and without disabling other devices from their normal operation mode. Modifications shall not require switching off power to any part of the system.
04.02.19	The application programs for the functional controllers shall be software based which shall be maintained even though power supply failure. The bidder should explain this during detailed engineering.

04.02.20	The loop/logic reaction time (from change of input to input module to the corresponding control command output) shall be suitable to match actual process requirements, subject to minimum requirement wherever specified.
04.03.00	CONTROLLER& I/O SUB-SYSTEM
04.03.01	The controller(s) shall be based on 32/64 bit latest version RISC processors or better with adequate memory to meet the functional specifications. The bidder must provide the document of Year of release of the controller.
04.03.02	Redundant controller(s) must be provided in separate racks with individual power supplies per rack and separate communication modules. No damage or failure to any single component, including mechanical, corrosion, electrical, etc., can cause loss of redundant control. Redundancy of controller(s) shall have redundancy in Power supply, CPU, supervisory and I/O communication link card/ cables, redundancy linkages and shall not have any common electronics, not even same back plane.
04.03.03	Control processing switchover time for a redundant pair of controller shall be 10 m.sec or better.(Any better time is acceptable)
04.03.04	Controllers shall not have any moving components like Hard Disk and shall operate only on Real Time Operating System. Soft Controllers and controllers operating on commercial general purpose operating system like Windows 10 or Linux shall not be accepted.
04.03.05	Controllers shall be capable of executing functional blocks @ 50 m.sec or better and all functional blocks/ control strategies shall be executable with deterministic execution times, individually assignable @ 50, 100, 200, 500 m.sec etc. It shall be possible to assign "phasing" for the control modules for execution at slower than base rate, so that the loading of controller as a whole is balanced. Execution of regulatory and data acquisition functions as called sub-routines are not acceptable. Determinism of execution frequency of individually settable function blocks / control strategies is paramount – programs word / byte length dependent "cycle time" will not be accepted.
04.03.06	Each controller provided with the control system shall have the capability of connecting with up to eight I/O racks connected either locally or remote up to a distance of at least 5 km.
04.03.07	DCS controller shall be suitable for location in the field with an operating temperature range of -20 to +70 deg C, 5-95 Non condensing RH and meet ISA S71.04. The hardware shall be compliant to standards like CSA C22.2, FM ISA S12.12, UL-508, and CE-Mark etc. It shall be capable of operating at 0-55 Deg.C and RH 5%-95% (non-condensing.)
04.03.08	The controllers shall have RAM of not less than 8 MB and rechargeable battery back-up for at least 45 days to protect the programs resident in the controllers in case of a prolonged power shut down.
04.03.09	The same family of controllers shall be used to accomplish Sequencing/ Interlocking Open Loop Control System, Close loop control system, Data Acquisition and Sequence of Events (SOE with 1 msec resolution) functionality and Annunciation, Soot blower, BMS, and Turbine protection. The number of controllers required to implement all the functionality shall be decided on the loading of the controllers in terms of all the following: <ul style="list-style-type: none"> ➤ Total I/O handling capacity: upto 60% ➤ Total controller resident memory usage: upto 60% ➤ Total throughput capacity (processing capability): up to 60% <p>If alarming, trending, messaging, dynamic real time data access from graphics consumes</p>

	<p>controller resources, the same effect shall also be taken into account while calculating loading of controllers. In case, 3rd. party device integration is routed through the controllers, resource allocation for the same shall also be taken into account while doing the calculation.</p> <p>The basis of calculation shall be as follows:</p> <ul style="list-style-type: none"> ➤ Execution of CLCS control modules: 200 msec ➤ Execution of OLCS control modules: 200 msec ➤ Execution of DAS control modules: 500 msec ➤ Execution of BMS control modules: 50 msec ➤ Peer-to-peer data exchanges amongst controllers @ 1 no./millisec. ➤ Total number of Operating stations: 12 nos. requesting 50 real-time data/sec ➤ Worst case alarming: 20/sec (burst) from one controller <p>The following indicates the number of control drawings/ modules (explained in 4.03.10 below) for each functionality of the above:</p> <ul style="list-style-type: none"> ➤ CLCS (including Calculations/ Totalizers etc. related to CLCS): 50 nos. ➤ OLCS: Device Control/ Logic/ Sequencing: 200 nos. ➤ BMS: 100 nos. ➤ DAS: 70 nos.
04.03.10	<p>The vendor shall provide detailed calculation on controller loading to derive the required pair of redundant controllers along with supporting documentation/ spec. sheets from the principal manufacturer for the basis of calculation. The system shall have on-line display of controller loading for monitoring purpose.</p> <p>The controller loading shall be demonstrated during Factory Acceptance Test (FAT), and Site Acceptance Test (SAT). During any stage of the test, if it is found that the controller load is beyond the specified limit, the Bidder shall supply and commission additional controllers and their accessories as required meeting the specification, without any additional cost and time implication to the TNPGL.</p> <p>The philosophy of development of control strategies shall follow a hierarchical structure. Related functional blocks pertaining to a particular function of an equipment (e.g. ID Fan # 1 Start up) / control scheme shall be contained in a proper control drawing/ module. The development of such control drawing shall be possible using graphical object oriented tools from the engineering station. Unrelated functional blocks shall not be combined in a control drawing.</p> <p>The control drawings generated from engineering environment shall automatically be available for monitoring control execution and make changes to settable control parameters from operating stations (HMI). The required software to accomplish the same shall be included in the offer. It shall not call for any duplication of engineering efforts to build such "detailed control displays".</p> <p>The controller must be tightly integrated with the human interface.</p> <p>All process conditions (interlocks, sequence logic conditions, etc.) shall be visible on any operator station with no display development. This shall be built into a point detail display. The operator, with proper access, shall have the ability to bypass an interlock from this display without creating custom graphic displays. The</p>

	control strategy development tool shall not be required to be used to allow an operator display to visualize the control module or sequential control chart from a point detail display.
04.03.11	The philosophy of the control system shall be that of an integrated global database. The engineering for control shall create a single database, which need not be duplicated for work station / operator stations separately. Alarms and Events shall also be a part of that. Users shall not have to create process alarms/ messages in the operators' stations separately.
04.03.12	The control engineering environment shall have ready to use function blocks to build all CLCS, OLCS and DAS strategies included but not limited to the following: <ul style="list-style-type: none"> ➤Regulatory and DAS (CLCS & DAS): PID/ PID with FF, Calculator, General purpose array, Flag, Converter, Remote cascade, Bias, Ratio bias, Dead time, Lead –Lag, Ramp, Positional proportional, Override selector, Switch, Auto-Manual, Fanout, Totalizer, Pulse etc. ➤Discrete logic : as per IEC 1131 standards ➤Sequential control: as per S88.01 standards
04.03.13	The I/O subsystem shall have redundant link with the controller (redundant communication cards and cables). The controller-I/O data highway shall be redundant with a deterministic >4 MBPS open industry standard protocol. All the I/O cards shall have filed to system isolation. The individual types of cards shall meet the following: <ul style="list-style-type: none"> ➤AI: For 0/4-20 mA input, Max number of channels: 8/16, Resolution: 16 bit with Open circuit detection with programmable Fail-safe values, Accuracy: 0.1% or better. Multiplexer cards will not be acceptable. ➤T/C, RTD, Potentiometric Inputs: 8/16 points max, Optionally AI cards with current converter shall be offered, if the system is unable to accept any of the above type. ➤AO: For 0/4-20 mA output with current limitation, Max. No. of channels: 8/16, Output impedance shall be 750 ohms minimum. ➤DI: 8/16/32 points /card max. DI cards for SOE shall have time stamping @ 1msec resolution at the card level. However, the SOE inputs shall be freely available for any other control function like other non-SOE DI. ➤ DO: 8/16/32 points /card max. All DO shall be provided with Interposing relays
04.03.14	Online modification shall be possible to change set point, Analog I/P range, tuning constants, Pulse Width & Pulse duration, operating mode, controller configuration etc., from Engineering Station.
04.03.15	The controller shall be capable of carrying out following alarm check functions: <ol style="list-style-type: none"> a) Input open/output open check b) High High, High, Low and Low Low alarms c) Velocity and deviation alarms d) Alarm hysteresis e) Alarm bypass f) Alarm output off.
04.03.16	The system shall be capable of sending the following messages to the operator interface sub- system: <ol style="list-style-type: none"> a) Self Diagnostic Alarms b) Process Alarms c) Loop status changes

04.04.00	DCS INPUT / OUTPUT MODULES								
04.04.01	The process Input / Output (I/O) modules and termination shall be modular plug-in-type suitable for mounting in racks. Any I/O card shall operate in any slot on the I/O Bus. All I/O cards shall utilize optical or galvanic isolation techniques to protect the system from input spikes. All I/O cards shall have surge, over current and reverse polarity protections. All modules shall offer channel to channel galvanic isolation.								
04.04.02	<p>The maximum number of inputs/outputs to be connected to each type of module shall be as follows:</p> <table> <tr> <td>1. Analog input module</td> <td>8/16</td> </tr> <tr> <td>2. Analog output module</td> <td>8/16</td> </tr> <tr> <td>3. Digital input module</td> <td>8/16/32</td> </tr> <tr> <td>4. Digital output module</td> <td>8/16/32</td> </tr> </table> <p>(Note: For Digital inputs one change over contact is counted as 2 inputs)</p>	1. Analog input module	8/16	2. Analog output module	8/16	3. Digital input module	8/16/32	4. Digital output module	8/16/32
1. Analog input module	8/16								
2. Analog output module	8/16								
3. Digital input module	8/16/32								
4. Digital output module	8/16/32								
04.04.03	<p>The following requirements shall be met:</p> <ol style="list-style-type: none"> a. Printed circuit boards for I/O modules shall be designed so that it is not necessary to remove power or field wiring to replace any input/output module. b. Input and output hardware shall be supplied according to the signal levels. Additional rack space, power supply requirements, interconnecting cabling and terminations shall be supplied. c. Input filters to attenuate noise shall be provided. d. All analog /binary inputs and outputs shall be capable of withstanding 500V DC common mode and 500 V AC peak to peak. All analog outputs shall be short circuit proof. e. Common Mode Noise rejection for analog inputs shall be minimum 120 db at 50 Hz f. Normal mode noise rejection for all analog inputs shall be 60 db at 50 Hz g. Any single sensor/transducer/transmitter failure alarm shall be provided on programmer station monitors for all sensors/ transducers/ transmitters. Similarly sensor break alarm for thermocouples etc. shall also be displayed on the monitors. h. All inputs / outputs (AI / AO / DO) shall have integral isolators and current limiting circuitry so that faults, short circuits, open circuits and overloads in one signal do not affect any other signal. i. Input / Output modules shall incorporate signal conditioning / filtering circuits to reduce the effects of electrical surges, noises and contact bounces. j. Input / Output modules shall be designed to withstand vibration / EMI / RFI effects as per relevant standards. k. Status indication of each input shall be available on the Operator & Engineering workstations. l. It shall be possible to remove and insert the modules while the system is 'ON' m. Diagnostic LEDs shall be provided on the front plate of each module to indicate faults. Additionally alarm contacts shall also be provided for annunciating in programmer's / operator's monitor. n. Identification labels (color coded) to indicate one type of I/O card, signal level etc. shall be provided on the front plate for each I/O module. 								

04.04.04

Analog Inputs:

The DCS shall be capable of accepting the following analog inputs.

- Both grounded and ungrounded signal shall be acceptable.
- 0/4 -20 mA DC (powered by DCS)
- 0/1 -5V DC (powered external to DCS)
- All ISA standard thermocouple – ANSI / ISA MC 9.5.1 inputs
- RTD inputs PT100, PT1000,
- Copper Resistance Thermometer (CRT) 53 ohms (Cu-53).
- Ohm (Potentiometric Input)

Note: If the system is unable to accept any of the above type, necessary current convertors shall also be supplied and installed in the Marshaling cabinet.

The analog input card shall be intelligent type capable of carrying out functions like signal conditioning and conversions. It shall also detect open and short wire condition. To improve conversion and reliability each channel shall have individual converters.

Analog input modules shall be able to power field instrumentation loops with a loop resistance of 600 ohms.

Thermocouple inputs shall be connected directly into the system I/O card termination panels/cards. It shall also detect open wire conditions. No intermediate TB's are recommended.

Over all analog accuracy shall be better than 0.1% of span for voltages, mA and RTD's. For thermocouple the accuracy shall be atleast 0.5% of span anywhere along the curve.

The accuracy shall be inclusive of power supply variation and long - term drift.

Calibration of the analog /digital converters shall be continuously checked. An indication shall be provided by the system of a calibration error greater than 0.1% of span.

Conversion and linearisation for Type B, D, E, G, J, K, N, R, S and T thermocouples as defined by International Protocol Temperature Standard (IPTS 68) shall be included.

Each thermocouple input shall be capable of accepting a signal from any standard type thermocouple. The input signal to digital conversion accuracy shall be within $\pm 0.1\%$ of span or better.

Open Thermocouple detection shall be provided. Each thermocouple shall be checked when the point is scanned so that an open thermocouple will be alarmed within the point's scan cycle. Cold junction compensation shall be provided as a standard feature.

Conversion and linearization for RTD inputs PT100, Pt1000, Copper Resistance Thermometer (CRT) 53 Ω (Cu-53) shall be included. 3 wire / 4 wire RTD shall be accommodated. The input signal to digital conversion accuracy shall be within $\pm 0.1\%$ of span or better.

The system shall be capable of accepting analog signal (1 to 5 Volts). The analog to digital conversion accuracy shall be $\pm 0.1\%$ of span or better. It shall be possible to detect an abnormal condition of the input and provide this information to the operator.

Analog input/output cards shall be designed for one digital converter per point or card depending on Bidder's standard design.

All channels shall be isolated. Group isolation will not be accepted.

	The analog input range of each channel should be configured ONLINE from an Engineering station.
04.04.05	<p>Analog Outputs:</p> <p>Analog outputs with standard 4-20/ 0-20 mA DC, fully isolated from ground shall be available. Analog output cards must be capable of driving 4 –20 mA DC into 750 ohms minimum.</p> <p>Analog output modules shall provide the resolution and accuracy as shown below:</p> <p style="padding-left: 40px;">Resolution : +/- 0.1% of full scale</p> <p style="padding-left: 40px;">Accuracy : +/- 0.1% of full scale</p> <p>Open analog outputs shall result in an alarm in the Operator Station. Analog output cards for closed loop shall be redundant and the minimum number of channels to be 8.</p>
04.04.06	<p>Digital Inputs:</p> <p>Digital Input Modules (DIM) shall convert the external binary signals from process to internal signal level of the system. It shall be provided with internal voltage source to convert contact state of potential free contacts, either change-over or ON-OFF into logic level signals. It shall contain filtering to eliminate contact bounces. The filter shall reject input signal levels, which are not stable over fifteen milli seconds. Facility for automatic pegging the binary signal to logic one/zero or last correct value in case of failure of binary input module. All binary signals shall be acquired validated, processed, alarm checked and their data base updated within one second. It shall be possible to manually disable any binary input either through deleting from scan or substitution from HMI.</p> <p>Possibility of surface film or contaminant on the contact shall be considered while selecting this source. The system shall be capable of supporting both on/off and latched discrete input applications. All channels shall be isolated. Group isolation will not be accepted.</p> <p>The digital Input cards for the MFT controllers of BMS shall be redundant.</p> <p>Input interrogation voltage shall be 24V DC.</p> <p>Each module shall be provided with necessary circuitry to detect card power supply failure and same shall be indicated. Each module shall be designed with self-checking features for detecting faulty operation. In case of individual card failure, on line replacement of the faulty module shall be possible.</p> <p>Input status simulation facility shall be possible, when the System is "ON-LINE".</p>
04.04.07	<p>Pulse Input:</p> <p>The system shall be capable of taking pulse input from Flow-meters etc.</p>
04.04.08	<p>Digital Outputs:</p> <p>Digital Output Modules (DOM) shall convert the internal level of the system into external binary signal levels required by the process. It shall be able to source / sink sufficient current while energising field outputs. The outputs shall be able to drive solenoid valves, breaker coils, contactors etc., through interposing relays. The following is a list of the minimum discrete type output that shall be available for controlling ON/OFF status of final control devices like motor starters, solenoid valves, indicating lamps, annunciator facia windows etc.</p> <ul style="list-style-type: none"> • Discrete (on / off) • Single pulse (configurable width) <p>The outputs shall be 24 V DC direct driving for indication in UCD and Back panels and</p>

	<p>for other application through Inter Posing Relays. The Contact rating of relays shall be minimum 10 A @ 250 V AC,5 A@ 250V DC. The relays shall have 2 NO + 2 NC configuration.</p> <p>The digital Output cards for MFT controllers of BMS shall be redundant.</p> <p>The duration of the single pulse outputs shall be individually adjustable. The adjustment shall be configured ONLINE from an engineering workstation.</p> <p>The max. no. of channels to be 32. All channels shall be isolated. Group isolation is not acceptable. Each module shall be provided with necessary circuitry to detect card power failure and same shall be indicated. Each module shall be designed with self-checking features for detecting faulty operation. In case of individual card failure, on line replacement of the faulty module shall be possible.</p> <p>Output status simulation facility shall be possible, when the system is "ON-LINE"</p>																																				
04.04.09	<p>Serial Interface</p> <p>All serial data used in the control logics of DCS controllers shall be read/write, and processed at the controller level ie. data being read/written by the DCS must be processed at the DCS processor, I/O rack and not via a connection directly into a PC. Such kind of critical serial data processed at the operations network level is not acceptable unless noted otherwise by the TNPGL. Serial data used for only monitoring purpose shall be interfaced directly at Workstation level without using DCS Controller. Vendor shall clearly mark in his proposal about serial data being processed at DCS controller which is used in control logics and serial data being processed directly at Workstation level.</p>																																				
04.04.10	<p><u>I/O counts:</u></p> <p>a1. For DAS /Closed Loop/Measurement System:</p> <p>Standard DCS system (Dual redundant processor, with redundant communication and power supplies arrangement, Integrated SER & Original licensed Software) with following I/O Counts</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.a</td> <td>Thermo-couple type Analog Inputs</td> <td>328Nos</td> </tr> <tr> <td>1.b</td> <td>RTD type Analog Inputs (Pt-100,Cu-53)</td> <td>417Nos</td> </tr> <tr> <td>1.c</td> <td>4-20/0-20 mA, Voltage Inputs and Ohm (Potentiometric Input)</td> <td>551Nos</td> </tr> <tr> <td>2.a</td> <td>Digital Inputs</td> <td>331Nos</td> </tr> <tr> <td>2.b</td> <td>SER type 1 mSec Resolution DI</td> <td>207Nos</td> </tr> <tr> <td>3.</td> <td>Analog Output 4-20 mA</td> <td>219Nos</td> </tr> <tr> <td>4.</td> <td>Digital Output with IPR Relay</td> <td>202Nos</td> </tr> <tr> <td>5.</td> <td>Pulse Input</td> <td>12 Nos</td> </tr> </tbody> </table> <p>Note: If the system is unable to accept any of the above type, necessary current convertors shall also be supplied and installed in the Marshalling cabinet.</p> <p>a.2. For Turbine Protection System:</p> <p>A dedicated 2 out of 3 Controller for performing Open loop control and sequential operation of Turbine Protection system for LMW Turbine.</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>SER type 1 mSec Resolution DI</td> <td>70 Nos</td> </tr> <tr> <td>2.</td> <td>Digital Output with IPR Relay</td> <td>70 Nos</td> </tr> </tbody> </table> <p>b. For Open Loop System:</p> <p>Dedicated Controllers as per Drawing No: IA-03 for Open loop control and sequential operation of main equipments like ID/FD/PA fans, Mill, Air Pre Heater, Boiler feed pumps, condensate pumps, Cooling water pumps, Heaters, Generator Electrical Section etc.</p>	Sl. No	Description	Qty	1.a	Thermo-couple type Analog Inputs	328Nos	1.b	RTD type Analog Inputs (Pt-100,Cu-53)	417Nos	1.c	4-20/0-20 mA, Voltage Inputs and Ohm (Potentiometric Input)	551Nos	2.a	Digital Inputs	331Nos	2.b	SER type 1 mSec Resolution DI	207Nos	3.	Analog Output 4-20 mA	219Nos	4.	Digital Output with IPR Relay	202Nos	5.	Pulse Input	12 Nos	Sl. No	Description	Qty	1.	SER type 1 mSec Resolution DI	70 Nos	2.	Digital Output with IPR Relay	70 Nos
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2.	Digital Output with IPR Relay	70 Nos																																			

Sl. No	Description	Qty
1.	4-20/0-20 mA & Voltage Inputs	200 Nos
2.	Digital Inputs	2300 Nos
3.	SER type 1 mSec Resolution DI	400 Nos
4.	Analog Output 4-20 mA	50 Nos
5.	Digital Output with IPR Relay	1100 Nos
c. For Burner Management System:		
Sl. No	Description	Qty
1	Digital Inputs	975 Nos
2	SER type 1 mSec Resolution DI	100 Nos
3.	4-20 mA/Analog Input	60 Nos
4	4-20 mA Analog Output	50 Nos
5	Digital Outputs with IPR Relay	700 Nos
d. For Soot Blower System:		
A dedicated controller for performing Open loop control and sequential operation of Soot Blower System		
Sl. No	Description	Qty
1.	4-20 mA/Voltage Input	10 Nos
2.	Digital Inputs	800 Nos
3.	Digital Outputs with IPR Relay	250 Nos
04.05.00	COMMUNICATION SUB-SYSTEM (DATA HIGHWAY)	
04.05.01	The communication sub-system shall be a digital communication bus that provides a high speed data transfer rapidly and reliably between the various sub-systems. All the controllers, workstations, Historian node, MIS System, tightly integrated with the Communication Bus directly as per the DRA.NO:01."System Integration diagram".	
04.05.02	Communication sub-system shall be dual redundant, consisting of two separate communication buses and two separate communication interfaces for each node. Both data highway subsystems shall be active at all times. The protocol/ bandwidth shall be 1GBPS or higher switched Ethernet or open industry standard deterministic protocol.	
04.05.03	Redundant communication controllers shall be provided to handle the communication between each functional group of controllers of Control System and the System Bus. The design shall be such as to minimize interruption of signals. It shall ensure that a single failure anywhere in the media shall cause not more than a single message to be disrupted and that message shall automatically be retransmitted. Any failure or physical removal of any station/module connected to the system bus shall not result in loss of any communication function to and from any other station/module.	
04.05.04	Communication speed on the communication bus shall be sufficient to update the HMI data base minimum once every second. The overall system performance including display update time shall be independent of the loading of the bus.	
04.05.05	Healthiness of each bus shall be automatically tested periodically at regular intervals without affecting system operation.	
04.05.06	Passive coaxial cables / fiber optic cables/Twister pair of CAT5 or above shall be employed for System Bus. The distance between UCD and CER may be approximately 50 meter. Hence suitable medium of communication shall be used for MAIN DATA HIGHWAY.	
04.05.07	The design and installation of the system bus shall take care of the environmental conditions and hazardous area classification as applicable to similar services. The redundant buses shall be physically separate and shall be routed separately.	

04.05.08	Built-in diagnostics shall be provided for easy fault detection. Communication error detection and correction facility (ECC) shall be provided at all levels of communication.
04.05.09	In case of main bus failure or any communication device failure, the transfer to the redundant back up device shall be automatic without interrupting the system operation and without any operator's intervention. Information about the failed bus/device shall be displayed on the HMI.
04.05.10	Failure of a particular node shall not be treated as failure of Communication Bus. Transceiver failure at a particular node shall not be displayed as Data Highway failure. Bus and node devices shall be opto isolated
04.05.11	It shall be possible to switch over the communication from main bus to the redundant bus manually without disturbing the system operation.
04.05.12	It shall be possible to connect or disconnect any device from the system without disturbing the operation.
04.05.13	In general, the transmitting message shall identify the transmitting and the receiving device. The transmitting device shall receive a reply from the receiving device on the receipt of correct message. Lack of response shall be considered as a receiver failure.
04.05.14	The mechanism used by the communication system for error checks and control shall be transparent. Error checking on all data transfer shall be done by cyclic redundancy check and / or any other advanced codes.
04.05.15	The data highway offered shall have at least 10 nos. spare nodes capacity without highway extender for future expansion. Bidder shall state in the proposal maximum no. of nodes that can be connected to the data highway in the system.
04.05.16	The Bidder shall furnish details regarding the communication system like communication protocol, bus utilization calculations etc.at the time of detailed Engineering.
04.06.00	DCS POWER SUPPLY MODULES
04.06.01	<p>The following requirements shall be met:</p> <ol style="list-style-type: none"> a. The system power supplies shall be suitable for 110 V AC, 50HZ. b. The power supplies shall have built-in diagnostic circuitry that checks for out-of-range voltages and over temperature conditions. Each power supply unit shall have pair of LED's to indicate normal operation and alarm condition. c. The power supplies shall be able to withstand 5msec power voltage (holding time) without interrupting the system operation. d. The power supplies shall be provided with necessary cooling fans. e. The power supplies shall be provided with galvanic isolation. f. The power supply units shall be provided with miniature circuit breaker (MCB) of sufficient rating. g. Redundant power supplies shall be suitable for parallel operation.
04.07.00	PROGRAMMER'S STATION (PROGRAM DEVELOPMENT/ MODIFICATION, SYSTEM MAINTENANCE AND DOCUMENTATION FACILITY)
04.07.01	<p>The system shall have five engineering stations with no common electronics, shall be located in computer room, one each exclusively for the following application.</p> <ul style="list-style-type: none"> • Turbine Protection & Annunciation system • Closed loop control system • Open loop Control system • Burner Management System • Soot Blower & Other system <p>It shall also be possible to view and modify logics & database of other area with relevant passwords from any Engineering Station.</p>

	All the functionality of operating subsystem shall be available in the Engineering stations besides the engineering functionality.
04.07.02	<p>The DDCMIS software supported hardware platform of each shall conform to the following as minimum or latest configuration at the time of FAT:</p> <p>1 No. of 24" wide viewing angle high brightness LED Monitor, Latest version CPU, keyboard and mouse,i3/i5 processor or better with minimum 3GHz speed,4 GB DDR3/4 RAM,HDD Hard disk 1TB SATA 7200 RPM or better, DVD-CD R/W drive. Dual input monitor port VGA and HDMI or DVI port.</p> <p>The Operator and Engineering functions shall be separated out using proper security levels for authentication and authorization. All upgraded hardware computer and its accessories should be industrial standard with rich in quality because of continuous running.</p>
04.07.03	<p>Bidder shall provide programming facilities/systems as a minimum for Control system and HMIPIS and system documentation facility to achieve paperless documentation for DDCMIS. The programming tools shall have in-built safety features that will protect the system against inadvertent and unauthorised use of these tools. Necessary hard key locks and software locks, etc. shall be provided for this. During on line programming, external plant/equipment should not be affected.</p>
04.07.04	<p>The system shall also have facility to permit the programmer to add text information at the beginning and end of each program, wherein programmer will list out his name, time, date the change which has been made, name of the person who has authorized the change, etc.</p>
04.07.05	<p>The structuring/configuration/modification of Control loops/logics in Control system and program development/modification in HMIPIS shall be possible from fully graphic displays using familiar & conventional functional blocks.</p>
04.07.06	<p>Any modification done in Control System and HMIPIS shall be suitably logged so that it can be traced to the user log-in ID and time of change.</p>
04.07.07	<p>Control system Structuring/configuring and tuning facilities shall be provided for structuring/ modification, storing/loading, testing, tuning, monitoring, etc. of all the microprocessor-based controllers of the control system.</p>
04.07.08	<p>It shall be possible to configure the system with ease without any special knowledge of programming or high level languages. The running logic should be capable of being viewed on-line with dynamic status of inputs, outputs of each logic/loop component on programmer station. Control strategy shall be implemented using familiar and conventional automation function blocks (software implemented).</p> <p>Whenever any change in configuration is done, it shall be recorded and modified configurations shall be available for printing and documentation and shall be stored in non-volatile memory. All the system configuration, tuning/fixed parameters shall be documented and printed in form of function diagrams and lists respectively</p>
04.07.09	<p>On-line tuning of the control loops shall be possible without causing any disturbance in the execution of the control loops. Provision to store and retrieve on immediate and long term basis the system configuration, data base etc. on some device such as external hard disk drive shall be included. Facility shall be provided to reload/download the system or controller module from the already stored data, on-line.</p>
04.07.10	<p>Facility for modification shall be user-friendly. For example, modification of logics/loops etc., zooming for better display, stretching etc. should be possible. It shall be possible to add/modify, delete blocks in logics/loops in on-line.</p>

04.07.11	<p>The Engineering Stations shall provide the ability to maintain the process database and monitor plant performance. Process variables shall be created, deleted, modified, or calibrated using this console. All changes shall be saved in bulk memory and / or documented for future use.</p> <p>Initialization and maintenance of all aspects of the DCS shall be provided at the Engineering Station. The system shall be completely self sufficient and capable of editing existing programs database, building new functions, and reinitializing and loading all nodes in the system while the system is in operation.</p> <p>All Engineering functions shall be capable of being executed either off-line or on-line. The Engineering station shall have all facilities required for database and control configuration generation and modification, graphics building, and report creation.</p> <p>The logic blocks used in the Engineering station shall be represented in Boolean Logic symbols such as AND,OR gates for easy understanding of Logic. The DCS Database configuration software shall allow logic to become "Live" (for all the functions in the viewed page) by directly taking real time values from the controller for easy troubleshooting.</p>
04.07.12	<p>The Engineering Station offered shall have provision for performing the following engineering functions.</p> <ol style="list-style-type: none"> a. Database generation & Database configuration (including configuration of all displays and control drawings/ modules for various sub- systems). b. Graphics Display generation & Modification c. Control Algorithm generation & Modification d. System Access configuration e. Modification of operational data f. Downloading of the configurations in each sub-system. g. Configuration of various Control functions or Control blocks to implement various control strategies and downloading the same into the respective Control stations. h. On-line compilation of all types of dynamic graphic displays. i. Setting of real time clock. j. Start/Stop of each sub-system k. Enabling/disabling of different instruments/ peripheral connected to the system. l. Scan/off-scan on different tags connected to the system. m. Preparation and compilation of logs/reports/ historical trend points. n. Calling of detailed self-diagnostic displays for maintenance aid. o. Loading, editing, compiling and executing of all programs written using High Level Languages supported by the system. p. Diagnostics
04.07.13	<p>Database:</p> <p>The DCS shall have a distributed, global and relational database wherein the configuration information is stored. Any change made to an attribute of any data base point shall only need to be made once. The complete DCS shall have the capability of implementing tagging, configuring, storing, accessing, utilizing and displaying. The system shall be capable of scanning these points once each second without degrading performance. Bidder shall specify in his offer any limitations of the DCS system in this regard.</p> <p>The configuration information stored shall contain the control strategy and data</p>

	<p>acquisition functions along with signal conditioning, range, algorithm, control constants and status of mode of operation. The system shall also allow the Engineer/Operator to print out a complete record of the system configuration.</p> <p>The database shall have the ability to accept changes in the control strategy and data acquisition programs. This shall not cause any degradation in performance, reliability and system's integrity. This function shall be key lock protected or pass word protected in order to prevent unauthorized data entry.</p> <p>Bidder shall prepare a complete I/O list for the complete control and data acquisition system including the necessary graphics development and implementation attributes for trending historical storage and graphics for the soft (LED MONITOR – based) control and monitoring interface.</p> <p>The complete database shall contain every tagged point in the complete DCS system. Tagged points refer to field I/O wired to the DCS and internal system generated data points, which are results of calculations or transformations. Any data point available to the operator via the LED MONITOR operator stations shall be tabulated in the database report. SOE points shall be included in the DCS database and be available for functions of control, alarming, graphic generation etc., as would any other digital input to the system.</p> <p>The Bidder shall clearly list out in his offer a description of all database fields that must be completed, the information that is to be defined and the responsibilities for completing each field for each database record. The data base shall include as a minimum, data fields for specification of the following:</p> <ul style="list-style-type: none"> • I/O point Number • Description • Signal input/ Output Range (Analog) • Engineering Range (Analog) • Set/Reset status (Contacts) • Alarm limits (Analog, three levels of severity) • Alarm Status (Contacts) • Alarm Priority. • Alarm Dead band (Analog) <p>The DCS shall constantly monitor analog I/O for values that are out of sensing range and alarm such occurrences. Displayed data of point with bad quality or calculated variables derived from the points with bad quality shall display the last good value and identify the point as having bad quality by means that the data are of bad quality.</p>
04.07.14	<p>Database Management:</p> <p>The process variable database shall be maintained and loaded through the Engineering station. Any process variable shall be added, modified or deleted from the Engineering station. The Engineering station shall be able to access any running controller to receive complete information about any variable. Database information shall be down loaded on line directly to the appropriate process controller as modified.</p>
04.07.15	<p>Control Configuration and Modification:</p> <p>Online configuration and modification capability is required, without the need to take a primary or backup controller offline. The system database, modulating control loops, and binary logic shall be configured and downloaded to the process controllers from the</p>

	<p>Engineering station. The capability shall exist to copy database, modulating control loops, and binary logic from a process controller to an engineering station file. Function should exist to enable the engineer to initialize a copy from one controller to a backup controller.</p> <p>System configuration shall be performed through interactive graphics editing programme that allows DCS logic/ configuration drawing to be created, with no computer programming skill required. The system, shall use a graphically oriented, object based approach to process design, which allows the user to link function blocks together in a 'connect the block' manner, to configure the control strategy and to create the drawings that will be its documentation. It should be possible to create and use, user defined function blocks not defined in the standard function block library. The DCS utility software must also include a verification feature that will ensure accurate documentation by comparing configuration drawing against the actual process configuration executing in the multi-function controller.</p>
04.07.16	<p>Graphic Display Creation and Modification:</p> <p>The Engineering/programming console shall be provided the facility for creating new displays and modifying existing displays by the Engineer.</p> <p>Graphics shall be generated interactively at the Engineering station. Existing graphics shall be edited and the modified display shall be saved as a new graphic or it shall replace the original. Process variables shall be automatically linked to graphic displays when referenced by identification numbers. All displayed process variable shall be updated each second. The state of process variable shall be indicated by colour or symbol change. Click facility on graphics shall be provided to directly link graphic displays to process variables, control actions, or other displays.</p> <p>The Graphic builder utility shall have support for standard library objects of commonly used plant equipments (e.g. motors, pumps, heat exchangers, valves, boilers etc.). It shall support 3D objects, animation linked to dynamic data etc. The environment of building and compiling graphics with dynamic data shall be intuitive and user friendly. It shall be possible to convert the graphic pages in html format for viewing through IE/ Netscape navigators etc (along with dynamically linked data).</p> <p>The graphics builder utility shall use the same point tag as are used in the process data to access real time variables from any database. No intermediate index numbers or addressing shall be required. Graphics builder utility shall be subject to system access protection.</p> <p>The Bidder shall include a minimum of (100) hundred custom graphics, which will include PID and control station type graphics. Standard graphics like menus, alarming, trends, HSR, hardware displays shall not be counted in the hundred custom graphics.</p>
04.07.17	<p>GRAPHIC LIBRARY:</p> <p>The system shall have a library of standard graphic picture elements/blocks for creating various graphic pages. The user should also be able to create custom graphic symbols /elements to be used for depiction of plant or process equipment. Once created, these elements shall be accessible for repeated use, by referring its name.</p>
04.07.18	<p>Online configuration changes shall automatically update all modules, tags and subsystems affected by the change. Online configuration changes shall follow a prompt validation sequence requiring a final acknowledgement step before the change is</p>

	transmitted.
04.07.19	It shall be possible to save all database and configuration data on both removable and non- removable media for back up purposes without taking the system off line.
04.07.20	It shall be possible to down load the data bases and configuration data to all modules from a single location.
04.07.21	Each analog input/output and analog control block shall be assigned as engineering unit designation.
04.07.22	The philosophy of control strategy development requirements is detailed in the controller subsystem sub section.
04.07.23	The system shall support server scripting for automating custom applications.
04.08.00	HUMAN-MACHINE INTERFACE AND PLANT INFORMATION SYSTEM (HMIPIS) REQUIREMENTS
04.08.01	<p>General Requirements</p> <p>The Work station based (or) Client server based (Redundant server with cold sever – total 3 Nos.) HMIPIS shall be accepted. The operator interfaces system shall be a well engineered human interface system to permit error free interactions between the user and the automated process control system. Man-Machine Interface system shall be designed and engineered for safe, efficient, reliable and convenient operation. HMIPIS shall employ high-performance, non proprietary open system architecture to ensure fast access and response time and compatibility with other system and portability of third party software. HMIPIS shall be used primarily for the following functions:</p> <p>(a.)As operator interface for control operation for the plant for accepting data from and issuing commands to Control system etc.</p> <p>(b.) To perform plant supervisory, monitoring and information functions.</p> <p>The operator interface of the HMIPIS shall consist of monitor / Mouse, Keyboards of OWS, large video screen (LVS), printers, etc.</p>
04.08.02	<p>The system shall have Seven (7) Operator Work stations with no common electronics, located in Unit Control Room.</p> <p>It shall be possible to use any operator station for operation of any area of the Boiler, Turbine, Generator and their auxiliaries that are configured in the system (including the future requirements).</p> <p>All OWS of the MMIPIS shall be fully interchangeable i.e. all operator functions including (for quick access to displays & other operator functions) control, monitoring and operation of any plant area on drive shall be possible from any of the OWS at any point of time without the necessity of any action like downloading of additional files. Each OWS shall be able to access all control information related data under all operating conditions including a single processor/computer failure in the MMIPIS. Further, simultaneous operation of at least two drives of control system shall be possible from a single display without calling additional displays for multiple drive operation.</p> <p>All frequently called important functions including major control loop display shall be assigned to dedicated function keys for the convenience of the operators. The operator workstation shall be self hosting.</p> <p>The display selection process shall be optimized so that the desired display can be selected with barest minimum number of key strokes/ steps by the operator.</p>

04.08.03	All frequently called important functions including major displays shall be assigned to dedicated function keys on a soft keyboard for the convenience of the operator for quick access to displays & other operator functions.
04.08.04	HMI shall perform the following operator's and Engineers functions. Operators Functions <ul style="list-style-type: none"> •Plant graphic display/ faceplates •Alarm display •Plant control/Operation display •Logs and report generation •Real time and historical trend display Engineer's Functions <ul style="list-style-type: none"> • Generation & modification of graphics/displays/logs reports. • Modification/addition of control loops • Controller configuration • System diagnostics • Maintenance logs
04.08.05	The operator functions for each OWS/LVS shall as a minimum include Control System operation (A/M selection, raise/lower, set point/bias change, on/off, open/close operation, mode/device selection, bypassing criteria, sequence auto, start/stop selection, drive auto selection, local-remote/other multi-position selection etc.); alarm acknowledge; call all kind of displays, logs, summaries, calculation results, etc.; printing of logs & reports; retrieval of historical data; and any other functions required for smooth operation, control & management of information as finalised during detailed engineering.
04.08.06	The display selection process shall be optimised so that the desired display can be selected with the minimum no. of operations. Navigation from one display to any other should be possible efficiently through paging soft keys as well as through targets defined on the displays. There should be no limitation on number of such targets.
04.08.07	The system shall have built-in safety features that will allow/disallow certain functions and entry fields within a function to be under password control to protect against inadvertent and unauthorised use of these functions. Assignment of allowable functions and entry fields shall be on the basis of user profile. The system security shall contain various user levels with specific rights and shall be as finalised by the TNPGL during detailed engineering. However, number of users in a level and rights for each level shall be changeable by the programmer (Administrator).
04.08.08	The Operating station shall use Open industry standards and products so that no special operator training is required. The operator stations of the DCS proposed are of WINDOWS-10 or Latest Version of WINDOWS based system.
04.08.09	The Operator/Engineering environments shall use familiar windows techniques like user configurable menus/ toolbars, copy-paste operations for user commands etc. in order to achieve intuitive and easy navigation and fast access to key process areas.
04.08.10	Each operator and engineering station will have integrated alarm message and event data on one single display screen. The acknowledgement of any alarm from any single operator station will be global / The acknowledge of alarm shall only be done from the respective OWS and will not require any special wiring or configuration to accomplish this task.
04.08.11	Device diagnostics for all analog, Field bus, and HART devices must be capable of generating an alarm.

04.08.12	The control system must have a global database with transparent operational integration of multiple systems both local and remote.
04.08.13	The required software for converting the plant graphics developed by the graphic building tool to html pages with ActiveX control/ Java shall be included. The intent is to make the graphics "internet/ intranet" ready so that the same can be used to view live graphics from MIS network in plant connected suitably by TCP/IP with DCS system using thin clients like IE/Netscape navigator etc.
04.08.14	The system shall support DDE, so that historical/ real time data from the system are portable to MS office applications (e.g. excel). The supplied software shall support this functionality as a basic requirement.
04.09.00	Plant Supervisory, Monitoring and Information Functions of HMIPIS
04.09.01	The HMIPIS shall be designed as an on-line system which shall process, display and store information to provide the operator, either automatically or on demand, the relevant information as indicated in subsequent clauses. The following functions shall be performed by HMIPIS as a minimum:
04.09.02	Assignment of Output channels. It shall be possible to assign any analog & binary point of HMIPIS to pre-selected output channels of Control System
04.09.03	Performance calculations: The performance calculations shall use any high-level language. An extensive set of steam property subroutines based on 1967 ASME steam tables shall be included in the system. The calculation shall be carried out at 30% unit load or higher. The calculation frequency shall be selectable at site from 10 minutes to 1 hour, with a step of 10 minutes. The performance calculations shall be broadly subdivided into two classes: Class I: Equipment protection calculations Class II: Plant/equipment efficiency calculation. The Class I calculations are generally for the purpose of detecting & alarming unit malfunctions. These shall include cold reheat steam approach to saturation temperature, super heater spray outlet approach to saturation temperature, turbine steam-metal temp. differences, turbine metal temperature rates of change, feed water heater terminal temp. difference, feed water heater drain cooler approach, excess air deviation from standard, feed water heater temp. deviation from standard, drum water saturation temp. rate of change, etc. The class-II performance calculations shall be performed to determine the performance of individual items of equipment and the overall unit. The periodicity of these calculations shall be selectable from 10 minutes to 60 minutes in increments of 10 minutes. These shall include calculations for Boiler efficiency, Gross turbine generator heat rate, gross unit heat rate, net unit heat rate, operating hours, plant load/availability factors, HP/IP/LP turbine enthalpy drop efficiency, condenser/ deaerator/ economizer performance, air heater performance, unit availability calculations, deviation from expected values for each calculation shall also be computed.
04.09.04	Alarm Displays: 1. The alarm display shall consist of a header and up to 18 full line alarm message per page. Up to 1000 lines of alarm and return information shall be available to the operator, and should be accessible by paging backward and forward as many times as necessary to display all current alarms. 2. It is desired that the same be conforming to ASM (Abnormal Situation Management) Consortium's guideline. 3. Rapid alarm filtering by plant area shall be possible. Snapshot views of area-wise

	<p>alarm counts shall be available.</p> <ol style="list-style-type: none"> 4. Detail alarm summary page shall contain up to 1000 alarms. 5. It shall be possible to filter the alarms against each column (priority, point, area, time of occurrence, status etc.) with a single mouse click. The operators shall also be able to apply customized filters and save the same. 6. It shall be possible to acknowledge alarms individually or by page. It shall also be possible to do the same from customized graphic pages. Once one authorized operator acknowledges a particular alarm from one authorized Operator station, the same shall not get acknowledged globally. 7. Soft Alarm annunciator shall indicate alarms in a station status bar by blinking color, which shall indicate the existence of the highest priority alarm. <p>Each graphic page shall have one line indication of the highest priority/ latest alarm in the system available all the time at top/ bottom of the display.</p> <p>The Operators stations shall have Standard System Display for the common functionality and this shall not call for any special engineering efforts/ programming techniques:</p> <ul style="list-style-type: none"> ➤ Menu/navigation displays ➤ Process/ System Alarm summary ➤ Process/ System Event summary ➤ Trends ➤ Operating groups ➤ Point details ➤ Popup faceplates ➤ System status displays ➤ Configuration displays ➤ Loop Tuning displays ➤ Diagnostic and maintenance displays ➤ Summary displays
04.09.05	<p>DISPLAYS:</p> <p>Various displays on the OWS/LVS shall as a minimum include PID displays or mimic, bar chart displays, X-Y & X-T plot (trend) displays, Operator guidance message displays, group displays, plant start-up/shutdown message displays, system status displays etc. The resolution of mimics shall be at least equal to resolution of LVS.</p>
04.09.05.01	<p>GRAPHIC DISPLAYS:</p> <p>Pictorial and schematic displays of plant systems, flow diagrams, equipment sketches, single line diagram, etc. shall be available. Each display shall include alphanumeric and graphic symbols that shall be programmed to change color or shape, or blink, as a function of different states of the process variables. Color-coding schemes for all displays shall be subject to TNPCL approval. All process variable values and status shall be dynamically updated each second regardless of process status or process upsets. System overview, group level, sub-group level, drive (single loop) level and face plate displays shall be provided.</p> <p>It shall be possible to view more than two graphics/display on single page.</p> <p>The display should be arranged in safe manner, such that not more than 5 displays can be opened at a time.</p> <p>These displays shall not clutter and hide the essential portion of displays like alarm message.</p>

	<p>The call up time of graphic display to be 2 sec. maximum.</p> <p>It shall be possible to place a new display or graphic in service without interrupting an operator's ability to control the plant.</p>
04.09.05.02	<p>Overview Displays:</p> <p>Overview displays should show individual deviations between process variables and their set points. Loops in manual shall be indicated on the display along with points in alarm. Overview displays shall provide access to each individual group display. There shall be no limit to number of over view displays, and any loop or group can be displayed on any number of overviews. Overview displays shall provide access to each individual group display.</p>
04.09.05.03	<p>Control Group Displays:</p> <p>Standard group displays shall be provided, which can incorporate at least 8 related parameters for easy plant monitoring and control. This shall have the same "look and feel" of panel board-like displays/ indicators. It shall be automatically linked to the trend / numerical views of the related parameters.</p> <p>Any system point can be configured in any group and displayed in as many groups as desired. At the group display the operator shall be able to view the loop process variable, set point, and output in both digital and bar format. The operator shall select a loop or device for control, change loop mode, change the set point in automatic mode, change the output in manual mode, issue commands to start/stop or open/close binary drives. Group displays shall provide access to single loop displays.</p> <p>The operator shall be able to call up detailed information about any process variable. The sub-screen shall display all information about the selected point. The operator should be able to select median average/ individual sensors in configurations where multiple sensors have been used for the same process parameter.</p>
04.09.05.04	<p>FACEPLATE DISPLAYS:</p> <p>The control windows shall be user definable, which displays up to 8 large sized instrument faceplates for operation and monitoring. Each faceplate shall also be opened individually. It should be possible to carry out the control operation directly through faceplates.</p> <p>Faceplate displays for modulating drives should display the following parameters as minimum.</p> <ul style="list-style-type: none"> • The process variable • Set point • Deviation • Position feedback from the actuator • Command output to the actuator • Whether in Manual/Auto/Cascade mode or not <p>These displays should be in the form of both a bar graph and in alpha-numeric forms. Switching of control mode between "Auto" and "Manual" shall be possible from the Faceplates.</p> <ul style="list-style-type: none"> • Faceplates of binary drives with inching duty shall be similar to those for modulating drives except that indications for set point and process value feedback shall not be available. However, OPEN/CLOSE status feedback's shall be available. Faceplate displays for the other binary drives should display the present status of the drive(ON/OFF,OPEN/CLOSE etc).Operators should have the facility of issuing commands to the drives from these faceplates.

04.09.05.05	<p>BAR CHART DISPLAYS:</p> <p>Bar charts shall be programmable to show process variable profiles in bar chart form. There shall be minimum 8 bar charts per screen. Provision shall be available for displaying process variable point id, service, and scales in engineering units and current values and alarm limits.</p> <p>Variables in the alarm shall be displayable in a different colour than variables within alarm limits. Bars shall be displayed vertically.</p>
04.09.05.06	<p>Pop-up Window/ Split screen Display:</p> <p>The system shall support pop-up windows and split screen displays, so that plant information/alarm shall be displayed on the main screen while detailed information or operator entry fields or trends shall be displayed in the sub-screen/pop-up window, simultaneously on the same MONITOR.</p> <p>Ready to use pop-up faceplates shall be available without any additional engineering for all standard dynamic points in plant graphic displays. They shall appear with a single mouse click from the graphic displays. It shall be possible to have at least 4 such faceplates opened at a time. The system shall also support keeping a faceplate remain open even if the base graphic display is changed. Besides standard library of faceplates, the system shall also allow developing customized pop-up faceplates.</p>
04.09.05.07	<p>Trend Display (X-T Plots) :</p> <p>These displays shall show the trend of analog points with respect to time. These displays shall be continuous curve plot & not point plots. Time spans of displays shall have operator selectable intervals of 5,10,15,30, 60 minutes, 8, 24 & 72 hours. In addition, zoom in/out, stretching facilities etc. shall be provided. Sufficient buffer space shall be provided to store data for minimum 500 points at HMIPIS scan rate for 72 hours.</p> <p>The system shall provide at least 2000 trend sets for viewing from any operating station. The real time/ historical trends shall not be Operators' station specific and it shall be possible to assign any parameter in the system to any trend page of any Operating station.</p> <p>The following types of trend displays shall be available:</p> <ul style="list-style-type: none"> • Bar graph • Multi pen (16 points) trend against time • X-Y plot • Group trends <p>The following features shall be available as minimum in trend displays:</p> <ul style="list-style-type: none"> • Assignment of points by operators • Combination of real-time and historical data • Panning/ zooming/ scrolling. Archived historical data shall be available by scrolling back automatically • Hairline cursor for instantaneous value readout • Copy/ paste of data to clipboard Decluttering - to make few pens temporarily disabled.
04.09.05.08	<p>X-Y Plots :</p> <p>At any instant of time, this page shall include up to 3 independent X-Y point plots (values of X and Y variables) of up to three equipments typically in the form of a cross 'X'. Operating curves shall be superimposed over the X-Y plot. Alphanumeric information shall be overlaid to indicate X and Y scales, point identification, current operating point value with engineering units, etc. Two or three pairs of X and Y variables having common operating curves shall be displayed on one display page only. In such cases distinct symbols shall be used to show operating point for each. The balance shall be</p>

	programmable at site.
04.09.05.09	<p>Real time trending:</p> <p>The system shall be capable of trending any point defined on the highway. The user shall select a sample frequency as fast as one second monitor trends shall be able to graphically display the relationship of upto sixteen analog variables (Y axis) vs Time. Alphanumeric information shall be displayed on the same screens to identify points, scales, current values and related information. X vs Y plots shall also be available. All points in the system shall be capable of being assigned to a trend display (not simultaneously). The trend display function shall be arranged to allow the operator to select for each value the color coding of the variables displayed, bottom and top chart limits, range of the time period, different trend intervals, set-point, and time base. The point ID, abbreviated English description, value, quality, engineering units, high and low limits of the point on the trend shall be displayed for each variable displayed.</p>
04.09.05.10	<p>Short term historical trend:</p> <p>Each operator station shall maintain 48-hour history of up-to 100 process variables. Any graphic display using LED MONITOR trends will automatically fetch the full history of a plotted variable if it is one of the 100 points. Each operator station shall assign its any set of 100 process variables for collection. It should be possible to select display intervals as low as 1 second.</p>
04.09.05.11	<p>Tuning trend:</p> <p>The tuning trend is displayed in a tuning window.</p> <p>Data to be processed : PV, SV, MV, FV, Recording time span : 15 minutes.</p>
04.09.06	<p>X-Y plot using stored data :</p> <p>This type of display will show the analog trend of X-axis variable with Y-axis variables. One example of such display is Turbine Bearing Vibration with respect to Turbine speed during turbine Start up Condition. The balance shall be as per operator's definition.</p>
04.09.07	<p>Sequence Displays :</p> <p>Sequence chain displays for each group & sub-group shall be used to trace the sequence of a control chain as well as to facilitate the operator interventions & enable mode changes/auto selection. Sequence chain display shall present complete sequence chain, in functional blocks, steps being carried out, criteria, running time, waiting time, monitoring time, operating mode, various parameters with associated engineering units for each step and criteria. It shall be possible to display a list of missing criteria for each sequence chain on operator's demand. The sequence chain display shall automatically move forward when the auto sequence is in operation.</p>
04.09.08	<p>Drive Level Displays :</p> <p>For each drive (both binary & modulating) a drive level display shall be provided which shall indicate the drive related inputs/outputs, permissive and protection the drive level logic and other drive related information including individual drive faults & disturbance criteria. It should be possible to call these displays as pop-up Windows. It shall also be possible to call these displays as first up displays from the control file/faceplates.</p>
04.09.09	<p>CLCS Displays :</p> <p>The loop schematic for each loop shall be available in a display form which shall show the individual analog & binary values (input/output & intermediate).</p>
04.09.10	<p>Group Displays :</p> <p>The group display shall present point information including point ID, description, current value, range, function group, quality tag & engineering unit of a group of points.</p>

04.09.11	<p>Bar Graph Displays : Horizontal & Vertical bar charts shall be provided for the display of TNPGL related points. The format & the point assignment shall be approved by TNPGL during detailed engineering. Number of bars in a display shall be limited only due to visibility & resolution & no restriction shall be there in the numbers otherwise.</p>
04.09.12	<p>Alarm/Fault Analysis Displays In order to guide the operator in case of a process fault/alarm, a fault analysis display shall be provided so that the cause of the alarm, is presented to the operator. For each alarm, various reasons for the cause of the alarm shall be displayed. The operator workstation will include an alarm summary that will be historized as a minimum. The operator shall be able to click on an alarm to automatically call up the graphic that is most relevant to that alarm.</p>
04.09.13	<p>Point Detail Display: From any display, i.e. mimic alarm or any other group display, facility shall be provided to select any point for point detail display. This display shall include all the database attributes of the point. For field I/Os, the termination and interconnection details up to field sensors shall additionally be available. In the point detail display of calculated point, by simple clicking of point or through soft key it shall be possible to display the calculation used and to get further details of any other calculated points used in the calculation</p>
04.09.14	<p>Displays On large Video Screen In addition, top area of the LVS (around 20-25%), shall be reserved for display of soft replica of Conventional annunciation facia (for permanent viewing i.e., not operator changeable). The exact format shall be finalised during detailed engineering with the successful bidder. LVS based overview displays shall be provided, which shall be overlaid across all the LVS for viewing as video wall. Electronic water level indicator (EWLI) of Boiler Drum or separator shall be provided in LVS in soft form with signal from EWLI unit.</p>
04.09.15	<p>Event Summary: The Operator station shall have an Event Message Summary displaying the following in chronological order:</p> <ul style="list-style-type: none"> • Occurrence, acknowledgement of alarms and "return to normal" • Operator action journal (all control actions by operator) • Login/ Security level changes • Database modifications • System restart <p>It shall be possible to store a minimum of 20,000 such messages and archiving facility shall be provided to archive the same. It shall be possible to assign operator's instruction/ guidance to important events, which are viewable in case of occurrence and it is desirable to have facility for the operators to log comments for the same after occurrence.</p>
04.09.16	<p>Logs/Summaries/Reports The system shall generate three basic types of reports/logs i.e., Event activated, Time activated and on-demand log & summaries. The log format and point assignment for each logs/ report and other design features shall be as finalized during detailed engineering. The system shall have the facility for viewing of the logs/summaries on the OWS/LVS as well as for their copying in formats compatible to be used with MS-office or similar tools (Eg.-MS-Excel etc.)The system will be designed for automatic printing of all the reports/logs with a provision of inhibition of the print function for each log separately, with selectable duration and selectable page/group of each log. Manual</p>

04.09.17	<p>printing of time-actuated log shall also be possible. Automatic switching of any log function from a pre selected primary printer to a pre selected secondary printer (defined) on a per log basis shall be possible. However, change in the assignment of the printers shall be possible from programme station. The DCS shall be capable of generating messages as a result of changing of assignments made by operator and engineer. Event messages shall be logged on designated printers. Additionally the capacity shall exist to save messages to the historian storage device for later retrieval.</p> <p>a. Event activated Event activated logs shall as a minimum include alarm log, trip analysis log, startup log & operator action log. All operator actions, modification in data base etc. shall be logged (along with historical storage) along with the username responsible for that action. The trip analysis log shall record 30 - 100 pre-trip and 30 - 100 post-trip readings, operator selectable at site for the pre-defined parameters (not less than 250 points), sub-divided in user defined groups. The data collection rate shall be HMI scan rate to 2 minutes (operator selectable at site). It shall be possible to assign 1- 4 initiating events. The exact details shall as finalised during detailed engineering. The system shall be capable of generating and printing SG & TG start-up logs, the functionality of which will be similar to the trip analysis log. System error log shall report the diagnostics information from control system, data communication, nodes & network switches of HMIPIS. Operator action log shall record all the operations carried out by the operator either through LVS/OWS or through hardwired push buttons. C&I log shall record all the events in the control system like logs trip to manual, auto set point change, standby pumps start, drive start through sequence etc.</p> <p>b. Time Activated Logs. Time activated logs shall as a minimum includes shift log and daily log. Each of these shall provide hourly record of a minimum 250 points sub divided into user defined groups.</p> <p>c. Operator demand logs Operator demand logs shall include, as a minimum, maintenance data log, performance log and various summaries as described below. Maintenance Data Log (MDL) shall provide schedule of preventive maintenance and routine equipments inspection. The data in MDL shall include current status, total running time, running time since last maintenance, running time in current financial year, loss due to downtime etc. Exact format shall be as approved by TNPGL during detailed engineering.</p> <p>d. Various summaries Various summaries shall include off scan summary, constants summary, point quality summary, substituted values summary, peripheral status summary, alarm annunciation group summary, etc. This summaries shall also be available process area or sub-area wise, as well as based on any other data base criterion like functional group no, cabinet no, type of signal etc.</p> <p>Log Generation Utility The Bidder shall offer a log generation utility to generate a log/report having following facilities as a minimum.</p> <ol style="list-style-type: none"> Define format of the log like header information, time, date etc. Selection of any point (scanned and calculated) from the data base and assign it to a log group.
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	<p>c. Selection of log data collection process initiating event, collection intervals(1, 2, 3, 5, 10, 30, & 60 minutes) for each point of a particular log group. Facility shall also be provided for selection of 100 points at a collection intervals of 1, 2, 3, 5, 10, 20, 30 seconds.</p> <p>d. Assignment of log printout initiation on event or time including, selection of the printing interval for particular log group and time of printing. (For time initiated logs).</p> <p>e. Assignment of no. of samples to be collected for each point.</p> <p>f. Select points for which minimum, maximum accumulation over a selected period, average, etc., values can be printed. Also facility shall be provided to tag the time at which the parameter passed through maximum/minimum. It shall be possible to define 100 log groups of 15 points each. Any log group can have any point from the database. One log shall include at the maximum 10 such groups.</p>
04.09.18	SOE Summary: The system shall have a dedicated summary page for SOE for DIs with SOE. Occurrence of any SOE event shall be immediately notified.
04.09.19	OPERATOR GUIDES: Pages of operator guidance information shall be available. The guides shall be static messages or shall also contain current equipment status information.
04.10.00	Plant Data History SUB-SYSTEM
04.10.01	A redundant instance of plant history shall be offered with a global central history database. Operator station based distributed localised historian will not be accepted. The redundancy of historian shall be single point failure proof. They shall not share any common electronics (Processor, HD etc.)
04.10.02	<p>The hardware platform of each shall conform to the following as minimum or latest configuration at the time of FAT:</p> <p>1 No. of 24" wide viewing angle high brightness LED Monitor, Latest version CPU, keyboard and mouse,i3/i5 processor or better with minimum 3GHz speed,4 GB DDR3/4 RAM,HDD Hard disk 1TB SATA 7200 RPM or better, DVD-CD R/W drive. Dual input monitor port VGA and HDMI or DVI port.</p> <p>All the above peripherals shall be functionally assignable & interchangeable. The vendor shall provide documentary evidence from the principals that the supplied HW platform is certified for use. In case, any particular make/ model is recommended by the principal, the same shall be supplied to ensure trouble free operation.</p>
04.10.03	<p>Redundant Historical Data Storage and Retrieval:</p> <p>Function: Historical data storage and retrieval capability shall be provided in order to facilitate long monitoring of plant equipment and performance. To be properly utilized, it shall not be necessary to detail what is to be stored; therefore, all inputs shall be stored at all times at the interval of 5 minutes even if not in alarm, in as compact a form as possible. All alarms and returns to normal of all also be stored as periodic, monthly, SER, and post-trip logs.</p> <p>On Line Data Storage: Data shall be monitored at specified intervals and saved upon any status change or significant change of value. The engineer shall be able to define the monitoring rate and significant change deadband for every analog variable collected. Data shall be stored on a hard disc of the redundant historian nodes for a minimum of 30 days, and shall be available to operators and engineers for TFT plots, trends, and calculations.</p> <p>Historical Data Storage: Data shall be transferred periodically to a USB based external hard disk Drive (Capacity-</p>

	<p>2Terra Byte) automatically. 2 Nos. of Spare external hard disk Drive (Capacity- 2 Terra Byte) shall also be supplied for back up purpose. All archived data so saved shall contain file directory information defining the beginning and ending times of data storage and the list of points saved, together with description, units and other relevant data.</p> <p>Historical Data Retrieval:</p> <p>Historical data shall be retrievable by a set of algorithms available at the historian node. Data shall be retrieved by point id, group of points, and time span.</p> <p>Information to be stored, during the changing of the storage media or the retrieval of previously stored information, shall not be lost.</p> <p>The system shall inform the operator or plant engineer when the storage media is a stated percentage full and needs to be changed. If the historical storage media is full and no back-up device is available, the data shall continue to be stored by removing the oldest data first.</p> <p>The Historical Data Storage and Retrieval functions shall run in parallel and independently of all other functions.</p>
04.10.04	<p>Historical trend capability:</p> <p>All process variables, Digital input & calculated variable shall be stored in the database of historian node. The hard disk of each historian node shall be 320 Giga Byte or more. The user shall be able to trend any value stored in the historical database including analog, calculated and digital values. Historical data shall be stored in the historian node for a period of at-least 30 days and data shall be transferred periodically to external hard disk automatically. All digital points shall be stored on status changes; alarm points on real time, SOE and trip analysis are to be stored. All analog variables, Digital input and calculated variable shall be stored at the interval of 5 minutes. Further all logs/reports shall be stored in the hard disc/external media. Capabilities shall include:</p> <ol style="list-style-type: none"> 1. Trending of up-to sixteen variables simultaneously. 2. Compression and expansion of trends between pre-defined (configurable) scales. 3. Scrolling back and forward in time in full page and half page increments. 4. Copying any trend in color to the printer/copier assigned, with one key stroke pre-defined sets of historical trend screens accessible from the keyboard or custom graphic displays.
04.10.05	<p>History data shall be available freely for being used for trending, custom application programs, displays and reports. It shall have ODBC/DDE support for reuse in any other database with ODBC support (e.g. MS Access) or Excel spread sheets.</p>
04.10.06	<p>The subsystem shall be capable of historising at least 2000 points from any connected subsystem. For each of such points, it shall be possible to store 1 min snapshots for more than 60 days and 1 hour snapshots for more than 2 years. Apart from this the system shall allow fast history of at least 600 parameters wherein 1 sec snapshots can be stored for more than 30 days.</p>
04.10.07	<p>The subsystem shall have archiving facility to archive old historian data into removable media, which shall be played back using normal interfaces for viewing on-disk data (scrolling back).</p>
04.11.00	<p>MEASUREMENT FUNCTIONS OF CONTROL SYSTEM</p>
04.11.01	<p>All the signals coming into/going out of the Control System shall be connected through marshalling cabinets. The input / output modules employed in the Control System shall be separated from controller hardware.</p>

04.11.02	Analog signal conditioning & processing
04.11.02.01	The conditioning and processing functions to be performed as a minimum for the analog inputs coming for control and information purposes are: <ul style="list-style-type: none"> a. Galvanic isolation of input and output signals wherever required. b. Transmitter power supply with per point fuse protection or current limiting and power supply monitoring. c. Transducer/transmitter signal output limit check d. Implementation of multiple measurement schemes e. Square root extraction f. Pressure and temperature compensation. g. On-line ADC gain and drift monitoring and correction at periodic intervals. h. Linearisation of thermocouple signals i. Reasonability check for all analog inputs.
04.11.02.02	All analog signals for control purpose shall be acquired, validated, processed and their respective data base updated at a maximum interval of 250milli seconds except for some fast acting control loops for which the above-referred time shall be as per process requirement. For signals required for information only, the above functions shall be performed at an interval of 1 seconds. The validated analog inputs shall be converted into engineering units on a per point basis. Analog input processing (scanning to alarm checking) shall be performed once every scan cycle.
04.11.02.03	The 4-20 mA input analog cards shall be suitable for interfacing transmitters giving 4-20mA analog signal along with superimposed HART interface signals. 4-20 mA DC signal will only be used for control purpose and superimposed HART signal will be used for configuration, maintenance, diagnostic and Record keeping facility for electronic transmitters and analysers etc.
04.11.03	Binary signal conditioning & processing
04.11.03.01	The changeover type contacts (i.e. 'NC' + 'NO' together) shall be wired to the Control system for all the binary inputs required for control purposes, except for inputs from MCC/ SWGR, actuators and inputs related to hardwired signal exchange among various functional group for which non-changeover type Contact ('NC' or 'NO') shall be wired to the Control System. The binary inputs required for information purposes only shall be wired to Control system in the form of non-changeover type contacts.
04.11.03.02	The conditioning and processing functions to be performed as a minimum for the binary inputs coming for control and information purposes are: <ul style="list-style-type: none"> a. 24 VDC power supply for contact interrogation for all potential free contacts with per point fuse protection or suitable current limit feature/ isolation through opto-coupler. b. Contact bounce filtering delay time of 15 milliseconds. c. Facility forpegging the binary signal to logic one/zero or last correct value in case of failure of binary input module. d. Binary signal distribution to different user shall be in such a way so as to ensure that a short/ground fault on one user is not reflected to the other user. e. Implementation of multiple measurement schemes for signals for control purpose. f. All binary signals shall be acquired validated, processed, alarm checked and their data base updated within one second. In addition to this requirement, binary signals required for SOE shall have a resolution of 1 ms. g. Checking for excessive number of status changes for all binary/contact inputs. h. The non-coincidence monitoring shall be provided for binary inputs for all changeover signals, namely process actuated switches required for control purpose (i.e. protection/interlock, permissive, logical intervention etc.)

04.11.04	<p>Triple measurement scheme for analog inputs employing three independent transmitters connected to separate tapping points shall be employed for all measurements used in analog control functions.</p> <p>The three signals shall be auctioneered to determine the median/average value, which will be used for control purpose. In case one transmitter fails or shows excessive deviation with respect to others, it will be removed from computation of median/average value & the average of the other two transmitter outputs shall be used for controls. The control loop shall trip to manual when any two of the three transmitter signals fail. The operator shall be able to select any of the transmitters or the median/average value from the control desk. The outputs of the transmitters shall be continuously monitored for excessive deviation, which shall be displayed, logged & alarmed.</p> <p>Individual transmitter signal, their status and selected value for control/ measurement and shall be available on OWS.</p>
04.11.05	<p>Dual measurement scheme for analog inputs employing two independent transmitters, connected to separate tapping points/ temperature element shall be employed for the remaining measurements used for analog control functions.</p> <p>The output of the redundant transmitters shall be continuously monitored for excessive deviation. In case the deviation is within limits, the mean value shall be used for the control loop. If the deviation becomes high (with both transmitters remaining healthy), the loop will be automatically transferred to manual. However, if one transmitter fails and the other transmitter remains healthy, then the output of the healthy transmitter shall be used for control. If the other transmitter also fails, loop shall trip to manual. The outputs of the transmitters shall be continuously monitored for excessive deviation, which shall be displayed, logged & alarmed.</p> <p>Individual transmitter signal, their status and selected value for control/ measurement shall be available on OWS.</p>
04.11.06	<p>For all binary and analog inputs required for protection and Interlock purpose in furnace & turbine protection and other equipment which are required for protection of more than one equipment (e.g. those interlocks which shall result in loss of generation, non availability of a major equipment etc.), Redundant I/O Modules shall be provided.</p>
04.11.07	<p>Wiring Scheme for inputs to control system shall be as follows:</p>
04.11.07.01	<p>Each of the dual/triple redundant binary & analog inputs shall be wired to separate input modules. In addition, for functions employing 2 out of 3 voting logic controllers like turbine protection, each of the redundant binary & analog signals shall be wired to separate input modules associated with each controller in line with configuration drawing of TPS (DRA.NO:02) and meeting requirement stipulated under Clause 4.15.01 of this Section. Similarly each of the dual redundant binary & analog Inputs shall be wired to separate input modules. These redundant modules shall be placed in different racks, which will have separately fused power supply distribution. Implementation of multiple measurement scheme of these inputs will be performed in the redundant hardware. Loss of one input module shall not affect the signal to other module and also other channels of these modules can be used by other inputs of the same functional group.</p>
04.11.07.02	<p>The single binary & analog signal required for control purposes shall be wired as follows:</p> <ul style="list-style-type: none"> • The limit & torque switches and the MCC/ SWGR check backs shall be wired to Drive control modules wherever provided. For the drives where DCM are not provided, these signals shall be connected to input module only. • Other single analog & binary inputs shall be wired to single input modules.

04.11.07.03	The binary and analog outputs from one subsystem of the Control System to other which are required in these systems for control purposes (only very few critical signals e.g., MFT, Turbine Trip command etc.) shall be made available from triple/dual redundant binary and analog output modules. However, redundancy in binary & analog outputs to indicators/recorders, SERS and Annunciation Facia lamps is not required.
04.11.08	The signal conditioning functions like multiple measurement schemes, square root extraction for flow signals, pressure and temperature compensation, limit value computation can be performed either in the controllers or in signal conditioning and processing hardware outside controllers.
04.12.00	CONTROL SYSTEM REQUIREMENTS
04.12.01	The control system shall be broadly divided into CLCS, OLCS, BMS, SB, and Electrical System.
04.12.02	The functional grouping should be as per DRA.NO:03 and changes in Functional group are not accepted. The CLCS system shall perform the following: CLCS consists of control, monitoring function of Boiler, Turbine, Generator and its auxiliaries. Example: Furnace Draft Control, Air Flow Control, Secondary Air Damper Control, Drum Level Control etc. The OLCS system shall perform the following: OLCS consists of Binary control functions of Boiler, Turbine, Electrical system and its auxiliaries. The BMS system performs the Furnace safeguard supervisory system. The SB System control and monitor the Soot Blower system.
04.12.03	The number of Functional Groups (FGs) shown in these drawings are the minimum required. However, splitting of any functional group in more than one FGs due to any limitation in Bidder's system shall be acceptable, subject to TNPCL approval. For each of the FGs, separate sets of controllers, I/O modules, communication controllers, power packs/ modules etc. shall be provided. Mixing of hardware of two or more FGs shall not be acceptable. It shall be ensured that failure of any set(s) of hardware of any FG does not affect other FG(s) and data communication between other FG(s) and MMIPIS.
04.12.04	The minimum functions to be realized in each of the above mentioned Control Systems shall be as per requirements specified under subsequent clauses of these specifications. The Bidder shall provide all hardware/software, whether or not specifically indicated in this specification to fully meet operational/maintenance/safety requirement as well as statutory/ international standard and proven practices.
04.12.05	The Control System shall function reliably under the environmental conditions as specified under Clause 03.02.22 of this specification. It shall be immune from the interferences resulting from disturbances in power supply feeders, signal lines, inputs, outputs, etc. as experienced in a coal fired power station.
04.12.06	The Control System shall have on-line simulation & testing facility. Further, it shall be possible to on-line configure & tune controllers through configuration & Tuning Station for Control system.
04.12.07	The system shall have the flexibility to easily reconfigure any controller at any time without requiring additional hardware or system wiring changes and without disabling other devices from their normal operation mode. Modifications shall not require switching off power to any part of the system.
04.12.08	The remote manual operation from hardwired backup A/M stations & Push Button (PB) Stations (wherever provided) shall be independent of availability of controllers & power supply to controllers.

04.12.09	The executive programs for the controller modules shall be firmware based, which shall be non-volatile and shall not be alterable except by replacement of parts. The application programs for the functional controllers shall be software based which shall be maintained through power supply failure. The application program shall be alterable through the configuration and tuning station for all configuration and strategy changes, etc., and through the operator's console for set point/bias changes, device selection, etc. Parts replacement or parts removal shall not be required in order to accomplish changes in application programs including system tuning.
04.12.10	All the 100%hot/redundant backup controllers shall be identical in hardware and software implementation to their corresponding main controllers and shall be able to perform all its tasks. The backup controller shall track its corresponding main controller. There shall be an automatic and pumpless switchover from the main controller to its corresponding backup controller in case of main controller failure and vice versa without resulting in any change in control status. In case of switch over from main controller to the 100% hot backup controller, the back-up controller shall work as the main controller. Facility shall also be provided for manual switchover from main to100% hot back-up controller and vice versa from the programmer's console.
04.12.11	The control system hardware design shall be such that it is able to withstand power line disturbances.
04.13.00	BURNER MANAGEMENT SYSTEM (BMS)
04.13.01	<p>GENERAL DESCRIPTION:</p> <p>All the controllers of DCS including BMS shall be in same controller. Offered controller must be in service for BMS purpose for at least one year in any one of 200 MW or higher capacity coal and oil fired Boiler in India. The existing Furnace Safeguard Supervisory system (FSSS) of TNPGL/TTPS UNIT III, 210 MW is designed based on use with a boiler of the single furnace, natural circulation, tangentially fired type with pressurized pulveriser system. The system provides for the remote, manual operation of</p> <ol style="list-style-type: none"> 1. Two (2) Elevations of oil guns with provision of firing by HEA ignitor system for Heavy oil only. 2. One (1) Elevation of oil guns with provision of firing by HEA ignitor system for Heavy oil / Light oil. 3. Six (6) pulveriser serving six elevations (24 nozzles) of coal nozzles from a remote console mounted control panel. <p>The oil trip valves, H.O. Recirculation valve and Hot air gate can be opened / closed from the control panel.</p> <p>The oil guns, scanner fans, pulveriser, Raw coal feeder can also be started/stopped from the control panel.</p> <p>Purge cycle can also be started from the control panel.</p> <p>Indicating lights on the console mounted panel show the operating status of various field equipments comprising FSSS.</p> <p>The existing Electro-mechanical relay type Burner Management System BMS (FSSS) supplied by COMBUSTION ENGINEERING/USA and M/S. BHEL are now proposed for R&M by replacing them with DCS.</p> <p>The proposed DCS system shall support minimum back panel operation. Emergency Control Station ie Indicators, Push Buttons for operation & monitoring the parameters and it shall be suitable the BMS system shall be provided with in Back panel as per Annexure-B interfaced with DCS system.</p>

	<p>GENERAL REQUIREMENT</p> <ol style="list-style-type: none"> 1. The system is to include all the automatic and safety features as out lined in (NATIONAL FIRE PROTECTION ASSOCIATION) NFPA BULLETIN 8502 implosion and explosion prevention for multiple burner boiler furnaces and NFPA 8503 pulverized fuel system. All the control system equipment is to be designed and applied for fail-safe and fault tolerant operation. The bidder should clearly indicate how this philosophy is achieved in their proposal/offer. 2. Two MFT(Master Fuel Trip) channels shall be provided. Each channel shall have redundant controllers. I/O modules used for MFT channels shall be redundant. 3. The boiler trip function shall be implemented by 1-0-0-2-D Fail safe processors. This part shall be properly integrated in the main DCS system. 4. The Controllers of BMS shall be integrated with DCS controller through DATA HIGHWAY. Controllers shall be same family of DCS Controller. Interfacing of these two Controllers via server or any other media are not acceptable. 5. The system hardware and software shall comply with the requirements of IEC (INTERNATIONAL ELECTRO-TECHNICAL COMMISSION) 618508 & IEC 61131-3 standards on Functional Safety of Programmable Electronic System. 6. The BMS shall be so designed that it is completely reliable. The BMS shall be most versatile, rugged, microprocessor controlled, user friendly and based on latest state of art technology. 7. The basic philosophy of BMS shall be based on the state of art practices prevailing in the field of BMS for Thermal Power Stations. 8. Exclusive hard-wired tripping panel shall be provided. The emergency trip push buttons should be provided for cutting off all fuels and all HT Drives related to BMS through hard wired panel in case of emergency. 9. BMS shall perform protection, sequential interlocking operations; drive control interlocks with their safety protection. The BMS shall provide adequate and reliable protection & safe guard various equipment and shall assist the operator in easy, safe & efficient starting and tripping of various drives in the plant. 10. The BMS shall be designed to ensure the execution of a safe, orderly safe operating sequence during the startup and shutdown of the fuel firing equipment. And it should also provide complete protection against malfunctions of the fuel firing equipment. 11. The logic system should have necessary redundancy and supervisory circuits to avoid any failure, which could develop into dangerous situations. The boiler trip circuit shall be so designed that single point failure does not impair the safety. 12. The system shall be provided with adequate safety, diagnostic and application software and proved hardware from the same family of DCS hardware. 13. A Separate Engineering station for the BMS shall be provided. 14. Necessary cabling for the above work shall be bidder/ vendor scope. 15. All cables should be of FRLS and Heat resistant Type.
04.13.03	<p>LOGIC CIRCUITS</p> <p>The BMS logic drawing shall be furnished during engineering stage to the successful bidder/tenderer by TNPGL/TTPS.</p>
04.13.04	<p>M.F.T. REQUIREMENT:</p> <ol style="list-style-type: none"> a. Two MFT channels shall be provided. Each channel shall have redundant controllers. I/O modules used for MFT channels shall be redundant. b. The acquisition and conditioning of binary and analog protection criteria signal of MFT shall be carried out in each of the redundant channels.

	c. The tripping devices shall be designed to operate on the existing TNPGL 220 V DC supply. The trip coils shall be monitored continuously for healthiness and failure shall be alarmed.
04.13.05	Simulation The bidder shall have QA accreditation and shall have adhered to the principles outlined in AS 61508. It is the responsibility of the bidder/ tenderer for the development of the program, and for the test running the program by simulating the inputs and proving that the output occur at the right time and at right duration.
04.13.06	HARDWARE ARCHITECTURE & SOFTWARE ARCHITECTURE The Hardware architecture shall include self-checking firmware, external/internal watchdog systems, redundant processors, and dual input/output as required to achieve the specified .Software architecture shall include communication drives, fault handling, executive software, input/output functions and derived functions as required the system . Redundant components shall be separated so as to reduce common cause failure. The offered BMS package shall be in successful service in 210MW Boiler for a minimum period of one year and Documentary evidence shall be submitted for this requirement.
04.13.07	Input/output modules/redundancy <ol style="list-style-type: none"> 1. The BMS input Modules shall be same family DCS. 2. On line maintenance of BMS input Modules should not affect the OLCS and interlock protection and sequence of control system etc. 3. On line programming and modification of BMS logics should be possible without affecting the OLCS and other protection interlock. 4. The redundancy should be based on a true hot back up concept. 5. The redundancy minimum level should be 100 %(that is 1:1) 6. The redundancy shall be on true hot back up concept. Both main and back up modules should continuously perform the function with one on line and the other on hot standby mode. 7. Both main and back up modules should continuously monitor for fault diagnosing. 8. In the event failure of either the main module or the stand by module diagnostic message should be available in operator's CRT as well as maintenance engineer's CRT and an alarm should be initiated. 9. In the event failure of running module, the stand by module will take over automatically and such change over should not affect any manner the plant process control or interlock, and should be reported to the log files. Indication lamps should be provided for easy identification of module in service/failure etc. 10. The control loop or ladder logic configuration is independently available both in main and stand by modules. Any change in configuration made will be automatically updated in both in main and stand by modules. Hence after a failure when the stand by module taken over the control there will not be any transfer of data/ configuration etc. from the failed module to healthy module. This feature eliminates the possibility of corrupt data of a failed module getting transferred to healthy stand by module.
04.13.08	In the event of a failure (main or backup module) as per diagnostics the design should ensure that <ul style="list-style-type: none"> • It is possible to remove the faulty module on line without interruption to the processor or the running module. • Replaced healthy module shall have the facility for auto down loading of the configuration and current plant data from the running module and serve as stand by one. (This ensures that any changes done by the operator or

	engineer during the maintenance interval is taken care of)
04.13.09	<p>The BMS shall have a suitable control system, dedicated to Boiler furnace Safety and operator assistance in starting and stopping of fuel preparation and burning equipment, and for preventing mal-operation of and damage to fuel preparation and burning Equipment.</p> <p>The controllers offered for BMS should directly and seamlessly get integrated with the plant data highway of MAIN DCS and it shall be operated, monitored from DCS. However signals that initiate mandatory master fuel trips shall be hardwired.</p> <p>BMS shall be limited to one boiler only and no regulatory and non safety related logics should be performed in BMS Controller.</p>
04.13.10	<p>The following minimum failures (as per NFPA 85 standard) must be evaluated and addressed. Bidders /tenderers not meeting any of these will be rejected.</p> <ul style="list-style-type: none"> • Interruptions, excursions, dips, recoveries, transients and partial losses of power. • Memory corruption and losses. • Information transfer corruption and losses. • Inputs and outputs (fail-on, fail-off) • Signals that are unreadable or not being read. • Failure to address errors. • Processor faults. • Relay coil failure. • Relay contact failure (fail-on, fail-off) • Timer failure.
04.13.11	<p>Single fault should not hamper safety shutdown actions. In case of equipment faults, clear diagnostic information should be provided automatically in order to minimize Maintenance complexity.</p> <p>All electronic circuitry shall be built up with plug-in modules. On line modification of cards in safe manner should be possible. The complete software should be modified while the boiler is in operation and this should be without violating the safety requirements.</p> <p>It should be possible to identify (alarm) and therefore isolate faults/ malfunctions at Equipment.</p> <p>The controllers offered should have an integrated event recording and alarming facility.</p> <p>Diagnostics shall be included in design to monitor process logic function.</p> <p>Logic system failure shall not preclude proper operator intervention.</p> <p>Logic shall be password protected.</p> <p>Process safety time should be within 1 second.</p> <p>Protection from effects of noise shall be adequate to prevent false operation.</p> <p>BMS logic should not be affected by fault on global data.</p>
04.13.12	<p>Tools required for installation, commissioning & Testing Hardware, software etc if any, should be supplied along with package. Fault card testing kit should also be supplied along with package & licensed software in CD.</p>
04.13.13	<p>The open loop control system of BMS shall be modular and shall be capable of supporting the following loops. The entire controller shall be dual redundant with operator transparent fall back. The suggested provisional assignment of controllers.</p> <ol style="list-style-type: none"> 1. Unit Controller. 2. Elevation controller. -----AB Elevation. 3. Elevation controller. -----CD Elevation

	<p>4. Elevation controller. -----EF Elevation</p> <p>5. Master Fuel Trip I</p> <p>6. Master Fuel Trip II</p> <p>7. Pulveriser A and B.</p> <p>8. Pulveriser C and D.</p> <p>9. Pulveriser E and F.</p>
04.13.14	Erection, calibration, testing and commissioning of the total system is in the bidder's scope. All tools and tackles, special testing equipments and consumables required for erection and commissioning activities shall be arranged by the bidder. The contractor shall provide any other special instruments required for commissioning of DCS. The contractor shall leave such special instruments if any in the plant after commissioning for the purchaser's use.
04.13.15	Any Hardware / Software additions required during any stages for the efficient, safe and reliable operation of the plant either during detailed engineering / Commissioning before final taken over shall be supplied, installed and commissioned by the bidder without any additional cost.
04.13.16	The bidder shall supply Power TBs for 110V AC, 220V DC for external Boiler auxiliary equipments with suitable protection.
04.13.17	All the I/O modules shall have built in optical isolation features.
04.13.18	<p>General requirement of Power and other requirement</p> <p>a. Power distribution arrangement shall be provided for 110V ac for the all nodes.</p> <p>b. 2 pole 15A MCB with bus arrangement of 4 sqmm copper isolating link type TB (15 nos. for phase and 15 nos. for Neutral) shall be provided for 110V ac for each nodes (Elev AB, Elev CD & Elev EF).</p> <p>c. 2 pole 6A MCB with bus arrangement of 4 sqmm copper isolating link type TB (15 nos. for phase and 15 nos. for Neutral) shall be provided for 110V ac for each nodes (Elev A & B, Elev C & D, Elev E & F).</p> <p>d. 2 pole 10A MCB with bus arrangement of 4 sqmm copper isolating link type TB (15 nos. for Positive and 15 nos. for Negative) shall be provided for 220V DC for Unit section</p> <p>e. Copper Bus bar arrangement shall be provided for 110V ac distribution at Hardware panel.</p> <p>f. All TBs used for hardware tripping panel shall be provided with 4 sqmm copper isolating link type TB.</p>
04.13.19	<p>FLAME ANALYSING SYSTEM</p> <p>The Bidder shall supply one set of Flame analyzing system with wired panel suitable for flame detectors- 20Nos. of make BHEL. The analyzer shall collect signal values from flame detectors and analyzes the signals from flame detectors. It shall determine, if the current signal value is within the programmed limits as defined by functions.</p> <p>The analyzer shall measure the quality of the signal to provide an indication of changes in the burner flame. Quality values shall act as a barometer, forecasting when a burner flame-out is likely to occur and to anticipate changes and problems. The instrument shall automatically monitors the electronic components of the Flame Detector and Analyzer to detect system problems or faults.</p> <p>A no-flame condition shall occur when the analyzer Unit logic determines that an unsafe condition exists.</p> <p>The analyzer unit shall generate a no- flame signal if:</p> <ul style="list-style-type: none"> • Any faults are detected by the analyzer unit • Any programmed function limits are exceeded.

Each Flame analyzer unit shall consist of two independent channels. Each channel can receive and process a flame detector signal. The two detectors may be in any combination of the following designs.

- All DFS Flame scanner heads
- 4-20mA sensors head
- 0-5Volt sensor heads
- Flame Rods (Ionic Flame Monitoring)

Each detector shall independently configurable from the analyzer unit's push buttons and display, or with Flame software communicating over an RS-485/suitable communication link.

The analyzer unit can be powered by a redundant reliable power supply source. The analyzer unit shall have built in diode auctioneering for power source isolation.

Flame Failure Relay Drop - out	Configurable 0.1 to 2.5 seconds
Flame Relays	Three total each with Form C contacts
Flame Relay contact ratings	250V ac/3A/750VA, 220Vdc/300mA/66 watts
Fault Relay contact ratings	250V ac/3A/750VA, 220Vdc/300mA/66 watts
Analog Flame Signal outputs	Two channels of 4-20mA signals. Each channel may independently monitor intensity, Frequency, Quality, or AC Amplitude
Serial Data communication	Two galvanically isolated RS-485 interfaces (Fully independent for redundancy)
Self checking Time cycle	Electronics shall be checked every 0.1 seconds
Ambient Temperature	0-60°C, 95%non- condensing atmosphere
Electrical connections	Screw terminals, compression type, accepting 12 to 20 wire gage
Module Mounting	Din rail mounting
LED display	Graphic LED display Module displaying 4 lines of 20 characters and multiple bar graphs
Programming push buttons	4 (Program, Display, Up and Down)
Status Lights	4 (Power, Flame #1, Flame #2, Flame #3 or Fault
Display options	7 to 13 information screens depending on module configurations
Program Lock-out	Local, DIP switch select
Remote programming	Remote programming of function via RS-485 link and Flame Explorer software
RS485	2RS485 interfaces, One for each channel for redundancy (each interface has access to both channels)
Relay outputs	3 - Flame #1, Flame #2, Flame #3 or Fault
Analog outputs	Two 4-20mA analog outputs for Trending or Monitoring of Frequency, Intensity, Quality, or AC Amplitude

The output of this flame analyzing system shall be interfaced with BMS DCS via suitable hardware and software. Any flame analyzing system in service with BHEL safe flame

	scanner for more than one Year in 200 MW or higher is acceptable.
04.15.00	TURBINE PROTECTION SYSTEM (TPS) FUNCTIONS
04.15.01	<p>The Turbine Protection System shall meet all applicable safety standards/requirements. The system design shall be such that safety function of the total system must not be jeopardized on occurrence of fault. Any single fault in primary sensor, input / output modules, controller module etc. shall in no way jeopardise the safety of the turbine. All modules to be used in this system shall be of fail-safe design.</p> <p>The Turbine Protection System shall also be implemented in 2 out of 3 voting logic. Three independent trip channels each having its own and dedicated processing modules, controllers, Input /output modules etc. shall be provided to achieve 2 out of 3 voting logic. {Refer DRA.NO:02 & 03}. The outputs of the three channels will be used to implement 2 out of 3 voting logic in two relay units, the output of which will be fed to the two turbine trip relays.</p> <p>Turbine shall be tripped when either of the above two trip relays operates. The exact implementation shall be subject to TNPGL approval during detailed engineering. All the input signals (trip signals etc. from the field devices) shall be fed in parallel to all the three/both the redundant channels of protection system as mentioned above via signal conditioning cards designed for such application. Further, the computation of field input voting logics i.e., 2 out of 3 etc. shall also be performed in the controllers of all the three/two channels of protection system, which will then perform the computation of 2 out of 3 voting logic independently.</p> <p>All trip signal inputs required for the safety of the turbine shall be based on 2 out of 3 logics.</p> <p>The tripping devices shall be designed to operate on 220 V DC supply. The trip coils shall be monitored continuously for healthiness and failure shall be alarmed.</p>
04.16.00	BINARY CONTROLS/OPEN LOOP CONTROL SYSTEM (OLCS) FUNCTION
04.16.01	<p>The OLCS shall include sequence control, interlock & protection for various plant auxiliaries/valves/dampers/drives etc. The sequence control shall provide safe and automatic startup and shutdown of plant and of plant items associated with a plant group. The interlock and protection system shall ensure safe operation of plant/plant items at all times and shall automatically shut down plant/plant items when unsafe conditions arise.</p> <p>The Loop reaction time (from change of output of the sensor element to the corresponding control command output) shall be within 100 milli seconds.</p> <p>Manual operation for the drives shall be included in the DCS. The output from the DCS shall be parallel to the existing push buttons, so that the operator could start/stop the drive either from the UCB or from console.</p>
04.16.02	<p>The OLCS shall be arranged in the hierarchical control structure consisting of unit level, group level, subgroup level & drive level (as applicable).</p> <p>It shall be possible to perform automatic unit startup & shutdown by issuing minimum number of command from the OWS. Thus, the unit level shall control all the Control System Blocks and issue appropriate startup & shutdown commands to various blocks of Control System.</p> <p>The group level shall control a set of functional sub-groups of drives. Appropriate startup and shut down commands shall be issued to the sub-group control and various check backs shall be received from sub-groups or drives. Each sub-group shall execute the sequential start-up and shut down programmes of a set of inter-related drives along with system interlocks and protections associated with that sub-</p>

	group as well as basic interlocks and protections related to individual drive falling under that sub-group. The drive level shall accept commands from the sub-groups, push buttons (wherever provided), etc., and transmit them to the respective drive, after taking into account various interlocks and protections and the safety of that particular drive.
04.17.00	Sequence Control
04.17.01	A sequence shall be used to move a set of groups, sub-groups from an initial steady state (for instance 'OFF') to a final steady state (for instance 'ON'). The sequence initiating command for the unit & group level shall be issued from LED MONITOR/KBD.
04.17.02	A sequence shall be made of steps. The steps shall be executed in predetermined order according to logic criteria and monitoring time consisting of the interlock & protection requirements and check back of previous step, which shall act as preconditions before the sequence control can execute the command for that step.
04.17.03	Each step shall have a "waiting time" implying that the subsequent step would not be executed unless the specified time elapses. A monitoring time shall also be defined as the maximum time required in executing the commands of any step and the time required for appearance of check back signals. In case, this is not completed within the specified time, a message shall be displayed and programme will not proceed further.
04.17.04	Manual intervention shall be possible at any stage of operation and the sequence control shall be able to continue at the correct point in the programme on return to automatic control. Protection commands shall have priority over manual commands, and manual commands shall prevail over auto commands.
04.17.05	An integrated unit startup system shall be implemented in DDCMIS incorporating all operational curves for SG, TG and auxiliaries. This shall guide the operator to take appropriate actions at appropriate time to bring the rated parameters safely within the specified time.
04.17.06	Open or close priority shall be selectable for each drive.
04.17.07	<p>The sequence startup mode shall be of the following types.</p> <p>i) Automatic Mode: In this mode of operation, the sequence shall progress without involving any action from the operator. The sequence start/stop command shall be issued from the LED MONITOR/KBDs.</p> <p>ii) Semi-Automatic Mode: In this mode of operation, once the sequence is initialized, the step progressing shall be displayed on the LED MONITOR. But the step execution command shall be prevented and shall be sent by the operator via the keyboards. It shall be possible to bypass and/or simulate one or more criteria to enable the program to proceed. This facility shall allow the program to be executed even if some criteria are not fulfilled because of defective switching device, etc., while the plant condition is satisfactory. All the criteria bypassed shall be logged and displayed. It shall be possible to put the system on the Auto-mode after operating it on semi-automatic mode for some steps or vice-versa, without disturbance to the sequence operation.</p> <p>iii) Operator Test Mode: It shall be possible to use the sequential control in operator guide mode/ test mode i.e., the complete system runs and receives input from the plant and the individual push button stations (where provided)/ keyboards but its command output is blocked. The whole programme, in this case shall run in manual mode. This mode shall allow the operator to practice manual operation using step and criteria indications. The actual protection shall remain valid during this mode of operation also.</p> <p>For the drives, the command shall be provided through O/P module to the</p>

	<p>coupling relays in MCC/SWGR/Actuator/Relay Cabinets as applicable and inputs (status, SWGR & process) shall be acquired through input modules. Redundancy in drive outputs shall be provided for drives during detailed engineering. The failure of one of the redundant, output module shall in no way affect the function of the other output module, wherever redundancy is provided.</p> <p>The output modules shall have the feature that ensures that in case of failure, all the outputs are driven to zero. The 24V DC command outputs to drives for ON/OPEN, OFF/CLOSE shall be separate and independent and inverted outputs shall not be employed. Live +24V DC outputs shall be provided to MCC/SWGR/ actuator as applicable when command is to be issued. Keeping +24V DC extended to the relays for these outputs continuously & extending ground/negative when command is to be issued, is not acceptable except some of the auxiliary plants as to be decided during detailed Engineering.</p> <p>For inching type of drives, position transmitter power supply and monitoring of position transmitter signal shall be provided. The sequence interlock & protection requirements shall be finalised during detailed engineering and the same shall be subject to Employer's approval.</p> <p>Drive related inputs and outputs shall be assigned in I/O modules as per pre-defined uniform pattern. The philosophy for the same shall be as approved by the Employer during detailed engineering stage. The interfacing of these outputs with MCC/SWGR/Actuators/Relay Cabinets shall be as per interfacing requirements. The system design shall ensure that in case of failure of output module, all the outputs shall be driven to zero. The position indication for inching type valves and pushbutton wherever provided shall be interfaced through I/O modules.</p> <p>The drive function i.e. basic interlock & protection logic of the drive shall be implemented in redundant controllers. The drive function shall ensure that protection signals for the safety of the drive shall be effective under all conditions and under all modes of operation. The different commands shall be performed according to the priority of protection 'Off', Protection 'On', manual and automatic. The standard functions like running time monitoring, status signaling, alarm/drive annunciation, etc. shall be performed in drive function.</p>
04.17.08	<p>The sequence shall be started by putting the sequence on 'auto' and on receipt of 'start' command from the OWS or from a higher-level group/ protection action as defined. The sequence shall then progress as per the defined logics. It shall be possible to select alternative operation in the same sequence depending on certain process/ equipment condition. Some step can be automatically bypassed also based on certain process/ equipment condition. When the expected result of the sequence is reached, the sequence is considered as "End".</p>
04.17.09	<p>If during sequence initialization or sequence progressing or during normal running of the drive, a shutdown criteria is present, the sequence shall be stopped and the shut down sequence initiated.</p>
04.17.10	<p>For the drives, the command shall be provided through redundant O/P module, and inputs (status, SWGR & process) shall be acquired through input modules. The inputs & output modules used in relation to drives shall not be mixed with inputs & output modules for other applications. The drive logic shall be implemented in the redundant controller.</p> <p>The status for the HT drives and some other important drives (total approximately 30 nos.) shall also be wired in parallel to redundant input modules so that on failure of the single input modules, the information regarding the status of affected drive remains</p>

	available in OLCS.
04.17.11	The output modules shall have the feature that ensures that in case of failure, all the outputs are driven to zero. The 24V DC command outputs to drives for ON/OPEN, OFF/CLOSE shall be separate and independent and inverted outputs shall not be employed. For inching type of drives, position transmitter power supply and monitoring of position transmitter signal shall be provided.
04.17.12	The sequence interlock & protection requirements shall be finalised during detailed engineering and the same shall be subject to Employer's approval.
04.17.13	The OLCS shall also include the control of electrical systems in addition to the auxiliaries of boiler & turbine performing functions such as open/close or on/off etc. of various electrical systems such as breakers and isolators, Raise/lower for equipment like transformers tap changer, synchronisation of unit, etc. All the features and specification requirements as specified above shall also be applicable for electrical system. Control and all the operation shall be performed through LED MONITOR/KBDs of OWS. However, emergency hardwired backup switches on UCP shall be provided.
04.18.00	ANALOG CONTROLS/ CLOSED LOOP CONTROL SYSTEM (CLCS) FUNCTIONS
04.18.01	The following control loops are envisaged for renovation which are in the existing CLCS system. <ol style="list-style-type: none"> 1. Furnace pressure control. 2. Total air flow control 3. PA header pressure control 4. Secondary air damper control. 5. Mill 'A' to 'F' hot air damper control 6. Mill 'A' to 'F' cold air damper control 7. Mill 'A' to 'F' raw coal variator control 8. Heavy oil temperature control 9. Heavy oil header pressure control 10. Heavy oil pump disch.pressure control 11. Light oil header pressure control 12. PRDS temperature control 13. PRDS pressure control 14. SH/RH spray control & Burner tilt control 15. Soot blower pressure & drain temp. control 16. CBD level control 17. Drum level control 18. DP across FCV (BFP scoop)/FCV wide open control 19. Hotwell level control 20. Dearator pressure Control 21. Dearator level control 22. Gland seal steam header pressure control 23. Speeder gear control (load control on pressure Mode) 24. HP Heater-7 level control 25. HP Heater-6 level control 26. HP Heater-5 level control 27. LP Heater-4 level control 28. LP Heater-3 level control 29. LP Heater-2 level control

	<p>30. Gland cooler level control 31. HP/LP Bypass control</p> <p>Note: Control loops for item No. 9, 11, 12 & 13 have final control element is electrical actuators. For other control loops, final control elements are Pneumatic actuators.</p> <p>HP, LP Bypass system consists of combined unit of servo valve and blocking units (10 Nos) supplied by M/s BHEL. If the servo valve operation is not supported by Vendor's DCS, the necessary suitable converter to be supplied by the Vendor's scope.</p>
04.18.02	<p>The CLCS shall continuously act on valves, dampers or other mechanical devices such as hydraulic couplings etc., which alter the plant operation conditions. The system shall be designed to give stable control action in steady state condition and for load changes in step/ramp over the load range of 60% to 100% MCR with variation or parameters within permissible limits to be finalised during detailed engineering state. The system shall have the following minimum features:</p>
04.18.03	<p>The controller capability shall, as a minimum, include (i) P, PI, PD and PID control functions and their variations (ii) cascade control (iii) feed forward control (iv) State - variable based predictive control for SH/RH temperature control (v) On-Off control, (vi) Ratio and bias control, (vii) Logical operation etc.</p> <p>The Loop reaction time (from change of output of the sensor of the transmitter/temperature element to the corresponding control command output) shall be within 500 milli seconds. However, for faster loops such as feed water, furnace draft, PA header pressure control loop etc. the same shall be based on actual process requirement but shall not be more than 250 mill second.</p>
04.18.04	<p>The control system shall be bumplessly transferred to manual on the following conditions as a minimum and as finalised during detailed engineering.</p> <p>Control power supply failure, Failure of redundant controllers, Field input signal not available, Analog input exceeding preset value, etc.</p>
04.18.05	<p>Any switch over from auto to manual, manual to auto and switchover from LED MONITOR operation to A/M station operation and vice versa shall be bumpless and without resulting in any change in the plant regulations and the same shall be reported to the operator.</p>
04.18.06	<p>Buffered analog output (positioning signal) of 4-20mA DC shall be provided from CLCS to the respective Pneumatic actuator I/P converters, shall produce valve open/close depending upon the command (4-20mA) corresponding to the signal air through the positioner compatible with Pneumatic actuator. For electrical actuators, CLCS shall produce three position (RAISE / OFF/ LOWER) pulsed outputs through potential free contacts to operate Reversible Magnetic Contactors (RMCs) compatible with the existing three phase motorized actuators. The contact rating of the IPR relay shall be 250 V AC/10 Amp. The DCS Controller shall produce proportional, integral, derivative pulsed output command to energize More/Less relays of the electrical actuators for valves/dampers/vane, which are based on the difference between Process Value (PV) and Set Point (SP). The controller signals the direction and the time of travel to the valve. The CLCS shall generate outputs without requiring any position feedback from the final control element. The adjustable dead band setting shall prevent the valve from hunting. Digital Input from the existing Auto/Manual Station (whether Auto or Manual) in the UCD shall be acquired to block the DCS Controller output pulses, if the AMS is selected in Manual Mode.</p> <p>CLCS shall also provide all the necessary outputs for indicators & recorders with output loop resistance of 500 ohms for each channel of the output module.</p> <p>For the drives, the command shall be provided through redundant O/P module</p>

	and inputs (position feedback & process) shall be acquired through input modules. The inputs & output modules used in relation to drives shall not be mixed with inputs & output modules for other applications. The drive logic shall be implemented in the redundant controller.
04.18.07	The functional requirement of the CLCS loops as well as the detailed schemes shall be finalised during detailed engineering stage and shall be subject to TNPGL approval.
04.18.08	The System being supplied shall be such that when permissible limits are exceeded, an automatic switchover from an operation governed by maximum efficiency, to an operation governed by safety and availability is affected.
04.18.09	For safety reasons, switchover logics associated with the modulating control loops shall be performed within the closed loop control equipment.
04.18.10	Time supervision facility shall be provided to monitor the final control element.
04.18.11	It shall be possible to block the controller output on a pre-programmed basis.
04.18.12	All controllers shall be freely configurable with respect to requisite control algorithms. It shall be possible to change any independent loop of a multi loop controller module without affecting other loops.
04.18.13	Whenever, alternate measurement is available for a control input the alternate measurement value will be automatically substituted in the control loop in case of loss of control input. All necessary software for switching and reconfiguration shall be provided. In addition, such substitution shall be balance less and bumpless and shall be reported to the operator.
04.19.00	OTHER TG C&I FUNCTIONS The TG control functions shall also, consist of Turbo-Generator Control System like Seal oil system, Stator water system, hydrogen cooling system etc. interlock & protection.
04.20.00	Station Wide Network Connectivity to a plant information network (TCP/IP on Ethernet) shall be provided through web server. On the Ethernet, Two number PCs. with latest configuration shall be provided which are to be located at a distance of 800 meters. To achieve the same, the vendor shall provide fiber optic or Ethernet cable with repeaters. <u>The system shall support the following:</u> <ul style="list-style-type: none"> • The information of Unit shall be available in each of the plant information networks PCs. • The PCs shall be Windows – 10 or latest windows based. • It shall be possible to view the plant Graphics and other operator screens (like group display, alarm pages etc.) for analysis purposes on real time basis in the PCs. The vendor shall provide necessary software /Hardware required. However operation of the plant shall not be possible from this PCs. Separate server shall be provided for this purpose with OPC server software for connectivity. • Real time process data (with time stamp) shall be available at these PCs in Excel spread sheet. The vendor shall provide necessary software/Hardware required. • The data exchange shall comply with de-facto standard like DDE,OLE,ODPC,OPC etc. • Necessary suitable Gateway/firewall shall be provided by the vendor.
04.21.00	SEQUENCE OF EVENTS RECORDING/ ANNUNCIATION SYSTEM FUNCTIONS
04.21.01	SER FUNCTIONS
04.21.01.01	The system shall monitor SOE inputs with a resolution of one millisecond at all times for all inputs including spare inputs. That is, all SOE points entering status change shall be

	reported and time tagged within 1 (one) millisecond of their occurrence. Input card shall be equipped with digital filters with filter delay of minimum 4ms (identical for all points) to eliminate contact bounce such that field contact which is changing state must remain in the new state for successive 4 ms to be reported as one event. The start of data collection for SOE report shall be reported to OWS within 1 second of SOE data collection initiation. The system shall also have provision of rejection of chattering inputs.
04.21.01.02	The system shall also include provision for historical storage and retrieval of SOE reports for 3 months period.
04.21.01.03	The SOE report collection shall begin on occurrence of change of status of any SOE point and shall be printed after an operator selectable time interval of 1 to 3 minimum or 100 status changes have taken place after the first event. Adequate memory to accommodate Six SOE reports i.e., two buffers of 100 status changes each shall be provided. Seventh SOE report shall overlap the first SOE report memory and so on.
04.21.01.04	The SOE reports shall also include a list of major equipment trip in chronological order and include the points, which initiated SOE collection.
04.21.02	Annunciation system Function
04.21.02.01	The annunciation system shall be implemented as an inbuilt function of the DDCMIS. The field contacts shall be acquired through DDCMIS only. All the annunciation shall be incorporated in the LVS with audible alarm. Further necessary critical annunciation facia windows (48Nos) shall be decided during detailed engineering and provided on unit control panel and the same will be driven through contact output modules of the control system of DDCMIS. Audible devices for alarm with adjustable pitch and sound and acknowledgement facility shall be provided for the above critical alarms. However additional facility to drive standalone printer in case of total MMIPIS system Bus failure shall be provided. For Remote Alarm system for Unit I, II, III cooling water pump house four numbers(4Nos)of 24 windows alarm annunciater and Boiler feed pump in Unit-III Three numbers (3Nos)of 24 windows alarm annunciater may be provided by the bidder scope.
04.22.00	GPS Satellite Radio clock system (Complete redundant)
04.22.01	The Bidder shall provide a data insensitive GPS satellite Radio Clock system to provide uniform timing throughout the various plant facilities supplied by Bidder as well as that not in Bidder's scope. The system shall be complete with receiving antenna (for receiving time from Satellite Radio signal), receiver and associated electronics, Redundant Master clocks, Interconnecting cables, cubicles, power supplies any other accessories. However, a provision shall be kept for synchronization of the master clock with other source. The MMIPIS, the switchyard event recorder and other plant PLC's shall be synchronized with the master clock once every minute, or at a frequency required by the MMIPIS system. The master clock shall be located in the CER and shall have facility for automatic synchronizing with external radio/satellite signals.
04.23.00	POWER SUPPLY & CABLING REQUIREMENTS
04.23.01	Power Supply: The C&I system shall be suitable for operating on 110V AC power supply. 230V AC, single phase, 50 HZ power supply of adequate capacity shall be provided for LED MONITOR, printer and other equipment which are not available for operation on 110V AC. The bidder shall be provided 24V DC Field control supply system for UCD,Local panel

	indication via suitable UPS power supply converter.
04.23.02	<p>AC Distribution Board (ACDB): The details of the AC distribution board, i.e. exact design, rating and number of feeders etc. of the 2x100% ACDBs shall be as finalised during detailed engineering and as approved by TNPGL. Minimum 15nos of 3 KVA feeders and 5 Nos. 5KVA feeders with fuses, MCBs for the rating shall be provided. Further, 25% spare feeders (min.3 Nos) with fuses for each rating shall be provided.</p> <p>Two nos. of 5 KVA, 110/ 230 volt step up Single phase transformer with input & output MCBs shall be supplied and installed in ACDBs for the Power supply of LED MONITORS, printers, panel mounted Indicators & recorders and other equipment which are not available for operation on 110V AC. Further, 25% spare feeders (min.3 Nos.) with fuses for each rating shall be provided.</p>
04.23.03	<p>Power Distribution Dual feeder of 110V AC, UPS power supply shall be provided at the DCS power distribution panel.</p> <p>The power distribution panels shall include MCBs for the DCS requirements and additionally 20 Nos MCBs are required for others systems like local BFP panels, Specific resistivity panel etc.</p> <p>Outputs of all MCBs shall be terminated in a terminals strip. MCBs shall be provided for the main incomers of 24 VDC, 110 V AC & 230 V AC. Each AC electrical power circuit breaker and fuse shall be tagged with a permanently mounted nameplate with service description. The requirement of power for the DCS and other subsystem equipment through Distribution panels with required power cable shall be under Bidder scope.</p>
04.23.04	<p>System Wiring: Connection between marshalling rack and system cabinets shall be with prefabricated cable or wire wrap. All cables shall be suitable for routing through the false floor below the panels in the control equipment room. Cable lengths shall be considered accordingly.</p>
04.23.05	<p>Field Wiring Connection: Field wiring shall be carried out using conductors with following sizes: Conductor - Copper Insulation - PVC Stranded - 7 strands minimum overall shielded Conductor size - 1.5 sqmm for single/ multipair/ multitriad twisted analog signal cables - 2.5 sqmm for power cables & DOs. - 4 sqmm BMS power supply distribution - 16AWG for 1/2/8/12 pair T/C compensating cables.</p>
04.23.06.00	PANELS, DESKS, RACKS AND CUBICLES
04.23.06.01	<p>In general in the following sections, panels shall mean desks, marshalling panels, system cabinets, relay panels & power supply panels unless otherwise stated.</p> <p>Unless otherwise specified, panels, desks and cubicles shall be of floor mounted and free standing construction including those used for alarm and protection relays and the like. Self-standing electronic cubicles shall be located in air-conditioned control equipment room (CER) as per the DRA.NO:07. The electronic cubicles shall house I/O racks, processor, power supply modules and cable entry shall be from bottom. Electronic cubicles located within CER shall have enclosure class IP: 20 or better.</p>
04.22.06.02	<p>Panel Construction All control, computing and output devices of the DCS, shall be housed in convenient steel structures units (cabinets) to facilitate equipment arrangement, design,</p>

	<p>installation and maintenance.</p> <p>All cabinets shall be vertical, freestanding, self-supporting, dust proof construction, fully internally wired suitable for tropical conditions. The cabinets shall be fabricated from minimum 2.0 mm thick Cold Rolled Carbon Alloy (CRCA) steel sheet and finish painted as per colour and quality approved by TNPGL. Suitable vibration dampers, lifting bolts, grounding bus shall be provided. All access doors shall be provided with channel rubber/neoprene gaskets, the operating handle shall have locking arrangements.</p> <p>System cabinets shall be located at CER and shall be freely accessible from front and / or back as required. Minimum space required shall be provided between the cabinets.</p> <p>All the cabinets and panels shall be completely wired and/or tubed, if required. Interconnections shall preferably done with the help of pre-tracked cables. Overall height, excluding cable boxes, shall not exceed 2.20 mtr. Construction shall be modular preferably to accommodate 19" standard electrical racks. All racks shall be of same height. Maximum swing out for pivoted card racks, doors and drawers shall be limited to 600 mm. Operating handles and locking devices shall be located within the operating limits of 0.5mtr.and 1.8mtr.above floor level. The minimum height for indicating instruments and meters shall be 1.5mtr.unless otherwise approved by the Engineer for the use on desks.</p> <p>Cabinets shall be equipped with front and rear access doors. Doors shall be equipped with lockable handles and concealed S.S. hinges with pull pins for each door removal. The Front door of the Electronic panel may be provided with transparent unbreakable glass with suitable thickness.</p> <p>Equipment, within the cabinet shall be laid out in an accessible and logically segregated manner. Clamping rails shall be provided for the incoming cables to prevent excessive stress on the individual terminal. All metal parts of the cabinets including doors shall be electrically continuous and shall be provided with a common grounding lug.</p>
04.23.06.03	<p>OPERATOR CONSOLE</p> <p>Control desk supplied shall be suitable for desk-top mounting of all DCS workstations The Operator control desk shall house the operator consoles. The Engineering System shall be placed on a separate desk in the computer room. The colour of desk and panel shall match the colour of UCB.</p> <p>Adequate support shall be provided for holding the LED MONITORS keyboards and mouse. In the horizontal plane of the console (X- plane), operator keyboard shall be fixed by making a dip (insert). Sufficient free space shall be considered in X-plane. Separate free going type drawer shall be provided for keeping QWERTY keyboard.</p> <p>All sections of the operation station control desk shall be constructed on single piece of sheet. The final finish of the desk shall be smooth. Design and workmanship shall be such as to result in a neat appearance outside and inside with no welds, rivets and bolt heads apparent from front and with all exterior surface true and smooth.</p> <p>Cable entries for the control desk shall be from the bottom. CPU of the PC can be fixed inside the console. Necessary fans have to be provided in the console for cooling. Necessary spare power sockets shall be provided in the console. Suitable pre-wired terminal strips shall be provided in the control desk of each section for all the workstations / LED MONITORS.</p>

04.23.06.04	<p>Panel Earthing</p> <p>Two separate earth circuits shall be provided for earthing, one as Electronic earth (or instrument grounding) through separate group of pits for earthing of instruments & electronics and second safety earthing for earthing of system cabinets. These two earth circuits are electrically isolated from each other.</p> <p>Each cabinet shall be provided with a copper bus 25 mm wide, 6 mm thick and of suitable length with tapped holes to suite M6 bolts of brass. The copper bus shall be mounted suitably inside the cabinet and shall be electrically isolated from cabinet steel structures through insulated spacers of suitable material.</p> <p>All circuit grounds of electronic instruments, shields & drain wires of signal cables shall be connected to this ground bus.</p>
04.23.06.05	<p>Intrinsically Safe Circuits Earthing</p> <p>Where intrinsically safe circuitry is involved from hazardous area to safe area or instrument panel it shall be routed through 'Zener Barriers' located in the safe area (instrument panel) of suitable rating and mounted on an insulated earthing bus bar having facilities for connections of a separately dedicated outgoing cable to a 'clean earth' system.</p>
04.23.06.06	<p>Color</p> <p>The exterior color and standard of finish of all panels and cubicles shall be uniform. The interiors shall be finished semi-glossy white.</p>
04.23.06.07	<p>Finish</p> <p>All metal surfaces shall be thoroughly cleaned and particular care taken during painting to ensure that a first class cover and finish is achieved both internally and externally.</p>
04.23.06.08	<p>Sealing of Panels</p> <p>The bottom of the panels shall be sealed by means of removable steel blank gland plates 3 mm thick with necessary gaskets & fire proofing compound shall be provided for sealing.</p> <p>Door sealing material shall be provided suitable for the specified site conditions.</p>
04.23.06.09	<p>Inter Panel Wiring</p> <p>For suites of panels inter panel bus wiring shall be routed through apertures in the sides of panels and not via external multi core cabling looped between the panels. Connection between marshalling cabinet & system cabinets shall be through prefab cables or wire wrap.</p>
04.23.06.10	<p>Panel Lighting / Service Socket</p> <p>Each panel shall include rear access doors and 230 V AC door-operated interior lamps. A service socket with fuse shall be provided in each panel.</p>
04.23.06.11	<p>Door Locks</p> <p>Doors shall be fitted with handles and locks. The doors shall be capable of being opened from within the panel without the aid of a key after they have been locked from the outside. Hinges will be made up of S.S, it shall be of the lift – off type, All the locks shall be similar openable with the same key. Spare Hinges and locks 50% shall be supplied.</p>
04.23.06.12	<p>Proofing Vermin</p> <p>All panels, desks and cubicles shall be adequately vermin proofed.</p>
04.23.06.13	<p>Double Terminations</p> <p>Wiring or terminal blocks shall be made such that each terminal shall only carry one wire. Double termination is not allowed except for stud type and wire-wrap terminals.</p>
04.23.06.14	<p>Ferruling</p> <p>Each wire and cable shall be tube ferruled accordingly and the ferruling system shall be</p>

	double cross ferruling marked on two sides of the termination.
04.23.06.15	Marshalling cabinets shall cater to all the input / output specified inclusive of the installed spares. The 20% installed spare I/Os shall also be wired to the marshalling terminals. For further expandability 20% spare terminals shall be provided in the marshalling cabinets. The number of marshalling cabinets to be provided shall be subject to approval of panel terminal strip layout & cable entry layout during detailed engineering stage. All digital and analog I/Os shall be wired with fused TB's with LED's.
04.23.06.16	Cabinets shall be provided for power distribution, hardwired limit value monitors, analog and digital signal multipliers, signal isolators etc.
05.00.00	Testing & Inspection
05.01.01	A 100% integrated system simulation test shall be carried out in the shop to test all hardware and software. The testing shall be carried out as per hardware testing of digital Process Computer's ISA RP 85.1.
05.01.02	All completely assembled system shall be subjected to burn-in under simulation condition at shop for duration of 48 hrs. in addition to the simulation and functional test time.
05.01.03	The Factory Acceptance Test shall be conducted within 100 days from the date of P.O. The FAT shall be carried out as per final approved drawings / documents. All logics, Signal exchange, Alarm reporting, SOE reporting, all type of measurements etc shall be demonstrated during FAT.
05.01.04	After successful completion of FAT, the part number and Quantity of the spare will be finalised for the DCS system as per the section 1E-02.01.01.
06.00.00	QUALITY ASSURANCE PROGRAMME, TESTING AND INSPECTION
06.01.00	Quality Assurance
06.01.01	The detailed Quality Plans for manufacturing and field activities shall be drawn up by the bidder and schedules and will be submitted to TNPGL for approval. In these approved quality plans, TNPGL shall identify customer hold points (CHP); These approved documents shall form a part of the contract.
06.01.02	No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/inspections by TNPGL Engineer, and duly authorized for despatch issuance of TNPGL.
06.01.03	For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.
06.02.00	Inspection, Testing and Inspection Certificates
06.02.01	The Vendor shall give the TNPGL fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Vendor's account.
06.02.02	SYSTEM ACCEPTANCE TESTS
	The TNPGL shall provisionally takeover the system from Bidder after system acceptance test. System acceptance test shall be started only after the satisfactory performance of loop checking record by Engineer-in-charge.
06.02.03	The system acceptance test shall be carried out in the presence of TNPGL representative and Engineer-in-charge or his authorized representative. The tests carried out in system acceptance test shall be fully recorded and duly signed by all representative participating in the System Acceptance Testing.

06.02.04	<p>Vendor shall carry out the following functional tests on the fully integrated system as a part of system acceptance test, as a minimum.</p> <ol style="list-style-type: none"> 1. Hardware verification as per final Bill of Material. 2. Visual and mechanical checking for proper workmanship identification, ferruling, nameplates, etc. 3. System configuration as per approved configuration diagram. 4. Checking of correct functioning of all keyboards and dual functional keys. 5. Checking of proper of hardcopy unit and also printers. 6. Demonstration of all system diagnostics. 7. Checking of correct changeover of redundant devices. 8. Checking of proper functioning of all disc drives, historical trend points, alarm summary and alarm history.
06.03.00	TNPGCL ACCEPTANCE TESTS
06.03.01	<p>After the pre-commissioning tests are satisfactorily over, the complete equipment shall be placed on initial operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant.</p>
06.03.02	<p>SUSTAINED PERFORMANCE TEST (SPT)</p> <p>The objective of the SPT is to determine the long-term stability and availability of the DCS under normal operating conditions. It will also verify the DCS ability to report any and all malfunctions in an easy to understand manner and the Bidder's ability to diagnose and fix any problem in a timely manner. The test commences when the DCS assumes a portion of the process. The SPT will be conducted by the TAMIL NADU POWER GENERATION CORPORATION LIMITED (TNPGCL) over a sustained period of 30 consecutive days (or longer under agreed conditions). The criteria for success will include atleast 99.9% availability (in the standard statistical sense) and not more than one hardware and / or software failure during the 30 days period.</p> <p>A failure is defined as any occurrence preventing full utilization of the DCS. Availability will not be effected and the SPT will be temporarily suspended in case of any failure caused by project supplied equipment or services. Any failure reported during the Test period shall be fully recorded and duly signed by Bidder's Representative and Engineer-in-charge.</p>
06.03.03	<p>Performance and Guarantee Test</p> <p>The values of performance parameters that are to be guaranteed are furnished elsewhere in this specification.</p> <p>The equipment shall be guaranteed to meet performance requirements required by this specification and rectification shall be carried out until satisfactory results are obtained. The TNPGCL reserves the right to reject the equipment shall the performance values fall short of those indicated in the schedule of Technical data sheets.</p> <p>In case of such option of rejection being exercised by the TNPGCL, Vendor shall replace the equipment, which shall meet the guaranteed values.</p>
06.03.04	<p>Test Codes</p> <p>The provisions outlined in the international or Indian codes shall generally be used as a guide for all above test procedure unless otherwise specified in Detailed Technical Specification.</p>
06.03.05	<p>Taking over</p> <p>Upon successful completion of all the TNPGCL Acceptance Tests, the TNPGCL shall issue to the vendor a Taking over Certificate as a proof of the final acceptance of the equipment. Such certificate shall not relieve the vendor of any of his obligations which</p>

	otherwise survive, by the terms and conditions of the Bidder after issuance of such certificate. Until the taking over certificate issued, the vendor is the custodian for all equipments.
07.00.00	DRAWINGS AND DOCUMENTS
07.01.01	All communications/ descriptions in the drawings, documents, LED MONITOR displays, software documentation and manuals shall be in English only
07.01.02	SYSTEM DOCUMENTATION The Bidder shall furnish detailed system and equipment documentation. It shall include detailed system and components description covering the installation, operator care and maintenance of all system components. All final system documentation for DDCMIS hardware and related software shall be furnished. The same shall be complete, accurate and fully representative of the supplied system and its elements. All documentation/ catalogues etc., shall be furnished in English language. In addition to the hard copies, any one portable electronic media based documentation system shall also be provided.
07.01.03	Hardware documentation Detailed technical literature, reference manuals, user's guide/manuals for the complete hardware like control system hardware, MMIPIIS hardware, I/O hardware, bulk memory units, peripherals and their controllers, communication hardware including controllers, man machine interfaces programmers unit, power supply modules etc., shall be furnished by the Bidder.
07.01.04	Operation and Maintenance manuals The operation and maintenance manuals shall include all information required for trouble shooting, repair and maintenance information regarding all equipments furnished for the completeness of the system. Sufficient documentation including block diagrams, component level circuit diagram with all component value, make, model, type, detailed wiring and external connection drawing etc., shall be provided to carryout trouble shooting and repair of all electronic cards (PCB), power supply modules at component level.
07.01.05	Software documentation and software listings All technical manuals, reference manuals, user's guide etc., in English required for modification/editing/addition/deletion of features in the software of the DDCMIS shall be furnished. The Bidder shall furnish a comprehensive list of all system/application software documentation after system finalisation for TNPGL review and approval. The software listings shall be submitted by the Bidder for source code of application software and all special-to-project data files
07.01.06	All systems drawings shall be available for review three (3) weeks prior to the formal System Design Review. During the meeting, the drawings shall be reviewed and approved for design. Further, Bidder shall not proceed without getting prior approval from TNPGL/TTPS for the documents required to be approved under "Vendor Data Requirement". After the completion of FAT, all additions and changes that have taken place during the FAT shall be incorporated and issued " Factory AS BUILT ". Drawings shall be issued no later than two weeks after SAT. Bidder is required to furnish six numbers of copies, as per Vendor Data Requirement, of the technical literature for all software and hardware models proposed. In addition, Vendor shall fill up all the data required to be furnished by him in the data sheets, which shall be supported by Vendor's standard literature. After commissioning, Six numbers of copies are to be supplied after incorporating all the necessary corrections. Ten sets of documents shall be provided in

	portable Electronic media (CD).
07.01.07	<p>Drawings /documents to be submitted by the Bidder</p> <p>A. For approval during detailed engineering:</p> <ol style="list-style-type: none"> a. Analog control schemes. b. I/O listing with tags. c. The protection and interlock schemes for all equipment, interlocking schemes for boiler, turbo-generator. d. Final technical specification with details. e. General arrangement of various cabinets, consoles etc. showing internal disposition of all components, units etc., with dimensional details. f. Single line power supply diagram, measurement loop diagram. g. Graphic display sheets, plant mimic sheets. h. Trending and Logging formats. i. System grounding scheme. <p>B. For Reference:</p> <ol style="list-style-type: none"> 1. System configuration diagram along with write up on the system. 2. Control room layout. 3. Technical catalogues of all the components of DDCMIS. 4. Wiring and termination diagrams for marshaling racks, cabinets and consoles. Formats and work sheets for generation and display of overview, groups, loops, graphics, alarms, operator's messages, real time and historical trends, log and shift format. 5. Application software formats and detailed documentation shall be provided in compact disk in addition to the hard copy. 6. Foundation plan drawings for various cubicles and consoles with dimension along with opening on floor for cable entry. 7. Bus loading calculations. 8. Site acceptance and testing procedure. 9. Initialization/ booting procedure. 10. Test, calibration and guarantee certificate. 11. Operation and maintenance manual. 12. Complete documentation regarding System Architecture, Communication module, Processor module, I/O Modules, Power supply Modules that will include component layout. Test pin voltage details, fault finding procedures, alarm rectification procedures, cables connector's pin details, Backplane pin details, switch settings, jumper settings in all the above mentioned modules and their functions including trouble shooting procedures. 13. Full Documentation for MMI Mother boards and drives, (Hard drive), CDROM (or) any other portable electronic media drive, DAT Network interface card. Complete hardware details of the Monitor, and Printers. 14. Layout of plug in cables and connectors in the system along with modules layout etc. must be supplied. 15. Technical specifications of all modules and cards used in the system MMI, Printers, and UPS. 16. Warranty / Guarantee certificate. 17. Final 'As Built Drawings' along with, 'Reproducible' shall be provided. In case the drawings / wiring details are prepared in CAD, the corresponding CD shall be submitted to the TNPGL.

	18. Six hard copies of all drawings and documents and ten copies of the same in portable electronic media shall be supplied.
08.00.00	LARGE VIDEO SCREEN
08.01.01	Six (6) nos. 70inch Full HD large video screens (LVS) along with redundant Display Controller separate for each LVS with, keyboard & Mouse assigned for control & Operation of SG, TG, Auxillary controls, CPU(service)controls & Unit Electrical systems.
08.01.02	<p>Functions Of LVS</p> <ul style="list-style-type: none"> a) Display of important data, graphics coming from the DCS, Video, SCADA, camera, etc in real time. b) To provide real time clear luminous view to share information to operators. c) The Large Video screen Graphics Walls shall be installed in the unit control room (UCR). Design of LVS shall be in such a manner, that it can be installed in linear or curvature setup. d) The overall resolution of the graphics wall shall be min.2800 x 1050 pixels or better. e) 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 Individual (Each operator) 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. f) The complete system shall be interfaced on 100/1000 Mbps or 1Gbps redundant LAN. Also LVS shall be integrated with the RGB, Video signals available in the control room by providing extra input cards. Complete cards shall be provided by bidder. g) The Large Screen System should have the functionality to pre configure and save various display layouts to be accessed at any given point of time with a simple mouse click. h) The system should be possible to show the mirror images of Six (6) operator workstations running on WINDOWS latest version and connected using the industrial grade managed type Ethernet switch with the display controller. i) The system should be able to show the applications running on UNIX complying to X-emulation protocol. j) The system should be configured such that any of the operator sitting on the same Ethernet should be able to work on the Large Screen Sitting at his own position with his local keyboard & mouse. k) The offered system should be able to work in 24/7 days environment and is of industrial nature. LVS system shall be provided with UPS redundant power supply.
08.01.03	<p>The Rear Projection Module shall have the following specifications</p> <ul style="list-style-type: none"> 1. The rear projection modules must be based on single chip DLP Rear projection technology. 2. The system shall have the scalability and upgradeability to be made up of multiple rear projection modules stacked up in rows and columns to achieve a display wall for better viewing ability in linear or curved configuration. 3. The each Rear projection Module shall be with a native resolution of 1920 X 1080 pixels or higher native Digital Micro Mirror device (DMD) chip resolution and should offer 16.7 million colors.It should be rear serviceable to avoid the operator distraction.

	<p>4. The screen shall be 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.</p> <p>5. The visual Display Unit /Rear projection Modules shall have redundant power supply modules, Redundant communication Modules, Redundant cooling Fans.</p> <p>6. Each cube shall have Hot swappable power supply in built.</p> <p>7. Light source shall be LED lamps with separate LED array for each colour (RGB).The average life of LED light source shall be >60,000 hrs</p> <p>8. The brightness uniformity should not be less than 90% ANSI 9.</p> <p>9. The dynamic contrast shall be 12,00,000:1 or higher</p> <p>10. The Aspect Ratio of each of projection module should be 16:9</p> <p>11. The projector brightness should be 750 ANSI lumens. The luminance on each rear projection module is 450cd/m² with DNP XPS screens having ½ gain angle of 35° horizontal and 27° vertical and full gain of 175°.</p> <p>12. The arrangement of LVS shall be discussed during detailed Engineering.</p> <p>13. The system shall have rear access only for the maintenance purpose to avoid any misalignment of the screens in the front</p> <p>14. LVS shall be curved with tentatively 5° angle between each cube at rear side and shall match with curvature of unit control Desk. The curvature will be decided during engineering stage</p> <p>15. Each cube control board input terminals shall have 2Nos of Digital DVI ports on Rear side. Other ports shall be provided as per requirement.</p> <p>16. The screen shall have on-screen diagnostics.</p>
08.01.04	LVS shall be designed for continuous viewing (24 hours in a day) under normal room ambient lighting without any need to darken the room. Suitable darkening of the projection screen for light absorption shall be provided for this purpose.
08.01.05	The LVS and its accessories shall be designed in such a way that the brightness in the centre of the screen and the edges of the screen is uniform and there is no perceivable difference in the quality of the picture on the centre and on the edges of the screen. All necessary hardware and software shall be supplied by bidder.
08.01.06	<p>The LVS software should have the following specifications:</p> <p>a. The software should be able pre configure various display layouts and access them at any time with a simple mouse click or based on the timer.</p> <p>b. The software should copy the screen content of the workstation connected on the Ethernet with the display controller to be shown on the display wall in scalable and movable windows in real time environment.</p> <p>c. The LVS diagnostic software shall perform health monitoring that allows timely detection of faults.</p> <p style="margin-left: 40px;">I) Wall health</p> <p style="margin-left: 40px;">II) Cube health</p> <p style="margin-left: 40px;">III) Cube IP address</p> <p style="margin-left: 40px;">IV) LED hours worked</p>
08.01.07	<p>LVS Annunciation</p> <p>Following indicates the guidelines for implementing LVS annunciation functionalities.</p> <p>1) The LVS annunciation will emulate salient features of the conventional hardware annunciations while presenting more flexibility.</p> <p>2) The annunciation points will be presented on topmost area of LVS screens. This "annunciation area" will be reserved for soft annunciations only and no process graphics/System window/application windows will occupy this area.</p> <p>3) The annunciation area will be divided in multiple "LVS alarm bands". There will</p>

be 3 Nos. of LVS alarm bands in each LVS screens. The height of this band will be typically 42 pixels. Light horizontal lines will be provided to separate the bands on screen. Also it may be possible that one (1) of the LVS shall be assigned completely for Annunciation.

- 4) In Alarm window, alarm text will be displayed when point is in alarm. There will be one alarm for each alarm window. The font type and size of message text shall be such that it is legible to operator. However typically this can be selected as "Arial 10 Bold".
- 5) Annunciation points shall be distributed on various LVS screens based on process area. That is, each annunciation point will be assigned LVS no. and alarm band no. on which it will be displayed. First three (3) rows of LVS will be used for critical alarm display. First row will be kept reserved for fixed alarm and the other two rows will be used for other alarm display for which location of window may vary. Number of LVS alarm will be decided during detailed engineering stage.
- 6) Each band will show up to 12 "alarm windows". The alarm popping up sequence is from left to right. No fixed space will be reserved for any alarm on any of the band. Alarms as and when occur shall be displayed on the bands one after other (from left to right) on each LVS screen and will persist until returned to normal and reset by operator. In case 'alarm band' described above is full (12 nos.) and new alarm(s) is/are reported, new alarm(s) will be presented sequentially on corresponding band by automatically scrolling older alarm(s) and left side of band, one by one until all latest alarms have been displayed. suitable scroll bar facility on both sides of each band shall be provided, which will appear only when there are more alarms than the designated display capacity (12 nos.) of LVS band. The scroll button(s) will flash (slow or fast) as per the state of alarm(s) in their band.
- 7) For each LVS annunciations, a menu based options to acknowledge, reset, configuration etc. is to be provided. Through configuration utility operator can view and edit alarm list, tag nos. etc. of all points in all LVS. The configuration utility shall be password protected for any modifications. However acknowledge/reset action of alarm point(s) of all band(s) of that LVS will be acknowledge/reset by individual operator.
- 8) The hooter sounds will be different for Boiler, Turbine and Generator related annunciations.

09.00.00	Documents to be submitted by the Bidder for evaluation of offer.
09.01.01	The bidder should be submit and explain the configuration diagram of his own system, based on the DRA.NO: 01 . If the given system is not satisfied with our requirement the offer will not be accepted.
09.01.02	<p>The bidder must submit the following details of the offered DDCMIS</p> <ul style="list-style-type: none"> • Name of the System, Controller, IO,SOE • Year of release of the System, Controller, IO,SOE • Whether Workstation/Client principle • Already installed station, Year of service • Software version/Year of release • Method of communication between Controllers/IOs • Configuration of Engineering workstation, Operator workstation, Historian station and LVS/MIS • License of the system • Start up and Essential spares • Functional group of the controllers • Alarm/SOE management • FAT facilities • Firewall/Gate way provision <p>Configuration of Data High Way</p>

SECTION VII– IB MICRO-PROCESSOR BASED PARALLEL REDUNDANT UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM	
01.01.00	<p>SCOPE</p> <p>This specification covers the requirements of Micro-processor based Uninterruptible Power Supply (UPS) to critical AC load systems, which have stringent requirements, imposed on voltage and frequency regulation, harmonic content and transient recovery. The Bidder shall furnish an integrated UPS System including UPS mains input isolating transformers, static inverters, static switches bypass switch, chargers, Valve Regulated Lead Acid maintenance free battery, ACDBs with all required isolating and protecting devices required to meet the system.</p> <p>The Bidder shall estimate the steady state and inrush KVA requirement of equipments/systems furnished by him and provide additional capacity margin of not less than 15% of the total estimated load in Bidder scope, or 70 KVA whichever is greater. The Bidder shall furnish the detailed calculations and justification for the rating so chosen by the Bidder. UPS and sub-systems offered by the Contractor shall be from reputed experienced manufacturers of specified range of equipments whose guaranteed and trouble free operation has been proven for at least Two (2) year in coal fired Thermal Power Station in the last 4 (four) years.</p> <p>The make, type and other details shall be subject to TNPGL approval.</p>
01.02.00	<p>CODES AND STANDARDS</p> <p>The design, manufacture, performance testing and inspection of equipment shall comply with all currently applicable statutory regulations and safety codes in the locality, where the equipment will be installed. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. Unless otherwise specified, the equipment shall conform to the latest applicable IS, BS or IEC Standards as mentioned in Data Sheet.</p>
01.03.00	<p>SYSTEM REQUIREMENTS</p> <p>The UPS system shall be of the static microprocessor based type and should operate in parallel redundant configuration. Each UPS system shall have UPS mains input isolating transformers ($\Delta\Delta$ & ΔY), 2x100% parallel redundant chargers and inverters, 2x100% battery bank, bypass line transformers and voltage stabilizer, static switch, manual bypass switch, AC distribution boards, other necessary protective devices and accessories and shall meet the following requirements as a minimum. Transfer of loads shall be with no break or with minimum interruption of the order of a fraction of a cycle during under voltage condition to the healthy inverter or to standby regulated supply. The components of UPS shall absorb power line voltage transients and surges, frequency variations and high/low voltage conditions from the critical load and act as a line filter and voltage regulator, apart from providing no-break power at constant frequency during normal power outages.</p>
01.04.00	<p>The KVA rating of UPS shall be as required by expected loads and include 15% spare capacity guaranteed at 50 deg.C ambient and load power factor of 0.8 lagging. If UPS KVA rating is applicable at a lower ambient temperature than specified 50 deg. C, the Bidder shall consider a derating factor of at least 1.5%/deg. C for arriving at the specified UPS capacity at 50 deg. C ambient. The UPS shall have an over load capacity of 125 % rated capacity for 10 minutes and 150 % rated capacity for 10 seconds. The inverter shall have sufficient capability to clear fault in the maximum rated branch circuit, limited to 12 percent of finally selected UPS Capacity. The sizing of UPS shall be based on the power factor of the loads being fed subject to a maximum of 0.8 lagging.</p>

01.05.00	<p>STATIC UPS SYSTEM SHALL BE AS DESCRIBED BELOW:</p> <p>Microprocessor based Parallel Redundant UPS with Static Bypass to Regulated Supply.</p> <p>The above system shall have two [2] 100% inverters operating in Synchronism as in the case of parallel redundant system explained above. The required DC supply to feed the inverters shall be obtained from 2 X100% chargers, one charger feeding each bus, with provision for either of the chargers to feed both buses through an isolator. One [1] 100% battery will be floating on each DC bus.</p> <p>The mode of operation shall be same as that in the parallel Redundant UPS, with static transfer switch in each branch inverter output side and with an additional back-up from a regulated AC supply through transformer and voltage stabiliser derived from a standby AC supply. The system shall have a manual selector switch. In the normal position, the respective UPS loads shall be supplied by its own inverter, sharing 50% load each, with output of both inverters automatically synchronised with each other, by using synchronising signal from the master inverter. If one inverter fails, the healthy inverter shall supply to full 100% load by operation of static switch. When any one of the UPS is under maintenance, the selector switch shall be suitably changed and the branch circuit supplying 100% load shall be synchronised with the frequency of standby source. If the frequency of the standby source is beyond the preset limit, the inverter frequency control shall get disconnected from the standby synchronising signal. The operating inverter shall continuously monitor the frequency of standby source and upon restoration of proper frequency of the standby source; the inverter shall use the frequency of the standby source as the synchronising signal.</p> <p>When the selector switch is in bypass position the standby source shall cater 100% load, isolating both inverters from the critical load bus.</p>
01.06.00	<p>DESIGN REQUIREMENTS:</p> <p>All UPS components, that is, battery charger cum DC switchgear, Inverter, static switch, bypass switch, AC switchgear and associated control and annunciation system shall be mounted in floor mounted, Sheet steel panel. The panels shall be designed for continuous operation for the ambient conditions. The battery will be separately installed in a battery room. In case fans are required for cooling, 100% standby shall be provided to ensure rated output of the UPS.</p> <p>The UPS system shall be capable of operating without D.C. battery in circuit under all conditions of load and the performance of various components of UPS like inverter, charger, static switch etc. shall be guaranteed without the battery in circuit.</p> <p>The UPS system design shall ensure that in case of failure of mains input power supply to one of the chargers, the other charger whose mains input power supply is healthy, shall feed to one or both the inverters as the case may be as per manufacturer's standard practice & continue to charge the D.C. battery at all load conditions. The Bidder should note that this situation should not in any way lead to the discharge of the D.C. Battery.</p>
01.07.00	<p>BATTERY:</p> <p>The batteries shall be VRLA sealed maintenance free type. The UPS battery shall have sufficient amp-hour capacity to supply 100% full load current of UPS for 30 minutes. For this, the UPS capacity to be considered as the finally selected UPS rating, irrespective of the actual load on UPS. A drop of 4V from battery room to the inverter input will be considered for design. The battery shall meet other specification requirements as specified above.</p>

	<p>The battery support time, number and type of batteries shall be as specified in Data Sheet. The required voltage of the battery shall be chosen by the Vendor to suit the supply voltage specified, and the guaranteed output voltage regulation, compatible with the parameters of the components made use of in the UPS system. The capacity of battery shall be chosen by the Vendor.</p> <p>Based on the battery support time/duty cycle specified in data sheet and the guaranteed DC/AC efficiency of the UPS system offered, the AH capacity offered shall be calculated based on the minimum ambient temperature indicated in Data Sheet, or 240 AH whichever is greater. Contractor shall furnish calculation for sizing of the battery based on the requirements specified in Data sheet.</p> <p>Capacity of the battery shall be subjected to TNPCL approval during detailed engineering without any commercial implication.</p>
01.08.00	<p>BATTERY CHARGER</p> <p>The capacity of the charger shall be as required and comply with the system requirement. Each of the two sets of 2x100% redundant chargers shall be sized to meet the 100% UPS load plus recharge the fully discharged battery within 8 hours. The Charger efficiency shall be 90% minimum.</p> <p>The charger in the float mode shall be capable of supplying the Inverter full load, in addition to float charging current of the battery.</p> <p>In the boost mode, charger shall be capable of charging the fully discharged battery in eight hours. The chargers shall automatically share the load during parallel operation. The parameters of the components shall be chosen to give the specified AC output of the Inverter and to be compatible with the design of the UPS System ensuring:</p> <ol style="list-style-type: none"> Regulation of the charger between no load and full load with line variation of $\pm 10\%$ and frequency variation of $\pm 5\%$. Ripple content limited to tolerance of $\pm 1\%$ Output DC voltage range under float & boost modes. <p>The charger shall have individually adjustable float/boost modes; automatic current limiting features during over load and over voltage surge suppressor for over voltage protection. Contractor shall furnish calculation for sizing the charger considering the requirements specified in data sheet.</p> <p>The charger shall receive supply from the A.C. mains through a triple pole MCCB; manually operated isolating switches on the secondary side shall be provided. The battery shall be provided with manually operated MCCB on the output side. Fast acting semiconductor fuses with kick fuses and alarms contacts shall be provided in each arm of float and boost chargers. Each branch circuit of the UPS shall have DC bus with connection to battery, battery chargers and inverters. It shall be possible to connect any of charger/battery to either of the inverter circuit by means of a bus coupler breaker.</p>
01.09.00	<p>Static Inverters:</p> <p>The static inverter shall be of continuous duty, solid-state type using proven Pulse Width Modulation (PWM)/Quasi-square wave/step wave technique. Ferro resonant type Inverters is not acceptable.</p> <p>Inverter shall receive DC power supply from battery/chargers and designed to operate over the entire range of input DC voltage from the charger and limits of battery voltage variation during discharge and charged conditions.</p> <p>The inverter shall comprise of IGBT power switching section and the regulating filter. The regulating filter shall limit over loading of the inverter during overloads and short</p>

	<p>circuits to the values specified. The inverter shall be provided with circuit limiting resistor and starting resistor to limit the magnetizing inrush.</p> <p>The inverter equipment shall include all necessary circuitry and devices to conform to requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization etc. The steady state voltage regulation shall be +2% and transient voltage regulation (on application/removal of 100% load) shall be +20%. Time to recover from transient to normal voltage shall not be more than 50 milli Sec. Frequency regulation for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination shall be better than $\pm 0.5\%$ (automatically controlled). The total harmonic content shall be 5% maximum and content of any single harmonic shall be 3% maximum. The inverter efficiency shall be at least 85% on full load and 80% on 50% load. The synchronisation limit for maintenance of synchronisation between the inverter and stand by AC source shall be 48-52Hz, field adjustable in steps of 0.5 Hz. Each Inverter shall have an over load capacity of 125 % rated capacity for 10 minutes and 150 % rated capacity for 10 seconds.</p>
01.09.01	<p>Over load, short circuit and load loss</p> <p>The inverter shall be provided with suitable Semi-conductor Fuses at the input and output which will permit proper coordination with other protective devices and at the same time protect the inverter against damage due to internal faults. However, if the Contractor's system design does not use fuses then fuse free circuit breaker may also be permitted provided it meets the specification requirements. All necessary equipment shall be provided to protect the inverter against overload, short circuit and 100% loss of load. The inverter shall be self-protecting against damage if energized with full load connected.</p> <p>Inverter equipment shall include all solid-state circuitry and devices including stable oscillator etc. to enable inverters to operate satisfactorily in parallel sharing mode each inverter taking 50% load during normal operation. In case of failure of either inverter, 100% load shall automatically be transferred to healthy inverter without any break and degradation in the quality of UPS output and disconnecting the faulty inverter automatically. The inverter failure shall be alarmed and the healthy inverter shall get synchronizing signal from the standby AC source and remain synchronized within the set limits. The limits for the synchronization between healthy inverter and standby AC Sources shall be field adjustable.</p> <p>On failure of both inverters, the loads shall be transferred to standby AC Power without a break, if within synchronization limits. Provision of asynchronous transfer with a break in case of inverter being out of synchronization limits shall also be there with standby source.</p>
01.09.02	<p>Static Switch and Manual Bypass Switch:</p> <p>Each inverter output shall be connected to the AC bus through a static switch and fast acting fuses. The static switch comprises an interrupter and transfer switch, enabling loads on each branch circuit to be connected to the inverter of the other branch circuit or to the standby regulated AC supply.</p> <p>The current rating of the static switch shall not be less than the continuous full load rating of the branch circuit and short time rating of 750% for 1 second.</p> <p>The static switch shall have made before break feature. The static transfer switch shall operate in conjunction with a static switch control circuit which senses the healthiness of the inverter, overload on the inverter, low AC input and low voltage on the output side of the inverter.</p> <p>The static transfer switch shall offer means of transfer of critical load from the inverter to the alternate source i.e., to the other healthy branch inverter or standby</p>

	<p>regulated AC supply. The transfer time shall be ¼ cycle maximum.</p> <p>The transfer of loads to the healthy branch circuit from the faulty branch circuit shall be automatic, whereas transfer from the inverter circuit to the standby-regulated source shall be either automatic or manual. An Auto/Manual switch shall be provided for this purpose. Retransfer to the branch circuit shall be manual.</p> <p>Automatic initiation of the transfer from a faulty branch circuit to either a healthy branch circuit or the standby regulated source shall be accomplished during following conditions:</p> <ol style="list-style-type: none"> a) Loss of inverter square wave/inverter failure b) Loss of inverter AC output <p>Manual initiation of a transfer from a branch inverter to standby AC regulated supply shall be through a push button-load to bypass; with no break transfer, locking out automatic retransfers. Retransfer shall be possible only manually in this mode of operation through a push button-load to inverter.</p> <p>Automatic transfer to healthy branch circuit or to the standby-regulated source shall be inhibited if the alternate source is not available.</p> <p>Manual bypass switch shall be employed for isolating the UPS during maintenance.</p>
01.10.00	<p>Step Down transformer and voltage stabilizer:</p> <p>Regulated standby AC supply shall be derived from standby supply through a step-down transformer of appropriate rating and a servo controlled voltage stabilizer with isolation transformer.</p> <p>The voltage regulation and transient response shall be as specified in Data Sheet.</p> <p>The transformer shall be of cast Resin type and its KVA rating and percentage impedance should be selected so that extremely fast fault clearance is achieved.</p> <p>The overload capacity of the transformer and voltage stabilizer shall not be less than 300% for 200-millisecond duration. The voltage stabilizer shall employ state of the art control circuitry and shall maintain the specified output voltage for 0-100% load with maximum input voltage variations as indicated above. The efficiency of the stabilizer shall be 95% or better.</p> <p>The make, type and other details shall be subject to TNPGL approval</p>
01.11.00	<p>CIRCUIT PROTECTION</p> <p>The following devices shall be provided to protect the UPS system:</p> <ol style="list-style-type: none"> a) AC input circuit breaker to supply charger b) AC input circuit breaker to supply standby transformer/ Voltage stabilizer. c) DC circuit breaker for battery output d) Fast acting semiconductor fuses for power bridges (charger and inverter) e) Inverter output fuses at static switch input <p>Each branch circuit of the UPS system shall be connected to a section of the AC Switchgear. Two sections of the AC bus shall be interconnected through a contact of selector switch. The critical loads shall be divided into several branch circuits protected individually with quick-acting fuses of smaller ratings to provide fast isolation of faults. The fuses provided in the inverter output circuit shall be co-ordinate with the smaller rating fuses provided in the branch circuit.</p>
01.12.00	<p>The UPS system shall be provided with necessary meters mimic diagram, local indication/alarm conditions and protection.</p>

01.12.01	<p>Meters</p> <p>Meters shall be suitable for flush mounting with flanges projecting in vertical panels. Meters shall have circular 240 deg scale, 96 mm square, moving coil (taut band) type, conforming to IS: 1248 with accuracy class 1.0 or better DC ammeters shall be provided with external shunts wherever currents exceed 5A. The following meters shall be provided:</p> <ol style="list-style-type: none"> a. Voltmeter with selector switch to measure input voltage/ standby AC supply. b. Ammeter with selector switch to measure input current c. DC voltmeter for charger d. DC ammeter for battery output e. Voltmeter for inverter output f. Ammeter for AC output and regulated standby AC g. Frequency meter for AC output of digital type h. Voltmeters/Ammeters for Boost Charger
01.12.02	<p>Local Indications/Alarm conditions</p> <p>LED indicators shall be provided on the panel for continuous monitoring of the UPS operation/status on mimic.</p>
01.12.03	<p>Alarm Indication</p> <ol style="list-style-type: none"> 1. System fault 2. Rectifier charger failure 3. Inverter A failure /Inverter B failure 4. Battery under voltage 5. IGBT over temperature 6. Overload 7. Static transfer to standby 8. Transfer inhibited 9. Overload shutdown 10. Emergency shutdown 11. Battery circuit breaker / switch open 12. AC Mains failure 13. AC standby source mains failure 14. Manual bypass ON 15. Fan failure 16. Asynchronous condition 17. Control power failure 18. DC ground fault <p>In addition to the above potential free contacts shall be provided for group alarm.</p>
01.12.04	<p>Status indication on Mimic:</p> <ol style="list-style-type: none"> 1. Charger ON 2. Battery on load 3. Inverter ON 4. AC stand-by source ON 5. Inverter on-load 6. Manual by-pass ON 7. Load on static bypass
01.12.05	<p>Protection:</p> <p>The UPS system components and assemblies shall be provided with the necessary protection in addition to the protection required for the complete system. Apart from the protections for the circuits broadly enumerated under clause 7.0, IEC 146-4, the following protections shall be provided:</p>

	<ol style="list-style-type: none"> 1. RFI Filter at input 2. RC Surge suppresser across transformer secondary 3. Semiconductor fuses for SCR bridges for rectifier, inverter and filter traps 4. Semiconductor fuses for filter capacitors 5. DC over voltage 6. Charger input current limit 7. Battery current limit 8. Under voltage and negative sequence on input side 9. Overload on inverter 10. Semi-conductor fuses in control circuit <p>Any other protection required for safe operation of the UPS depending on the components used and the circuit design.</p>
01.13.00	<p>CABLES:</p> <p>a) Supply and erection of 3 Core X 120 SQMM Aluminum armoured Power cable for extending 440 Volt from Switch gear room to UPS. 3 Runs of above such cable have to be provided one each for UPS1, UPS2 and By pass supply. The above cable shall have the rating of 1100V grade with standard shaped Aluminum conductors (Multi strand) XLPE insulated as per IS:7098, cores colour coded (Red, Yellow & Blue), inner and outer sheath made of FRLS compound as per IS:5831, Galvanised steel strip flat armoured as per IS:3975, approx overall dia. of cable is 35mm. The required length of cable to be 500 meters.</p> <p>b) Supply and erection of Power cables for extending 110V supply for the UPS System. The cable shall be 1100v grade single/multicore stranded electrolytic grade copper conductor, PVC insulated, aluminium wire armoured (for single core) and galvanized steel strip/ wire armoured (for multicore) cables with extruded outer sheath made of specially formulated fire retardant low smoke (FRLS) PVC compound. The cables shall conform to IS: 1554-PT-I in all other respect.</p> <p>c) For DC system only single core cables shall be used, that is, between battery/battery charger and battery charger/inverter, to eliminate the possibility of positive to negative faults in the cables.</p>
01.14.00	PANEL WIRING AND OTHER ACCESSORY EQUIPMENT:
01.14.01	<p>Panel Wiring</p> <p>Panels shall be completely wired internally to equipment and terminal blocks including all inter- panel wiring. Wiring shall be carried out with 1100 V grade, single core stranded copper conductor wires with PVC insulation. The minimum size of stranded copper conductor shall be 1.5 sq.mm for all circuits, except for CT circuits, which shall be 2.5 sq. mm. The minimum strands per conductor shall be three.</p> <p>Flexible wires shall be used for wiring of devices mounted on the moving parts such as swinging panels/ panel doors.</p> <p>Auxiliary bus bars for AC and DC circuits, synchronising circuits, annunciator circuits and other common services shall be run at the top of panels, running throughout the length of panels and shall be of copper of adequate section, suitably insulated all along their run.</p> <p>Wire terminations shall be made with solder less crimping type tinned copper lugs, with insulated sleeves provided at the wire terminations. Engraved, tight fit ferrules shall be provided at both ends of wires for identification.</p> <p>Wiring shall run in longitudinal troughs inside the panel and interconnection to adjacent panels brought out to separate terminal blocks located near the slots or holes meant for inter panel wiring. Inter panel wiring shall be in Vendor's scope.</p>
01.14.02	<p>Terminal Blocks</p> <p>Terminal blocks shall be 650 V grade, 10A rated, one piece molded, complete with insulated</p>

	<p>barriers, stud/screwed clamp type terminals, washers, nuts, locknuts and identification strips.</p> <p>CT and VT terminal blocks shall be provided with links and isolating facilities. CT secondary leads shall be provided with shorting and earthing facilities.</p> <p>A minimum of 10% spare terminal blocks shall be provided, uniformly distributed in a group of terminal blocks.</p> <p>Clearance between two rows of terminal blocks shall be 150 mm and between a row of terminal blocks and its associated glands shall be 250 mm.</p> <p>Whenever termination of TNPGL external cable is required, the necessary un-drilled, removable bolted gland plates, supporting clamps for cables and wiring troughs shall be provided.</p> <p>Ammeter selector switches shall be of the stay-put type with make before break type contacts.</p>
01.14.03	<p>Push Buttons:</p> <p>Push buttons contacts shall be momentary type, rated to make and carry 5A at 250 V DC and capable of breaking 1A inductive load at 250 V DC.</p>
01.14.04	<p>Selector Switch:</p> <p>Selector switch shall be of rotary stayput type with required number of positions. The switch shall be current rated at 125% of the UPS rating at 600 V AC. The auxiliary contacts of the switch shall be rated at 5A AC. The switch shall have make before break contact arrangement.</p> <p>The bypass position of the selector switch shall isolate the static switch from the load and connect AC standby supply to the load without interruption.</p>
01.14.05	<p>DISPLAYS:</p> <p>For main circuit indications like circuit breaker on/off, panel mounting type indicating lamps with series connected resistors, preferably built in the lamp assembly, fitted with translucent colored lamp covers shall be provided.</p> <p>LED indications shall be provided for status indication/ continuous monitoring of the UPS system.</p>
01.14.06	<p>AC Distribution Board (ACDB):</p> <p>The details of the AC distribution board, i.e. exact design, rating and number of feeders etc. of the 2x100% ACDBs shall be as finalised during detailed engineering and as approved by TNPGL. The power distribution should be redundant source for each node, server, work station etc with Fuse and MCB isolation. Minimum 15nos of 3 KVA feeders and 5 Nos. 5KVA feeders with fuses for the rating shall be provided. Further, 25% spare feeders (min.3 Nos.) with fuses for each rating shall be provided.</p> <p>Two nos. of 5 KVA, 110/ 230 volt step up Single phase transformer with input & output MCBs shall be supplied and installed in ACDBs for the Power supply of LED MONITORS, printers, panel mounted Indicators & recorders and other equipment which are not available for operation on 110V AC. Further, 25% spare feeders (min.3 Nos.) with fuses for each rating shall be provided.</p>
	<p>CONSTRUCTIONAL FEATURES</p> <p>Switchgear shall be:</p> <ol style="list-style-type: none"> of the metal enclosed, indoor floor mounted modular type made up of the requisite vertical sections of dust and vermin proof construction provided with a degree of protection of IP 32 provided with a metal sill frame made of structural steel channel section properly drilled for mounting the switchgear along with necessary mounting hardware. Hardware shall be zinc plated and passivated provided with labels on the front and rear indicating the switchgear designation

	<p>g) provided with cable entry facilities at bottom with 2 mm thick removable gland plates with necessary cable glands. For single core cables these plates shall be non-magnetic.</p> <p>h) of uniform height</p> <p>i) of single or double front execution as specified in Data Sheet</p> <p>j) provided with gaskets all round the perimeter of adjacent panels, panel and base frame, removable covers and doors</p> <p>k) provided with bus bars running at the top or bottom, as required, all along the length of the switchgear in a separate sheet steel enclosure.</p> <p>The switchgear frame shall be fabricated using suitable mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2.0 mm.</p> <p>Frames shall be enclosed by sheet steel of thickness not less than 2 mm smoothly finished leveled and free from flaws. Doors and covers shall be made of sheet steel of thickness not less than 2 mm. Stiffeners shall be provided wherever necessary.</p> <p>All panel edges and door edges shall be reinforced against distortion.</p> <p>Cutouts shall be devoid of sharp edges.</p> <p>Operating devices in the front of the switchgear shall be located not less than 250 mm above ground level.</p> <p>The switchgear shall be divided into distinct vertical sections each comprising:</p> <p>a) A completely metal enclosed bus bar compartment running horizontally</p> <p>b) Feeder modules in multi tier formation</p> <p>c) Enclosed vertical bus bars serving all modules in the vertical section. For safety isolation of the vertical bus bars, insulating barrier with cutouts shall be provided to allow the power stab contacts to engage with vertical bus bars.</p> <p>d) A vertical cable alley covering the entire height. The cable alley shall be minimum 200 mm wide.</p>
01.14.08	<p>In the panel, no hydrosopic materials are used and all wound components are with class H insulation.</p> <p>One metal sheet partition shall be provided between two adjacent vertical sections running to the full height of the switchgear except for the horizontal bus bar compartment.</p> <p>All equipment associated with a single circuit shall be housed in a separate module compartment of the vertical section. The compartment shall be sheet steel enclosed on all sides and the rear, with the drawable units in position or removed, except on the cable alley side. A plate cover with a slot to permit wiring connections shall be provided on the side corresponding to the cable alley. The front of the compartment shall be provided with a hinged door.</p> <p>For draw-out type modules, only the handles of control and selector switches, push buttons, knobs and cut-outs for lamps and meters shall be arranged on the front doors of the respective compartments to permit operation without opening the door. All other equipment pertaining to a circuit shall be mounted on the with drawable chassis. All cutouts shall be provided with gaskets for the purpose of dust proofing.</p> <p>Current transformers shall not be directly mounted on the buses.</p> <p>After isolation of the power and control connections of a circuit, it shall be possible to safely carry out maintenance in a compartment with the bus bars and adjacent circuits live.</p> <p>The withdrawable chassis shall move on suitable guides and on suitably plated steel or stainless steel rollers or balls to facilitate easy withdrawal.</p> <p>Cable alleys shall be provided with suitably hinged doors. It shall be possible to safely carry out maintenance work on cable connections to any one circuit with the bus bars and adjacent circuits live. Adequate number of slotted cable support arms shall be</p>

	<p>provided for cleating the cables.</p> <p>Rear of single front switchgear shall be provided with removable panels. It shall be possible for one person to remove and fix the removable panel.</p> <p>All doors shall be provided with concealed type hinges and captive screws.</p> <p>Switchgear shall be designed in such a way that all component equipment and bus-bars operate satisfactorily without exceeding their respective maximum permissible rise in temperature under ambient temperature conditions prevailing within the switchgear cubicle, with reference ambient temperature outside the switchgear cubicles.</p>
01.14.09	<p>Provision of ventilation louvers is considered undesirable. If ventilating louvers are considered essential by the Vendor, these may be provided. However, all ventilating louvers shall be provided with fine-brass screen, brass or GI meshes to prevent entry of vermin and dust.</p>
01.14.10	<p>FIXED TYPE WITHDRAWABLE CHASSIS:</p> <p>In this type of construction all power connections to the equipment mounted on the with drawable chassis shall be of the bolted type. All control circuit connections to equipment mounted on the with drawable chassis shall be carried out through conventional terminal blocks mounted in the respective chassis. It shall be possible to draw out the chassis after unbolting/ unscrewing all the power and control circuit connections to the equipment mounted on the with drawable chassis.</p>
01.14.11	<p>MODULE TYPES:</p> <p>The types of modules are as follows:</p> <p>Incoming circuit - Isolating switch</p> <p>Out going feeder - Switch-fuse unit controlled</p>
01.14.12	<p>MAIN BUSES AND TAPS:</p> <p>Switchgear shall be provided with phase and neutral bus bars.</p> <p>Bus bars shall be of uniform cross section throughout the length of the switchgear, and up to incoming terminals of the incoming feeder switch.</p> <p>The bus bars shall be made of high conductivity Electrolytic grade copper.</p> <p>Bus bars shall be provided with at least the minimum clearances in air as per applicable standards for a 110V, 1 phase.</p> <p>All bus bars, bus-taps shall be insulated with close fitting sleeve of hard, smooth, dust and dirt free plastic insulation of high dielectric strength to provide a permanent high dielectric non-aging and non-tracking protection; impervious to water, tropical conditions and fungi. The insulation shall be non inflammable and self-extinguishing and in fast colors to indicate phases. Joints shall be covered with removable moulded shrouds made out of fiberglass-reinforced polyester. The dielectric strength and properties shroud and sleeves shall hold good for the temperature range of 0 deg. C to 90 deg.C . If all insulating sleeve is not colored black, bus bars shall be color-coded with colored bands at suitable intervals.</p> <p>Bus bars shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents for the associated switchgear. Bus bar supports shall be made of Hylam sheets, glass reinforced moulded plastic material, permali wood or cast resin.</p> <p>Separate support shall be provided for each phase of the bus bars. If a common support is provided for all three phases, anti tracking barriers shall be incorporated.</p> <p>Bus bars joints shall be complete with high tensile steel bolts and Belleville washers and nuts. Bus bars shall be thoroughly cleaned at the joint locations and suitable contact grease shall be applied just before making a joint.</p>
01.14.13	<p>AIR BREAK SWITCHES:</p> <p>Air break switches shall be of the heavy duty, group operated load-break, fault-make type,</p>

	<p>complying with the requirements of applicable standards.</p> <p>The switches shall be capable of withstanding thermal stresses caused by over loads and short circuit current of values associated with the let through current of the associated fuse,</p> <p>The switches shall be capable of withstanding the mechanical stress caused by the peak short circuit current of value equal to the cut-off current of the associated fuse.</p> <p>Wherever solid links are used for the connections between switches and fuses, such links shall be fitted with insulated sleeves. Whenever the links are less than 100 mm in length where sleeves cannot be fitted, taping is acceptable.</p> <p>All live parts of the switch shall be shrouded.</p> <p>Switch operating handle shall be suitable for padlocking in "OFF" position.</p> <p>Each switch shall be interlocked with the associated compartment door to achieve the following interlocks.</p> <p>It shall be possible to open the door only when the switch is in the 'OFF' position.</p> <p>It shall not be possible to close the switch with the door open.</p>
01.14.14	<p>FUSES:</p> <p>Fuses generally shall be of the Semi-conductor fuse-link type having a certified rupturing capacity of not less than fault contribution of UPS at the rated voltage.</p> <p>Fuses shall be provided with visible indication to show that they have operated.</p> <p>Fuses shall preferably be mounted in carriers of material other than ceramic and shall be complete with fuse bases.</p> <p>Current time characteristics of fuses shall be furnished along with bid.</p>
01.14.15	<p>CURRENT TRANSFORMERS:</p> <p>Current transformers shall be of the dry type.</p> <p>Current transformer shall have a short time withstand rating equal to let through current of associated fuse for one second.</p> <p>Unless otherwise specified, the minimum performance requirement of current transformers are as follows:</p> <p>Measuring CTs – 10 VA, accuracy class 1.0 and an instrument safety factor of less than 5.</p> <p>All current transformers shall be earthed through a separate earth link on the terminal block to permit easy measurement of the current transformer insulation resistance.</p>
01.14.16	<p>CABLE TERMINATIONS:</p> <p>Suitable compression type, heavy duty brass cable glands with check nuts, rubber sealing ring and brass washers mounted on a removable gland plate shall be provided to support all power cables entering the switchgear. Cable glands shall incorporate built-in facilities for earthing the wire armour of cables. Cable glands shall be plated to avoid corrosion.</p> <p>Power cable glands and crimping type of tinned copper lugs shall be supplied to suit the cable sizes to be finalised at the time of detailed engineering.</p>
01.14.17	<p>EARTHING:</p> <p>Earthing shall be provided with an earth bus bar running along the entire length of the board. Material and size of the earth bus bar shall be as specified in data sheet. At either end of the earth bus, one (1) clamp type terminal with nuts, bolts and washers shall be provided for bolting the earthing conductor.</p> <p>Earth bus bars shall be supported at suitable intervals.</p> <p>Positive connection between all the frames of equipment mounted in the switchboard and earth bus bar shall be provided by using insulated copper wires, section equal to half the size of circuit load current carrying conductor, whichever is smaller.</p> <p>All instrument cases shall be connected to the earth bus bar using 1100/650V grade,</p>

	<p>2.5 sq.mm stranded, insulated copper earthing conductor.</p> <p>Two separate earth pits with earthing arrangements shall be provided for all panel earthing and UPS output neutral earthing respectively.</p>
01.15.00	<p>TESTS FOR AC DISTRIBUTION BOARDS</p> <p>Switchgear shall be subjected to tests as per relevant standards.</p> <p>Vendor shall submit available, type test reports of temperature rise and short circuit tests of similar switchgear. Also, calculations of temperature rise of the bus section offered shall be submitted for approval.</p> <p>Routine tests shall be carried out on all associated equipment supplied with switchgear, as per relevant standards. Type test certificates of all associated equipment shall be furnished.</p> <p>Certified copies of all type and routine tests certificates shall be submitted for the TNPGL approval before despatch of the switchgear.</p>
01.16.00	<p>TESTS FOR UPS SYSTEM</p> <p>Type and routine tests certificates for all components made use in the UPS system shall be furnished. Tests for components shall be as per relevant standard specifications.</p> <p>Vendor shall furnish his quality assurance plan for the equipment offered. The quality assurance plan shall include bought out components and assemblies used in the UPS system.</p> <p>System tests shall be performed on the completely assembled UPS system. System tests shall include frequency regulation, voltage regulation, current limiting feature and harmonic content tests in addition to the tests to prove the functional requirements such as phase and frequency control of inverters for synchronisation with range of adjustments, transfer of static switches for conditions of loss of square wave, overload and under voltage conditions.</p> <p>Type, routine and optional tests covered under clause 7.3 of IEC-146-4 shall be conducted on the UPS system in addition to the system tests.</p> <p>Endurance test on static switches shall be performed for not less than 10 transfer/retransfer cycles at full load.</p> <p>The complete assembled UPS system shall be operated at a rated load under relevant ambient conditions for not less than 96 hours continuously prior to the release for shipment.</p>
01.17.00	<p>VALVE REGULATED LEAD ACID SEALED MAINTENANCE FREE BATTERIES</p>
01.17.01	<p>SCOPE</p> <p>This specification covers requirements of sealed maintenance free battery complete with battery racks, intercell and inter tier connectors and all other accessories.</p> <p>In case of conflict between any section or clause of this specification and Data sheet, the requirements of Data Sheet shall govern.</p>
01.17.02	<p>CODES AND STANDARDS</p> <p>The design, manufacture and performance of equipment shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve Vendor of his responsibility.</p> <p>The equipment shall conform to the latest edition of standards</p>
01.17.03	<p>ACCESSORIES</p> <p>The battery shall be complete with accessories and devices, including but not limited to the following for UPS system.</p> <ol style="list-style-type: none"> a. Battery racks b. Porcelain insulators, rubber pads etc.

	<p>c. Set of inter cell, inter-tier and inter bank connectors as required for the complete installation.</p> <p>d. Accessories for testing and maintenance. One (-3), 0, (+3) volts DC voltmeter with suitable leads for measuring cell voltage (Portable).</p>
01.17.04	<p>LIFE</p> <p>The Vendor shall indicate the guaranteed life of the battery when operating under the conditions specified.</p>
01.18.00	<p>TESTS</p> <p>All tests shall be conducted, as per the relevant standards, Tests shall comprise of :</p> <p>a. Type Tests : Performed at MANUFACTURER'S WORKS.</p> <p>b. Acceptance Tests : Performed at site after installation and commissioning of the battery.</p> <p>All tests shall be witnessed by the TNPGL representative Details of tests to be performed are given below:</p>
01.18.01	<p>TYPE TESTS</p> <p>Type tests shall comprise of the following:</p> <ol style="list-style-type: none"> 1. Visual inspection 2. Dimensional check 3. Capacity test 4. Retention of charge test 5. Ampere hour and efficiency tests 6. Endurance test <p>Type tests shall be conducted on a minimum of one sample cell typical and identical with the cells forming the complete battery offered. However, the test cell shall not be one of the cells offered in the battery offered. In applications where the first momentary discharge stated in Data Sheet is high and lasts for several minutes a high discharge tests shall be conducted, in addition to the above test as a type test. This test shall ensure that at the end of the high discharge rate duty, end cell voltage does not fall below 1.8 volts</p>
01.18.02	<p>ACCEPTANCE TESTS</p> <p>Acceptance tests shall be conducted at site on completion of installation and commissioning and immediately prior to putting the battery in service. These tests shall comprise of:</p> <ol style="list-style-type: none"> 1. Visual inspection 2. Dimensional check 3. Capacity test 4. Test for voltage during discharge
01.18.03	<p>TEST REPORTS</p> <p>A preliminary copy of type test results shall be submitted for approval before the despatch of batteries. Six numbers of bound copies of complete test certificates shall be furnished with the batteries.</p>
01.19.00	<p>IDENTIFICATION</p> <p>Each cell shall be marked in a permanent manner to indicate the following information:</p> <ol style="list-style-type: none"> 1. Cell number. 2. Type of positive plate. 3. AH capacity at 10 hour rate. 4. Type of container. 5. MANUFACTURER's name 6. Month and year of manufacture.

01.20.00	BATTERY CHARGER
01.20.01	SCOPE This specification covers requirements of Battery Charger equipment comprising of rectifier, rectifier transformer and auxiliary equipment.
01.20.02	CODES AND STANDARDS The design, manufacture and performance of equipment shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve Vendor of his responsibility. Unless otherwise specified, equipment shall conform to the latest applicable standards.
01.20.03	CHARGER CUBICLE AND WIRING Cubicle accessories and wiring shall conform to the requirements of the specification.
01.20.04	ACCESSORIES Each battery charger shall include all the required accessories for the reliable operation.
01.20.05	INDICATION AND PROTECTION Each battery charger shall be provided with the following indication and protective devices: Three(3) neon indicating lamps on the AC supply of the charger. One(1) neon indicating lamp on the DC output side. Two(2) A.C. under voltage relays connected across fuses on the A.C supply side with alarm contacts for annunciator. Thermal overload elements on each fuse of the A.C. contactor on the supply side with alarm contacts for remote annunciator.
01.20.06	PERFORMANCE The automatic constant voltage regulator shall regulate the D.C. voltage within 1% of the set value from no load to full load under the supply voltage and frequency fluctuations of $\pm 10\%$ and $\pm 6\%$ respectively. The float charger shall have built-in current limiting feature to drop the output voltage on currents more than 110% of the rated current. Suitable ripple filtering circuits shall be provided to give a smooth D.C output. The ripple content shall be limited to less than $\pm 3\%$ on resistive load.
01.20.07	TESTS FACTORY TESTS All type and routine tests as listed in applicable standards shall be carried out at MANUFACTURER's works. ACCEPTANCE TEST Acceptance tests as per applicable standards will also be carried out on the assembled unit at site.
01.21.00	STATIC INVERTERS
01.21.01	SCOPE This specification covers requirements of Static Inverter for uninterrupted power supply to essential auxiliaries.
01.21.02	CODE AND STANDARDS The design, manufacture and performance of Inverter shall comply with all currently applicable statutes, regulations and safety codes. Nothing in the specification shall be construed to relieve the Vendor of his responsibility.
01.21.03	CONTROL SYSTEM Voltage Control The input DC voltage to the inverter shall be suitably monitored to ascertain the magnification required for obtaining the stipulated voltage at the output of the inverter.

	If the voltage at input of the inverter should fall below the prescribed minimum input voltage an alarm contact shall initiate annunciation. The load shall however be fed for two (2) minutes following the voltage dip.
01.21.04	<p>Frequency Control</p> <p>a) The synchronising frequency for the inverter shall be from a reliable AC source provided by the TNPGL.</p> <p>b) The synchronising frequency shall be input to a phase locked loop so that the frequency of the voltage output shall be within limits of the synchronising frequency prescribed in Data Sheet of the Specification.</p> <p>c) The loss of the source of synchronising frequency shall not turn-off the inverter and a temporary internal clock mechanism shall be initiated to maintain the inverter in operation until reliable supply of synchronising frequency is established. This loss of synchronising frequency shall not exceed one (1) hour.</p> <p>d) The loss of synchronising frequency input to the inverter shall initiate an alarm contact for annunciation.</p>
01.21.05	<p>Output over current Limit</p> <p>Unless otherwise stated in Data Sheet, the inverter shall be capable of being temporarily overloaded to 150% of its full load ampere capacity for sixty (60) seconds beyond which a current limit action shall be initiated and an alarm contact initiated for annunciation.</p>
01.21.06	<p>Control Modules</p> <p>All elements of the control system shall be mounted on epoxy laminate boards and each board shall be a plug in module mounted on a standard nineteen-inch rack, which shall be accessible from the front. Each card shall have LED indication on its front plate to indicate normal condition of the card. Readily accessible and clearly marked test pins shall be provided at the important points on the cards to enable signature analysis. The Vendor shall furnish the signal response at each test pin for a standard test signal input to the card.</p>
01.21.07	<p>The epoxy laminate shall be free from manufacturing errors and shall be designed to prevent incorrect insertion in the card rack. The copper side of the card shall be suitably acquired to prevent oxidation. The gap between two cards shall be sufficient to permit adequate ventilation.</p> <p>Adjustments susceptible to change by accidental contact shall be lockable.</p> <p>All control signals shall be in reference with a ground to be provided by the Vendor in the control system.</p>
01.21.08	<p>PROTECTIVE SYSTEMS</p> <p>a) Fuses for all power semiconductors and/or other devices like capacitors etc., which are not adequately protected against time of abnormal currents.</p> <p>b) Under voltage and over voltage protection on the input side. Loss of voltage to inverter shall entail tripping of the inverter.</p> <p>c) Protection for all control cards, power supply stabilizers, filter circuits etc. Protection shall be provided such that failure of a part does not cause damage elsewhere in the system.</p> <p>d) Polarizing relay to prevent reversal of polarity on the input side of the inverter.</p> <p>e) Protection of inverter IGBT circuits and other inverter elements during regenerative operation of the inverter and also during sudden load throw-off.</p> <p>f) All contacts for initiating alarm/annunciation shall be wired to a terminal board for local or remote annunciation.</p>
01.21.09	<p>INDICATING INSTRUMENTS/LAMPS</p> <p>Following minimum items shall be provided for each inverter. The Vendor may recommend any other item, if required, for the system to be supplied. Instruments shall have accuracy</p>

	<p>class of 1.5 or better. All meters shall be of Digital Indicators.</p> <ol style="list-style-type: none"> a. One D.C voltmeter b. One A.C. ammeter 0-150% of rated current. c. One A.C voltmeter. The voltmeter shall provide accurate reading in the range of rated voltage $\pm 10\%$. d. One digital frequency meter 45-55 Hz. Accuracy class 0.5. e. Indicating lamps with coloured lens & designation plates as follows: Green lens - Inverter Off, DC voltage ON Red Lens - Inverter ON, Output voltage ON Amber lens- Inverter tripped f. Audible alarm and facia annunciation system
01.21.10	<p>SWITCHING UNIT</p> <p>The specific scope of switching units on the input and output side of the inverter shall be as per the Specification.</p>
01.21.11	<p>Unless otherwise specified, switching unit at the output side of the inverter shall be a two-pole contactor with a fuse in series. The contactor coil shall be suitable for the specified D.C voltage. This contactor shall be remote operated. Local push buttons shall be provided for testing/maintenance. A local/remote selector switch shall be provided for this purpose. The output side fuse shall be suitable for discrimination with the downstream load circuit fuses as indicated. The Vendor shall note that discrimination sought is also in regard to the application where repeated inrush current during switch-in of the load is expected.</p>
01.21.12	<p>TESTING</p> <p>Following tests shall be conducted by the successful Vendor.</p> <p>Load test for half the quantity of inverters to be purchased.</p> <ol style="list-style-type: none"> a. Heat run test at design load capacity and operating PF. Under this condition the normal operation of the inverter shall be monitored. Exact procedure is subject to approval of the TNPGL. b. Test for voltage regulation during sudden load imposition. c. Harmonic analysis by a harmonic analyzer to determine total harmonic distortion. d. Routine Inspection/Test for all Inverters e. Power frequency withstand test on inverter system f. Power frequency withstand test for control cards. g. All modules & sub-assemblies shall be energized and tested individually as well as in assembled form at the factory. h. Any other test stipulated by the TNPGL. i. Acceptance Tests (Commissioning) <p>The equipment shall be demonstrated for proper operation including operation of meters, alarms and indication.</p>
01.22.00	<p>DRAWINGS/DATA WITH THE BID</p> <p>The Vendor shall furnish the following as part of the proposal:</p> <ol style="list-style-type: none"> a. Block diagram of the complete inverter scheme showing all major components and their ratings. b. Technical literature. c. Data Sheet and all other schedules enclosed with the specification.
01.22.01	<p>Uninterruptible Power Supply System Test</p> <p>Functional Test</p> <p>On completion of installation and commissioning of the equipment the following tests/checks shall be carried out with the max. available load, which does not exceed the rated continuous load. These tests/checks shall include but not limited to the tests as</p>

	indicated below.
01.22.02	<p>The details of the tests are as indicated below:</p> <p>1. Light Load Test</p> <p>This test is carried out to verify that the UPS is correctly connected and all functions operate properly. The load applied is limited to some percent of rated value. The following points should be checked:</p> <ul style="list-style-type: none"> (a) Output voltage and frequency and the correct operation of meters; (b) Operation of all control switches and other means to put units into operation. (c) Functioning of protective and warning devices. (d) Operation of remote signaling and remote control devices. <p>2. Checking of Auxiliary Devices</p> <p>The functioning of auxiliary devices, such as lighting, cooling fans, annunciation, etc., should be checked, if convenient, in conjunction with the preliminary light load test.</p> <p>3. Synchronisation Test</p> <p>If possible, frequency variation limits should be tested by use of a variable frequency generator, otherwise, by simulation of control circuit conditions. If applicable the rate of change of frequency during synchronization shall be measured.</p> <p>4. A. C. Input Failure Test</p> <p>The test is performed with a fully charged battery and is carried out by tripping input circuit breakers or may be simulated by switching off all UPS rectifiers and bypass feeder as at the same time. Output voltage variations are to be checked for specified limits with an oscilloscope of equivalent. Frequency variation is defined as the steady state frequency of the UPS with and without AC input. The rate of change of frequency is measured by the time it takes to reach steady-state values.</p> <p>5. A. C Input Return Test</p> <p>AC input return test is performed by closing AC input circuit breakers, or is simulated by energizing rectifiers and bypass feeders.</p> <p>Proper operation of rectifier starting and voltage and frequency variations are to be observed.</p> <p>Note: This test is normally performed with a fully or partially charged battery.</p> <p>6. Simulation of Parallel Redundant UPS Fault</p> <p>This test is applicable for UPS with parallel redundant connections. Faults of rectifier or inverter units may be carried out by simulation. Output transients are to be observed.</p>
	<p>7. Transfer Test</p> <p>This test is applicable for UPS with bypass, particularly in the case of an electronic bypass switch. Transients shall be measured during load transfer to bypass caused by a simulated fault and load retransfer after clearing of the fault.</p> <p>8. Full load test</p> <p>Load tests are performed by connecting the actual load to the UPS output.</p> <p>Large UPS in parallel connection may be load tested by testing the individual UPS units separately. Load tests are necessary for testing output voltage and frequency, rated stored energy, recharge time, ventilation, temperature rise and determination of efficiency. Load tests are performed to prove transient voltage deviations specified under step load conditions.</p> <p>9. UPS Efficiency</p> <p>UPS efficiency should be determined by the measurement of the active power input and output.</p> <p>10. Actual Load Test</p> <p>Conditions under actual load may differ from those with a dummy load. Steady-state generation of current and voltage harmonics and transients at load switching conditions</p>

should be observed

11. Current Division in Parallel UPS

Load sharing between the UPS units shall be measured with actual load under conditions of parallel operation.

12. Rated Stored Energy Time (Battery Test)

This test is a load test to prove the actual possible time of battery operation.

If rated load is not available in the case of large UPS, it is possible to apply a partial load to check the actual battery discharge characteristics and compare these with characteristics specified by the battery manufacturer. Discharge time with rated load shall then be calculated. The test shall be performed with a fully charged battery and also may be done under other battery conditions to be specified, if so agreed. Active power output of the UPS and the battery voltage shall be recorded during the test.

Since new batteries often do not provide full capacity during a starting up period, the discharge test may be repeated after a reasonable recharge time if the original test has failed.

13. Rated Restored Energy Time

Restored energy depends on the charging capacity of the rectifiers and the battery characteristics. If a certain recharging rate is specified, it shall be provided by repeating the discharge test after the specified charging period.

14. Battery Ripple Current

If battery ripple currents are specified, then the ripple current which depends on UPS operation shall be checked under normal operating conditions. Rough measuring methods are sufficient.

15. On site Ventilation Test

The test is performed with the actual load. Temperature conditions of all UPS cubicles are to be observed.

16. Overload Capability Test

Overload capability test is a load test. Specified values of short time overload or starting up sequences of actual load are to be applied for the time interval specified. Specified values of voltage and current are to be recorded.

17. Short Circuit Current Capability

If short-circuit current capability is specified, it may be tested by application of a short circuit to UPS output if necessary, via a suitable fuse, Short-circuit current is to be recorded.

18. Short Circuit Fuse Test

Fuse tripping capability of a UPS shall be tested, by short-circuiting the UPS output via a fuse of specified type.

The test shall be repeated to ensure against fuse non-uniformity and switching time during the cycle. The test is carried out at an appropriate UPS load, under normal operation, if not otherwise specified by TNPGL.

19. Restart

Automatic or other restart means are to be tested after a completed shutdown of UPS as specified.

20. Output Over voltage

Output over voltage protection is to be checked.

21. Periodic output voltage modulation

When this test is specified, it may be checked by voltage recording at different loads and operating conditions.

22. Harmonic Components

Harmonic components of output voltage shall be checked with the actual load. Methods of specification and checking shall be subject to **TNPGL** approval.

	<p>23. Earth Fault Test</p> <p>If the UPS output is isolated from earth, then an earth fault can be applied to any output terminal. UPS output transients (if any) shall be measured. If the battery is isolated from earth, then an earth fault can be applied to any output terminals. UPS output transient (if any) shall be measured.</p>
01.22.03	<p>Training:</p> <p>The Vendor shall provide training on UPS for eight maintenance Engineers in two batches. The duration of training shall be for one week.</p>

DATA SHEET

1.1	Type	Static Microprocessor Based
1.2	Power Rating at Load P.F 0.8 lagging	70 KVA or Greater
1.3	Application	For Power Supply to Instrumentation & Controls of DCS
1.4	Quantity	Refer Single Line Diagram
1.5	Method Of Energy Storage	Electrical- Battery Back-Up
1.6	Designation	Parallel Redundant With Static By-Pass To Regulated Supply
1.7	Whether Transfer Switch Required For Secondary Back-Up	To be furnished by Vendor.
1.8	Installation	Indoor
1.9	Temperature	
1.9.1	Ambient	30°C
	-For Operation (Deg C)	0 To 50
	-For Storage (Deg C)	0 To 50
1.9.2	Ref. Design Temp. (Deg. C)	50 Deg. C
1.10	Relative Humidity	Upto 95% Non-Condensing
2.0	Enclosure	
2.1	Material	Cold Rolled Sheet Steel
2.2	Sheet Thickness	2 mm
2.3	Degree of Protection as per IS-2417	IP-65
2.4	Painting	
	-Exterior	Light Grey
	-Interior	Glossy White
2.5	Cable Entry	Bottom
2.6	Acoustic Noise Level	60-70 DBA
3.0	UPS SYSTEM	
3.1	Input	
3.1.1	Supply Voltage	415V, 3 Ph, 50 Hz A.C. Non –Effectively Earthed
3.1.2	Allowable Variation	
	A) Voltage	±10%
	B) Frequency	47.5 to 52.5 Hz
3.2	Output	
3.2.1	Output Voltage	110V AC, Single ph 50 Hz
3.2.2	Ac Voltage Accuracy (Steady State Over Entire Load, Load PF)	+2% For Balance Load +3% For 20% Unbalanced Load
3.2.3	Transient Recovery	Return To Steady State condition within 50 m.sec. after disturbance
3.2.4	Voltage Wave Form	Sinusoidal
3.2.5	Range of adjustment of AC output Voltage	+ 5% at Rated Load.

3.2.6	AC Harmonic Content	5% total, 3% for any single harmonic 120 deg. +30 for 20% unbalance load
3.2.7	Nominal Frequency	50 Hz.
3.2.8	Frequency Regulation	+0.5%
3.3	Standby AC Supply with Isolation Transformer and Servo Controlled Voltage Stabilizer	Required.
3.3.1	Rating (KVA)	100% capacity of the UPS
3.3.2	Type	Dry, Two Winding
3.3.3	Ratio & Frequency-	
	-Primary	415 V, 3 Ph, 50 Hz
	-Secondary	110 V, 1 Ph, 50 Hz
3.3.4	Automatic Voltage	Required
	Regulator:	Servo Controlled
	a. Percentage Voltage Regulation	±2%
	b. Transient Response	±10% For Bypass
	c. Transient Recovery	Return to Steady State Condition in 1sec. after disturbance.
	d. Output Voltage Setting Range	±5% Of Nominal Voltage
3.5	Bypass Transfer	Auto/Manual Switch
3.6	Manual Bypass PBs	Load To Bypass & Load To Inverter
3.7	Manual Bypass Switch	Required
4.0	DC Link (Battery)	
4.1	No. of 100% Capacity Sealed Maintenance Free Battery	2 Set
4.2	Type of Battery	Sealed Maintenance Free
4.3	DC Link Voltage	To Be Chosen By Vendor
4.4	DC Voltage Variation Range	To Be Chosen By Vendor
4.5	Battery Support Time	100% Full Load Current of UPS System For 30 Minutes
4.6	Mounting Arrangement	Open Type
5.0	Battery Charger	
	Rectifier Unit	
5.1	No. of Units	Two Units Of 100% Capacity
5.2	Rectifier Unit	Silicon Rectifier 3 Phase Full Wave
5.3	TYPE	Float & Boost Charger
5.4	Parallel Operation	Required
5.5	Recharge Time On Boost Charge	8 Hours
5.6	In Rush Current	Maximum 25% Of Full Load Current (Energizing Rectifier Transformer with Inverter at No Load)
6.0	Inverter	
6.1	No. of 100% Inverters in System	Two Units
6.2	Type of Power Switching Device	Isolated Gate Bi-Polar Transistors
6.3.1	Overload	125% For 10 Min; 150% For 10 Sec

6.3.2	Short Time withstand	200% For 5 Milli Seconds
6.3.3	Over current Setting Range	100% To 160% of Load Current, Field Adjustable
6.3.4	Synchronising Between Inverters and Standby Supply	Required
6.4	Master/Follower Synchronising System	Required
6.5	Synchronising Range	± 3 Hz(47.0 Hz To 53.0 Hz)
7.0	Static Switch	
7.1	Type	Static
7.2	No. Of Switches	As Required
7.3	Rating	Equal To UPS Output KVA Rating at 0.8 Pf
7.4	Nominal Frequency	50 Hz
7.5	Purpose	Static Interrupter/Static Load Transfer to Regulated Supply/ Healthy Inverter
7.6	Maximum Transfer Time	Maximum of ¼ Cycle
7.7	Short Time Rating	750% For 1.0 Sec
7.8	Whether Make Before Break	Yes
8.0	Selection Switch	
8.1	Modes Of Operation	Pos I - Inverter Operation (Normal) Pos II - Inverter-1 (Maintenance) Pos III- Inverter-2 (Maintenance) Pos IV- By Pass
8.2	Whether Make Before Break	Yes
8.3	Rating	+25% of Inverter Output 600 V AC
8.4	Make/Break Rating	As Per IS – 4064
8.5	Short Time Rating	As Per IS – 4064
9.0	Circuit Breaker	
9.1	For Use In Ac System	
9.1.1	Type	MCCB
9.1.2	Application	415v, 3Ph, 50 Hz
9.1.3	Quantity	3
9.1.4	Rating Current	200 A
	Breaking Current	40 KA
	Short Time Current	40 KA/1.0 Sec.
9.1.5	Protection Setting Range	50% To 200% Overload 200% To 800% Short Circuit Release
9.1.6	Operation	Manual
9.2	For Use In DC System	
9.2.1	Type	Air Break
9.2.2	Application	Battery
9.2.3	Quantity	2
9.2.4	Rating	Contractor to state
9.2.5	Protection Setting Range	50% To 200% Overload 200% To 800% Short Circuit Release

9.2.6	Operation	Manual
10	AC DISTRIBUTION BOARD	
10.1	System Voltage	110 V, 1 Ph, 50 Hz 2 Wire System
	Qty	2 Nos.
10.2	Bus bars	
	Material	Copper
	Rating	*
10.3	Incoming	* Load Break Switch
10.4	Outgoing	* MCB
10.5	Metering, Indication, No. and Rating of Circuits	Will be finalised During Engineering
10.6	Cable Entry Facility	Bottom
10.7	Type of Module	Fixed Type
10.8	Material and Size of Earth Bus	GS 25 X 3 mm
VALVE REGULATED LEAD ACID MAINTENANCE FREE BATTERY		
I	General	
1.	Application	Unit Loads
2.	Number of Battery Banks required	Two Sets
3.	Number of Cells in each Bank	To be furnished by the Vendor depending upon Back-Up Time given Bank should be consisting of 2 Volt cell and each cell can be easily replaceable.
4.	Ambient Conditions	Min Temp 20.0 Deg.C Max. Temp 50 Deg.C Average.Temp 50 Dec.C
II	Rating	
1.	DC System Voltage	Normal: To be Furnished By the Vendor depending upon Back-Up Time given.
2.	Ampere Hour Capacity of Battery at 27 Deg.C 10 Hour Cell Voltage of 1.80 Volts/Cell	To be Furnished By the Vendor depending upon Back-Up Time given, or 240 AH whichever is greater.
III.	Discharge Duty	
1.	Cell Voltage-Initial/Final	2.15/1.8 Volts
2.	Tentative Size of Cables to connect Battery to External Circuit	Type PVC, Armoured single core multi stranded Copper Cable Size: as per current requirement
IV.	Miscellaneous	
1.	Mounting Arrangement	Double Tier
2.	High Discharge Test Required	Yes. Amps. as per IS 1651. Time: Two Hours
3.	Charging Method Proposed	Float/ Boost
BATTERY CHARGER FOR 110 V, 1PH UPS		
I	General	

1.	Number Required	2 Per Set
2.	Type	Boost & Float
3.	Dc System Voltage	*
4.	Float Charger Capacity	*
5.	Boost Charger Capacity	*
II.	DC Bus Load	
6.	Momentary	*
7.	Emergency	*
8.	Continuous	*
9.	Float Charging Current of Battery	As Required
10.	Boost Charging Current of Battery	As Required
11.	Maximum Time for Boost Charging of Battery	Eight (8) Hours
III.	AC System Data	
12.	Supply	415V, 3 Phase 50 Hz 3 Wire
13.	Variation in Supply	Voltage $\pm 10\%$, Frequency $\pm 6\%$
14.	Short Circuit Level	Will be furnished during Engineering.
15.	Type of Earthing	Non Effectively Earthed
16.	Auxiliary Supply Voltage if available separately	*
IV	Performance	
17.	Automatic Voltage Regulator (AVR) Required	Yes
18.	Regulation With AVR	$\pm 1\%$
19.	Permissible Harmonics at rated Continuous Load	$\pm 3\%$
20.	Minimum Permissible Power Factor at Rated Continuous Load	0.8
21.	Max. Permissible Variation in DC Voltage (No Load to Full Load)	1%
V.	Miscellaneous	
22.	Tap Changing Gear for Rectifier Transformer	Off Load
23.	Apparatus to Shut Down Charger Equipment in case of Auxiliary Supply Failure	*
24.	Cable Entry From	Bottom
25.	Cable Sizes Battery, DC Output AC Supply	*
Note: '*' Indicates Details to be furnished by Vendor		

SECTION VII- IC																											
CLAUSE	OTHER PANEL/ FIELD/ LAB INSTRUMENTS																										
1.00.00	ELECTRICAL TRANSDUCERS																										
1.01.01	Suitable Programmable transducers with 4-20mA output as per IS:12784 Part-I as indicated in I&C device list for feeding signals to panel mounted programmable meters (ammeters, voltmeters, VAR meters and watt meters, PF, Frequency etc.) and DDCMIS/DAS shall be provided by the Bidder suitably mounted in separate Transducer panel. The exact number of panels and arrangement shall be finalized & approved by Purchaser during detailed Engg.																										
1.01.02	All internal panel wiring shall be provided in accordance with Instrumentation Cables Section. For DDCMIS, Bidder shall provide prefab cables for further distribution to DDCMIS cubicles and UCR(Unit Control Room) mounted electrical meters. The terminal blocks in respective panels shall be provided suitable for signals from CT/PT as per following spec. clause and shall also meet requirements specified elsewhere. TB should have the Shorting facility of CT terminals for safety isolation of Transducers Proper segregation of terminal blocks shall be done such that the terminal blocks of incoming high-level signals shall be separate from low level output signal from transducers.																										
1.01.03	230 V/ 110 V AC Supply shall power the transducers through unit switchgear feeders. The exact power supply arrangement shall be finalized & approved by Purchaser during detailed Engg. All transducers shall be tested as per IEC 688 (for impulse test etc.) and SWC test as per ANSI C 37.90A 1989.																										
1.01.04	<p>All this transducers shall provide two decoupled 4-20 mA output signals one for driving the meters (as applicable) & one for use in DDCMIS/DAS. 6 times inhibit AC Current limiting feature shall be provided for all the transducers used for motor feeders (Surge arresters shall be provided from 1.5times to 10times the rated current). The following transducers shall be provided compatible to electrical meters specified & to Bidder's DDCMIS/DAS meeting following requirement.</p> <p style="text-align: center;">1. <u>Current Transducers</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Input & Quantity</td> <td>Input 1A/5A(CT secondary) - 100Nos (Programmable)</td> </tr> <tr> <td>Rated frequency</td> <td>47-52 Hz</td> </tr> <tr> <td>Output</td> <td>4-20 mA (2 Nos. decoupled)</td> </tr> <tr> <td>Over current</td> <td>Transducer for motor current ammeters shall be capable of withstanding min. 6 times CT secondary current of 1A/5A for a min. period of 30 seconds.</td> </tr> <tr> <td>Accuracy</td> <td>± 0.5%</td> </tr> <tr> <td>Isolation Test Voltage</td> <td>Electrical Isolation of 4KV between transducers connection</td> </tr> <tr> <td>Nominal I/P current Burden</td> <td><0.2VA @ In</td> </tr> <tr> <td>Nominal O/P current Burden</td> <td>0≤R≤15V</td> </tr> <tr> <td>Mounting</td> <td>Panel or DIN Rail Mounting</td> </tr> <tr> <td>Output Impedance</td> <td>500 ohms</td> </tr> <tr> <td>Response Time</td> <td>300ms</td> </tr> <tr> <td>Zero & Span Adjustment</td> <td>± 2% minimum at zero ± 10% minimum at span</td> </tr> </table> <p style="text-align: center;">2. <u>Voltage Transducers :</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Input & Quantity</td> <td>Input 110V VT secondary – 18 Nos Input</td> </tr> </table>	Input & Quantity	Input 1A/5A(CT secondary) - 100Nos (Programmable)	Rated frequency	47-52 Hz	Output	4-20 mA (2 Nos. decoupled)	Over current	Transducer for motor current ammeters shall be capable of withstanding min. 6 times CT secondary current of 1A/5A for a min. period of 30 seconds.	Accuracy	± 0.5%	Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection	Nominal I/P current Burden	<0.2VA @ In	Nominal O/P current Burden	0≤R≤15V	Mounting	Panel or DIN Rail Mounting	Output Impedance	500 ohms	Response Time	300ms	Zero & Span Adjustment	± 2% minimum at zero ± 10% minimum at span	Input & Quantity	Input 110V VT secondary – 18 Nos Input
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Rated frequency	47-52 Hz																										
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	120V VT secondary 04 Nos (Programmable)
Rated frequency	47-52 Hz
Output	4-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Nominal I/P voltage Burden	<0.6 VA @ Un
Nominal O/P current Burden	0≤R≤15V
Mounting	Panel or DIN Rail Mounting
Output Impedance	500 ohms
Zero & Span Adjustment	± 2% minimum at zero ± 10% minimum at span

3. Voltage Transducers :

Input & Quantity	a. Input 0-600 V dc – 2 Nos b. Input 0 to 75 mV(DC Shunt) – 5Nos. c. Input 0 to 100 mV(DC Shunt)- 2 Nos d. Input 0-500 V dc – 2 Nos (Programmable)
Rated frequency	50 Hz
Output	4-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Zero & Span Adjustment	± 2% minimum at zero ± 10% minimum at span
Mounting	Panel or DIN Rail Mounting
Output Impedance	500 ohms

4. Power Transducers :

Input & Quantity	3 Phase, 3 Wire, 5A (CT secondary) 110V (VT secondary CTR-10000/5A; PTR-15.75KV/110V) - 2 Nos; (Programmable)
Rated frequency	50 Hz
Output	4-9.33-20 mA dc (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Range	Lead 100-0-lag200MVAR
Zero & Span Adjustment	To be provided Externally
Mounting	Panel or DIN Rail Mounting
Output Impedance	500 ohms

5. 1 WATT Transducers :

Input & Quantity	3 Phase, 3 Wire, 5A (CT secondary) 110V (VT secondary) CTR-10000/5A; PTR-15.75KV/110V- 2 Nos; (Programmable)
Rated frequency	50 Hz
Output	4-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Range	0-250MW
Zero & Span Adjustment	To be provided Externally
Mounting	Panel or DIN Rail Mounting

Output Impedance	500 ohms
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5. 2 WATT Transducers :

Input & Quantity	3 Phase, 3 Wire, 1A (CT secondary) 110V (VT secondary) CTR-1500/1A; PTR-6.6KV/110V- 10 Nos; (Programmable)
Rated frequency	50 Hz
Output	4-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Range	0-20MW
Zero & Span Adjustment	To be provided Externally
Mounting	Panel or DIN Rail Mounting
Output Impedance	500 ohms

5. 3 WATT Transducers :

Input & Quantity	3 Phase, 3 Wire, 1A (CT secondary) 110V (VT secondary) CTR-3000/1A; PTR-6.6KV/110V- 2 Nos; (Programmable)
Rated frequency	50 Hz
Output	4-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Range	0-35MW
Zero & Span Adjustment	To be provided Externally
Mounting	Panel or DIN Rail Mounting
Output Impedance	500 ohms

6. Frequency Transducers :

Input & Quantity	a. 110V (VT secondary) - 2 Nos b. 120V (VT secondary) - 2 Nos (Programmable)
Rated frequency	50 Hz
Range	45 to 55 Hz
Output	4-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection
Zero & Span Adjustment	To be provided
Mounting	Panel Mounting Externally
Output Impedance	500 ohms

7. Power Factor Transducers :

Input & Quantity	3 Phase, 3 Wire, 5A (CT secondary)110V (VT secondary) CTR-10000/5A; PTR-15.75KV/110V- 2 Nos ; (Programmable)
Rated frequency	50 Hz
Range	0.5 lead –UPF- Lag-0.5
Output	4-12-20 mA (2 Nos. decoupled)
Accuracy	± 0.5%
Isolation Test Voltage	Electrical Isolation of 4KV between transducers connection

	Zero & Span Adjustment	To be provided Externally																																																																																																																																			
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	Note: All the Transducers should have auxiliary supply 110V or 230V AC.																																																																																																																																				
2.00.00	Panel Mounted Indicators for Electrical Parameters:																																																																																																																																				
2.01.01	These programmable meters are required for indicating the Electrical parameters like Voltage, current, Power Factor etc in the Control panel driven from DCS.																																																																																																																																				
2.01.02	<p>a. Programmable Ammeters / Voltmeters</p> <p>Accuracy - $\pm 0.5\%$ Auxiliary supply - 230V AC $\pm 10\%$ Mounting - Flush Size - 48(W) X 96 (H) mm Signal Input - 4-20 mA DC</p> <table border="1"> <thead> <tr> <th>Sl.No</th> <th>Item Description</th> <th>Display</th> <th>OutputDisplayRange</th> <th>Quantity</th> </tr> </thead> <tbody> <tr><td>1.</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-75 Amps</td><td>5Nos</td></tr> <tr><td>2.</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-200Amps</td><td>4Nos</td></tr> <tr><td>3.</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-50Amps</td><td>5Nos</td></tr> <tr><td>4.</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-150Amps</td><td>6Nos</td></tr> <tr><td>5.</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-30Amps</td><td>3Nos</td></tr> <tr><td>6.</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-60Amps</td><td>3Nos</td></tr> <tr><td>7.</td><td>AC Ammeter</td><td>4 1/2 Digit RED LED</td><td>0-1500Amps</td><td>8Nos</td></tr> <tr><td>8.</td><td>AC Ammeter</td><td>4 1/2 Digit RED LED</td><td>0-3000Amps</td><td>9Nos</td></tr> <tr><td>9</td><td>AC Ammeter</td><td>3 1/2 Digit RED LED</td><td>0-175Amps</td><td>7Nos</td></tr> <tr><td>10.</td><td>AC Ammeter</td><td>4 1/2 Digit RED LED</td><td>0-10000Amps</td><td>4Nos</td></tr> <tr><td>11.</td><td>DC Ammeter</td><td>4 1/2 Digit RED LED</td><td>0-1500Amps</td><td>1No.</td></tr> <tr><td>12.</td><td>DC Ammeter</td><td>4 1/2 Digit RED LED</td><td>0-3000Amps</td><td>2Nos</td></tr> <tr><td>13.</td><td>DC Voltmeter</td><td>3 1/2 Digit RED LED</td><td>0-600V</td><td>2Nos</td></tr> </tbody> </table> <p>b. Analog Ammeters / Voltmeters Type : CT operated AC moving coil Deflection: 240 ° Size: 144 X 144mm except SIno.9 Accuracy : +/- 1.5% of FSD Mounting : Flush,Tant band circular</p> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Item Description</th> <th>CTR/PTR</th> <th>Display range</th> <th>Qty. in Nos.</th> </tr> </thead> <tbody> <tr><td>1</td><td>AC Ammeter</td><td>200/1</td><td>0 – 200/1200</td><td>4</td></tr> <tr><td>2</td><td>AC Ammeter</td><td>40/1</td><td>0 – 40/240</td><td>7</td></tr> <tr><td>3</td><td>AC Ammeter</td><td>125/1</td><td>0 – 125/750</td><td>3</td></tr> <tr><td>4</td><td>AC Ammeter</td><td>150/1</td><td>0 – 150/900</td><td>6</td></tr> <tr><td>5</td><td>AC Ammeter</td><td>30/1</td><td>0 – 30/180</td><td>3</td></tr> <tr><td>6</td><td>AC Ammeter</td><td>100/1</td><td>0 – 100/600</td><td>2</td></tr> <tr><td>7</td><td>AC Ammeter</td><td>500/1</td><td>0 – 500/3000</td><td>3</td></tr> <tr><td>8</td><td>AC Ammeter</td><td>1500/1</td><td>0 – 1500</td><td>4</td></tr> <tr><td>9</td><td>AC Ammeter(90mmX90mm)</td><td>50/5</td><td>0 – 50/300</td><td>2</td></tr> <tr><td>10.</td><td>AC Voltmeter</td><td>15.75Kv/110</td><td>0-15.75KV</td><td>4Nos</td></tr> <tr><td>11.</td><td>AC Voltmeter</td><td>6.6Kv/110</td><td>0-6600V</td><td>15Nos</td></tr> </tbody> </table> <p>2.Watt/MVAR/Power Factor Meters: Accuracy - $\pm 0.5\%$ Display - 3 1/2 Digit RED LED Auxiliary supply - 230V AC $\pm 10\%$ Mounting - Flush Size -48(W) X 96(H)mm Signal Input - 4-20 mA DC</p>			Sl.No	Item Description	Display	OutputDisplayRange	Quantity	1.	AC Ammeter	3 1/2 Digit RED LED	0-75 Amps	5Nos	2.	AC Ammeter	3 1/2 Digit RED LED	0-200Amps	4Nos	3.	AC Ammeter	3 1/2 Digit RED LED	0-50Amps	5Nos	4.	AC Ammeter	3 1/2 Digit RED LED	0-150Amps	6Nos	5.	AC Ammeter	3 1/2 Digit RED LED	0-30Amps	3Nos	6.	AC Ammeter	3 1/2 Digit RED LED	0-60Amps	3Nos	7.	AC Ammeter	4 1/2 Digit RED LED	0-1500Amps	8Nos	8.	AC Ammeter	4 1/2 Digit RED LED	0-3000Amps	9Nos	9	AC Ammeter	3 1/2 Digit RED LED	0-175Amps	7Nos	10.	AC Ammeter	4 1/2 Digit RED LED	0-10000Amps	4Nos	11.	DC Ammeter	4 1/2 Digit RED LED	0-1500Amps	1No.	12.	DC Ammeter	4 1/2 Digit RED LED	0-3000Amps	2Nos	13.	DC Voltmeter	3 1/2 Digit RED LED	0-600V	2Nos	Sl. No.	Item Description	CTR/PTR	Display range	Qty. in Nos.	1	AC Ammeter	200/1	0 – 200/1200	4	2	AC Ammeter	40/1	0 – 40/240	7	3	AC Ammeter	125/1	0 – 125/750	3	4	AC Ammeter	150/1	0 – 150/900	6	5	AC Ammeter	30/1	0 – 30/180	3	6	AC Ammeter	100/1	0 – 100/600	2	7	AC Ammeter	500/1	0 – 500/3000	3	8	AC Ammeter	1500/1	0 – 1500	4	9	AC Ammeter(90mmX90mm)	50/5	0 – 50/300	2	10.	AC Voltmeter	15.75Kv/110	0-15.75KV	4Nos	11.	AC Voltmeter	6.6Kv/110	0-6600V	15Nos
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7.	AC Ammeter	4 1/2 Digit RED LED	0-1500Amps	8Nos																																																																																																																																	
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9	AC Ammeter	3 1/2 Digit RED LED	0-175Amps	7Nos																																																																																																																																	
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11.	DC Ammeter	4 1/2 Digit RED LED	0-1500Amps	1No.																																																																																																																																	
12.	DC Ammeter	4 1/2 Digit RED LED	0-3000Amps	2Nos																																																																																																																																	
13.	DC Voltmeter	3 1/2 Digit RED LED	0-600V	2Nos																																																																																																																																	
Sl. No.	Item Description	CTR/PTR	Display range	Qty. in Nos.																																																																																																																																	
1	AC Ammeter	200/1	0 – 200/1200	4																																																																																																																																	
2	AC Ammeter	40/1	0 – 40/240	7																																																																																																																																	
3	AC Ammeter	125/1	0 – 125/750	3																																																																																																																																	
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5	AC Ammeter	30/1	0 – 30/180	3																																																																																																																																	
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9	AC Ammeter(90mmX90mm)	50/5	0 – 50/300	2																																																																																																																																	
10.	AC Voltmeter	15.75Kv/110	0-15.75KV	4Nos																																																																																																																																	
11.	AC Voltmeter	6.6Kv/110	0-6600V	15Nos																																																																																																																																	

Sl.No.	Item Description	Output Display Range	Quantity
1.	Watt Meter	0-250MW	2Nos
2.	Watt Meter	0-20MW	9Nos
3.	Watt Meter	0-35MW	3Nos
4.	MVAR Meter	100(Lead)-0-200(Lag)	2Nos
5.	Power Factor Meter	0.5(Lead)-1-0.5(Lag)	2Nos
6.	Frequency Meter	45-55Hz	4Nos

03.01.00

PRESSURE /DP/ TEMPERATURE SWITCHES:

a. DP Switches- 6Nos.

Differential pressure switch for Furnace Pressure Protection
Range- (-) 375 to +375mmwcl; Three switches set at +150mmwcl on increasing pressure & Three switches set at -150mmwcl on decreasing pressure.

Type - Diaphragm, Entry for positive, negative pressure – on each side (Side entry);
Maximum bellow pressure 1Kg/cm²; Differential setting - ±50 mmwcl; Material - SS 316;
Switch rating– 2Nos;SPDT/10A resistive 4A inductive 380Vac; 12W 220VDC
Protection – Weather proof to IP-66 as per IS13947 (part1) 1993;
Accuracy - ± 1% ; Instrument connection- ¼"NPT(F);
Cable entry- ¾" NPT(F)

b. Pressure Switch – 2 Nos.

Application – For Light Oil Pressure Protection & Interlock;
Type - Diaphragm type Snap action switch; Range- 100PSI; One switch set at 90PSI on increasing pressure and One switch set at 25PSI on decreasing pressure Entry – Bottom Entry; Maximum bellow pressure 1000PSI, Adjustability – External by knob; Material - SS 316

Switch rating– 2Nos; SPDT/10A resistive 4A inductive 380Vac; 12W 220VDC
Protection – Weather proof to IP-66 as per IS13947 (part1) 1993;
Accuracy - ±1% ; Instrument connection- ¼"NPT(F);
Cable entry- ¾" NPT (F)

c. Pressure Switch – 2 Nos

Application – For Heavy Oil Pressure Protection & Interlock;
Type - Diaphragm Snap action switch; Range- 200PSI; One switch set at 112PSI on increasing pressure and One switch set at 35PSI on decreasing pressure; Entry – Bottom Entry; Maximum bellow pressure 1000PSI, Adjustability – External by knob; Material - SS 316

Switch rating – 2Nos. SPDT/10A resistive 4A inductive 380Vac 12W 220VDC
Protection – Weather proof to IP-66 as per IS:13947(part1) 1993;
Accuracy - ±1% ; Instrument connection - ¼"NPT(F);
Cable entry- ¾" NPT(F)

d. Temperature Switches – 2Nos.

Application – For Heavy Oil Temperature Protection & Interlock
Media temperature limits – (-100 to 300°F/-73 to 149°C)
Adjustable range – (50 to 250°F/10 to 121°C)
One switch set at 105°C and other switch set at 95°C

Type – Capillary, Entry – Bottom,
Capillary length -2meters long,
Bulb length – 110mm, bulb dia – 5mm,
Switch rating – 1No SPDT - 10A resistive 4A inductive 380Vac 12W220 VD

	<p>e. Local maintenance switches with mounting box (Remote-off-Scavenge)– 12Nos. 25A, 250V ac , Three way without off or Four way single pole switches.</p>																
04.01.00	<p>Push buttons with indicating lamps Red colour -25Nos. , Green colour -50Nos. All Push buttons with indication lamps in the Emergency back panel for UCD shall be provided with following specification:Oil tight heavy duty industrial rated brand ideally suited for control panels with 2NO and 2NC with LED indication Head type – Flush head rectangular type. All LED indicating lamps in the emergency back panel desk shall be directly driven by DCS DO card.</p>																
05.01.00	<p>Trip Circuit Supervision Relay The bidder shall provide Trip circuit supervision relay for HT Services trip circuit monitoring and permissive purpose, equivalent to ABB-TSR-B relay. Trip Circuit Supervision Relay</p> <table border="1"> <tr> <td>Quantity</td> <td>31 Nos;</td> </tr> <tr> <td>Voltage rating</td> <td>220V DC</td> </tr> <tr> <td>Voltage operating range</td> <td>175-275V DC</td> </tr> <tr> <td>Operating Time</td> <td><100ms</td> </tr> <tr> <td>Resetting Time</td> <td>>400ms</td> </tr> <tr> <td>Output Contacts</td> <td>3 Pairs(2NO+1NC)</td> </tr> <tr> <td>Contact rating</td> <td>5 Amps</td> </tr> <tr> <td>Mounting</td> <td>Panel</td> </tr> </table>	Quantity	31 Nos;	Voltage rating	220V DC	Voltage operating range	175-275V DC	Operating Time	<100ms	Resetting Time	>400ms	Output Contacts	3 Pairs(2NO+1NC)	Contact rating	5 Amps	Mounting	Panel
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06.00.00	<p>Turbo-Generator Auto synchronizer</p>																
06.01.01	<p>The Turbo-Generator Auto Synchronizer shall be of latest 32 bit micro-processor based multi-functional paralleling device suitable for Larger (210 MW) Turbo-Generator machine. The design shall ensure highly reliable paralleling with 2-channel measurement method and support monitoring function. Two independent methods shall decide on the connection conditions. The unit shall automatically detect the operating conditions and the response to these conditions shall depends on the settings.</p> <p>If the conditions are asynchronous, as is the case when synchronising generators, the generator speed shall be automatically matched to the system frequency and the generator voltage to the system voltage. The connection shall then be made at the synchronous point, allowing for circuit-breaker made time.</p> <p>Voltage and frequency functions ($V>$, V, $f<$, $f<dv/dt$) including voltage vector jump ($\Delta\Phi$) shall be available for protection or network decoupling application.</p> <p>It shall contain integral programmable logic functions for high flexibility so that adjustments can easily be made to the varying power station requirements.</p> <p>It shall contain MODBUS-RTU communication interfaces communicate with control systems and for time synchronization.</p>																
06.01.02	<p>Indications The system shall provide detailed data for analysis of synchronization (fault events from activated protection functions) and for checking states during operation. All indications shall be protected against power supply failure.</p> <p>1. Synchronization indications (Fault indications): The last eight synchronizations (faults) shall be stored in the unit at all times. A fresh synchronization (fault) shall erase the oldest one. The fault indications have a time</p>																

	<p>resolution of 1 ms. They provide detailed information on history. The buffer memory shall be designed for a total of 600 indications.</p> <p>2. Operational indications: All indications that are not directly associated with the synchronization (fault) (e.g. operating or switching actions) shall be stored in the status indication buffer. The time resolution is 1 ms, buffer size: 200 indications. Fault recording up to 10 or 100 seconds An instantaneous value or r.m.s. value recorder shall be provided. The firmware permits storage of 8 fault recordings. Triggering can be effected by the synchronization function (starting or closing command), protection function (pickup or tripping), binary input, the DIGSI 4 operating program or by the control system.</p> <p>The instantaneous value recording shall store the voltage input values, voltage differences and calculated r.m.s. values at 1-ms intervals. The r.m.s. values shall be calculated every half cycle. The total duration of the fault recording is 10 seconds. If the time is exceeded, the oldest recording shall be overwritten.</p> <p>Time synchronization A battery-backed clock shall be available and can be synchronized via a synchronization signal, binary input, system interface or SCADA. A date and time are assigned to every indication.</p> <p>Freely assignable inputs and outputs Binary inputs, output relays, and LEDs can each be given separate user-specific assignments. Assignment is effected using a software matrix, which greatly simplifies the allocation of individual signals. To ensure dual-channel redundancy, control of the CLOSE relay (relay R1 and R2) is prioritized and should not be altered. These two relays have a special, highly reliable control and monitoring logic</p> <p>Continuous self-monitoring The hardware and software shall be continuously monitored. If abnormal conditions are detected, the unit signals immediately. In this way, a great degree of safety, reliability and availability shall be achieved.</p> <p>Reliable battery monitoring The battery shall buffer the indications and fault recordings in the event of power supply voltage failure. Its function shall be checked at regular intervals by the processor. If the capacity of the battery is found to be declining, an alarm indication shall be generated. All setting parameters shall be stored in the Flash-EPR0M which are not lost if the power supply or battery fails. The unit shall remain fully functional.</p>
06.01.03	<p><u>Functional scope of the paralleling function</u></p> <p>Synchro-check In this mode, the variables ΔV, Δf, $\Delta \alpha$ shall be checked. If they reach set values, a release command is issued for as long as all three conditions are met, but at least for a settable time.</p> <p>Switching synchronous networks The characteristic of synchronous networks is their identical frequency $\Delta f \approx 0$. This state is detected, and fulfillment of the ΔV and $\Delta \alpha$ conditions shall be checked. If the conditions remain met for a set time, the CLOSE command is issued upto 100 msec.</p> <p>$\Delta V = 0$ TO $\pm 20\%$ (adj) $\Delta \alpha = 0$ TO $\pm 10^\circ$ (adj) $\Delta f = 0$ TO $\pm 5^\circ$ (adj)</p> <p>Switching asynchronous networks This state occurs in the power system and generator (open generator circuit -breaker). A</p>

check is made for fulfillment of ΔV and Δf conditions and the connection time is calculated, taking account of $\Delta \alpha$, and the circuit-breaker making time. By means of balancing commands (for voltage and frequency), the generator can automatically be put into a synchronous condition.

Switching onto dead busbars

The voltage inputs shall be checked. The CLOSE command shall be issued depending on the set program and the result of measurement.

The following operating states shall be possible:

-V1<V2>(connection to dead bus bar (side I))

-V1>V2< (connection to dead line (side 2))

-V1<V2< (forced closing)

Voltage and frequency band query

Synchronization is not activated until the set limits are reached. Then the remaining parameters (see above) are checked.

Vector group adaptation

If synchronization is effected using a transformer, the unit will take account of the phase-angle rotation of the voltage phasor in accordance with the vector group entry for the transformer. On transformers with a tap changer, the tap setting can be communicated to the unit. Deviations from the rated transformation ratio result in the appropriate voltage amplitude adaptation.

Voltage and frequency balancing

If the synchronization conditions are not fulfilled, the unit shall automatically output balancing signals. These are the appropriate up or down commands to the voltage or speed controller (frequency controller). The balancing signals shall be proportional to the voltage or frequency difference, which means that if the voltage or frequency difference is substantial, longer balancing commands shall be output. A set pause shall be allowed to elapse between balancing commands to allow the state change to settle. This method ensures rapid balancing of the generator voltage or frequency to the target conditions.

If identical frequency is detected during generator-network synchronization ("motionless synchronization phasor"), a kick pulse shall put the generator out of this state. For example, if the voltage is to be adjusted using the transformer tap changer, a defined control pulse shall be output.

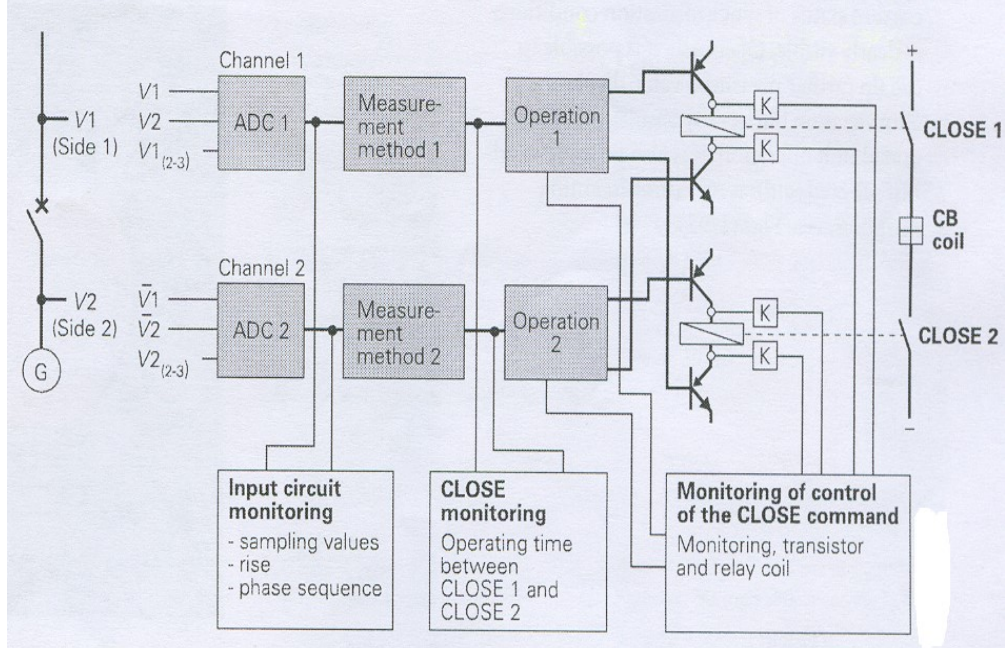
Several synchronizing points

Up to 8 synchronization points shall be operated. The data for synchronization of each circuit-breaker (synchronization function group) shall be stored individually. Selection shall be made either via the binary input or the serial interface. With the Continuous Function Chart (CFC), it is also possible to control the connection of the measured variables or commands via a master relay.

Commissioning aids

The paralleling device shall be designed to be commissioned without an external tester/recorder. For that purpose, it shall contain a codeword-protected commissioning section. This can be used to measure the make time automatically with the unit (internal command issue until the CB poles are closed). This process shall be logged by the fault recording function.

The operational measured values shall also include all measured values required for commissioning. The behavior of the paralleling function or the unit shall also be documented in detail in the operational annunciation and synchronization annunciation buffer. The connection conditions shall be documented in the synchronization record. Test synchronization shall also be permitted. All actions inside the synchronizer are taken but the two CLOSE relays are not operated (R1 and R2). This state can also be initiated via a binary

	input.
06.01.04	<p>Multi-channel redundancy:</p> <p>Generator synchronization especially requires units in which unwanted operation can be ruled out. The paralleling device shall achieve this multi-channel redundancy with a two-out-of-two decision. This means that two conditions for the CLOSE command must be fulfilled.</p> <p>In the two-channel version two independent methods work in parallel. The CLOSE command is given when the two methods simultaneously decide on CLOSE. Fig. shows the consistent implementation of dual-channel redundancy.</p>  <p>The measured quantities shall be fed to two ADCs. The second ADC processes the values rotated through 180° (e.g. V1). The monitoring methods shall test all the transformer circuits including internal data acquisition for plausibility and they block measurement if deviations are found. The phase-sequence test shall detect connection errors. The measuring methods 1 and 2 include the measurement algorithms and logic functions. In keeping with the two-channel redundancy principle, differing measurement methods shall be used to prevent unwanted operation due to systematic errors. In addition, closure monitoring (synchronism monitoring of both methods) etc shall also active. Unwanted relay operation shall be avoided by two-channel operation of both CLOSE relays.</p> <p>Moreover, coil operation shall be monitored in the background. When faults are found, the unit shall be blocked immediately.</p> <p>The plausibility monitoring of set values (valid limits) and selection of the synchronization function groups (only one can be selected) shall also be supported. In the event of any deviations, messages are output and the paralleling function shall be blocked.</p> <p>Output contact rating shall be capable of 220V DC, 6A.</p>
07.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES:
07.01.01	<p>Field mountable Local Junction Boxes with terminal blocks & other accessories</p> <ul style="list-style-type: none"> (i) Material and Thickness – 2 mm thick Polycarbonate (ii) Type – Hinged door. Door handle shall be of SS. Lock shall be provided with common key. Door gasket shall be of synthetic rubber. (iii) Mounting clamps and accessories - Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be in Bidders scope of supply. (iv) Types of Terminal Blocks - Rail mounted suitable for conductor size upto 2.5

	<p>mm². A M6 earthing stud shall be provided. Different colour terminal blocks for input, output signals.</p> <p>(v) Protection class - IP:55 minimum</p> <p>(vi) JB's outer side shall be coated with 0.5mm grey colour powder coating for MRT Olive Green colour powder coating for Inst and inner side with 0.5mm white colour powder coating.</p> <table border="1"> <thead> <tr> <th>SINo</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>12 way with 20 % spare terminal blocks</td> <td>200 Nos</td> </tr> <tr> <td>2.</td> <td>24 way with 20 % spare terminal blocks</td> <td>260 Nos</td> </tr> <tr> <td>3.</td> <td>36 way with 20 % spare terminal blocks</td> <td>36 Nos</td> </tr> </tbody> </table>	SINo	Description	Qty	1.	12 way with 20 % spare terminal blocks	200 Nos	2.	24 way with 20 % spare terminal blocks	260 Nos	3.	36 way with 20 % spare terminal blocks	36 Nos
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08.00.00	Local Push Button Station ,Loosed terminal Blocks and Local panel.												
08.01.01	<p>Local Push Button Station – 251Nos.</p> <ul style="list-style-type: none"> ➤ Material and thickness : 2 mm thick Polycarbonate ➤ Degree of protection : IP65 ➤ Anti Impact : IK08 ➤ Insulation Protection : Complete Insulation ➤ Temp : -40°C to 120°C ➤ Flame retardant : V2 ➤ Chemical Stability : Good ➤ Toxicity : No halogen ➤ UV resistance : UL508 ➤ Others : Integrated with terminals, cables with prefab Holes. <p>Push Button Oil tight pushbutton 30.5mm dia with shrouded actuators suitable for fixing add block type switching element PB of Red, Green in colour.</p> <p>Lockable Push Button Oil tight Pushbutton 30.5mm dia with 1 position lockable key actuators along with two keys suitable for fixing add block type switching element. Add block type glass covered switching element for oil tight Push Button 10A,415VAC one make, one break contact.</p>												
08.01.02	<p>Loosed Terminal Blocks - 1 Lot</p> <p>Loosed terminal blocks for all HT dummy panels, ESP Local panels etc .Rail mounted suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided. Different colour terminal blocks for input, output signals. All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, test plug bolts and test plug (as specified above for SWGR connections) transparent covers, support brackets, distance sleeves, warning label, marking, etc.</p> <p>For ensuring proper connections, Bidder shall provide suitable accessories, along with insulation sleeves. The exact connecting accessory shall be finalised as per application during detail engineering stage subject to Employer's approval without any cost repercussions.</p>												
08.01.03	<p>Local panel - 10 Nos</p> <p>Fournumbers Local panels for Instrument air compressor system, Service air compressor system, and MCP system with Start, Stop PB, Indications etc. Three numbers local panels for fixing of Recorders and Annunciation system in Cooling water pump for Unit I, II, III. Three numbers local panels for BFP with Start, Stop PB, and Indications , recorder Annunciation system etc</p> <p>All panels, shall be furnished fully wired with necessary provision for convenience</p>												

	<p>outlets, grounding, ventilation, anti-vibration pads as required for completeness of the system. All panels, desks, cabinets shall be free standing type & have bottom / top entry for cables to be finalised application wise during detailed engineering stage. Compression cable glands and fire proof sealing material to prevent ingress of dust and propagation of fire.</p> <p>Miniaturised push buttons shall be provided as actuating elements to meet the functional requirements for start/stop of Motor/pump of safe shut down of the unit. "Release" push buttons shall be provided for a set of push buttons Depending on the type of control/function and required number of push buttons and indicating LEDs & their color, push button stations shall be selected. The number and rating of contacts of push button stations shall be as per the requirement of DDCMIS. The exact location of these buttons shall be finalized during detailed engg. Stage.</p> <p>1 No. of ways 512</p> <p>2 Material 2 mm CRCA plate</p> <p>3.Mounting arrangement Both Free standing type cabinet (and) cabinet with Floor stand kit are acceptable. Should be suitable for mounting on floors, walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply.</p> <p>4.Type of terminal blocks Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². M6 earthing stud shall be provided.</p> <p>5. Protection Class IP-65</p> <p>6. Locking Industrial type locking mechanism with 2 keys, the key should be common for all the Field marshalling units.</p> <p>7. Gland plate 3 mm CRCA plate</p> <p>8. Grounding To be provided.</p> <p>9. Color shade To be decided during detailed engineering & subject to Employer's approval.</p> <p>10. Stand (Wherever Applicable) 75 X 40 mm C channel</p> <p>11. Illumination of panel 1 No. LED light</p> <p>12. Power receptacle 1 No. of 5A socket</p>
09.00.00	LAB INSTRUMENTS-2 NOS.
09.01.01	<p>Lap-top computer</p> <p>LapTop Configuration</p> <p>Intel core i9 or above</p> <p>RAM 16 GB</p> <p>Windows 10 with latest service package micro soft office(Latest Version)</p> <p>HDD 2TB</p> <p>Ports</p> <p>USBPort: 2xUSB2.0,1xUSB3.0</p> <p>Serial port:1 No</p>

	<p>HDMI Port: 1 No</p> <p>LAN RJ45: 1 No</p> <p>Line in, Mic in, Speaker out with Headset</p> <p>Communication:</p> <p>ETHERNET (Integrated 10/100 Ethernet LAN or above)</p> <p>Wi-Fi, Blue tooth</p> <p>WEB Camera above 1 Mega Pixel</p> <p>Battery back up, Up to 10 Hrs</p> <p>2 Years warranty</p> <p>Display: 17 inch HD</p> <p>Latest version DVD writer</p>																												
10.00.00	SMART TRANSMITTERS																												
10.01.01	<p>Common specification for Smart Pressure Transmitter with 2 valve SS Manifold and Smart DP Transmitter with 5 valve SS Manifold</p> <table border="1"> <tr> <td>Type</td> <td>Inductive/Capacitance /Silicon resonance/ Piezo-resistive type only</td> </tr> <tr> <td>Supply Voltage</td> <td>15 to 35 V DC and protected against reverse polarity connection</td> </tr> <tr> <td>Turn Down ratio</td> <td>100: 1</td> </tr> <tr> <td>External Zero and Span Adjustment</td> <td>To be provided. Zero can be fully suppressed or elevated within the Lower & Upper range limits</td> </tr> <tr> <td>Sensor Fill Liquid</td> <td>Silicone Oil</td> </tr> <tr> <td>Accuracy</td> <td>± 0.075 % of span</td> </tr> <tr> <td>DC output signal</td> <td>Two wire 4-20 mA DC Output (Linear or Square root) with Digital HART Communication signal superimposed on it</td> </tr> <tr> <td>Process Connection</td> <td>½ " NPT(M)</td> </tr> <tr> <td>Mounting</td> <td>2 " Pipe Mounting with Bracket to be provided</td> </tr> <tr> <td>Local Indication</td> <td>LCD Display of Process value in % or in Engineering Value configurable thro' HART Communicator</td> </tr> <tr> <td>Manifold</td> <td>SS 316 material; Max. Working Pressure 250 Kg/Cm²; Max. Temp - 540° C</td> </tr> <tr> <td>Stability</td> <td>5 years calibration</td> </tr> <tr> <td>Enclosure</td> <td>IP-67</td> </tr> </table>	Type	Inductive/Capacitance /Silicon resonance/ Piezo-resistive type only	Supply Voltage	15 to 35 V DC and protected against reverse polarity connection	Turn Down ratio	100: 1	External Zero and Span Adjustment	To be provided. Zero can be fully suppressed or elevated within the Lower & Upper range limits	Sensor Fill Liquid	Silicone Oil	Accuracy	± 0.075 % of span	DC output signal	Two wire 4-20 mA DC Output (Linear or Square root) with Digital HART Communication signal superimposed on it	Process Connection	½ " NPT(M)	Mounting	2 " Pipe Mounting with Bracket to be provided	Local Indication	LCD Display of Process value in % or in Engineering Value configurable thro' HART Communicator	Manifold	SS 316 material; Max. Working Pressure 250 Kg/Cm ² ; Max. Temp - 540° C	Stability	5 years calibration	Enclosure	IP-67		
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5.	0 to 10 Kg/Cm ²	140 Kg/Cm ²	15 Nos																										
6.	0 to 6 Kg/Cm ²	140 Kg/Cm ²	8 Nos																										

	7.	0 to 2.5 Kg/Cm2	140 Kg/Cm2	5 Nos
	8.	-1 to +1.5 Kg/Cm2	140 Kg/Cm2	7 Nos
	9.	-760 mmHg to 0	100 Kg/ Cm2	2 Nos
10.01.03	Smart DP Transmitter with 5 valve SS Manifold: TOTAL – 36 Nos			
	Sl.No.	Calibration Range	Static Pressure	Quantity
	1.	0 to 0.25 Kg/Cm ²	140 Kg/Cm2	1 Nos
	2.	0 to 120 mmWCL	140 Kg/Cm2	3 Nos
	3.	0 to 250 mmWCL	140 Kg/Cm2	1 Nos
	4.	0 to 500 mmWCL	140 Kg/Cm2	5 Nos
	5.	0 to 1500 mmWCL	140 Kg/Cm2	5 Nos
	6.	-400 to + 400 mmWCL	140 Kg/Cm2	3 Nos
	7.	-300 to + 300 mmWCL	140 Kg/Cm2	2 Nos
	8.	-2000 to +2000 mmWCL	140 Kg/Cm2	1 Nos
	9.	0 to 0.4 Kg/Cm ²	400 Kg/Cm2	2 Nos
	10.	0 to 25 Kg/Cm ²	400 Kg/Cm2	2 Nos
	11.	0 to 2.5 Kg/Cm ²	400 Kg/Cm2	2 Nos
	12.	0 to 0.63 Kg/Cm ²	400 Kg/Cm2	3 Nos
	13.	-630 to + 630 mmWCL	400 Kg/Cm2	6 Nos
	Other details like Transmitter Tag, Service etc. to be punched on the transmitters will be furnished by TNPGL during detailed engineering.			
11.00.00	HART Communicator for Smart transmitters: 2Set.			
11.01.01	The HART Communicator shall be able to communicate with reputed make Smart Transmitters like Rosemount, Honeywell, ABB, Electronet, Yokakawa etc.			
	PROCESSOR BASED UNIVERSAL HART COMMUNICATOR			
	Processor	32 Bit		
	Memory	1. Program and device descriptions-- 80 MB and above 2. Transmitter Data - 2 KB standard Memory and 2 Nos. of 32 KB removable Non - volatile memory (Data pack)		
	Display	8 -line by 21 character liquid crystal display		
	Key Pad	Membrane keys with tactile feedback 25 large keys including 6 action keys, a complete alphanumeric keypad, 4 software defined function keys, ON/OFF and cursor control keys		
	Power Supply	Disposable/Re-chargeable batteries with Battery Holder		
	Operating Temp. Limits	0 to 50 Deg. C		
	Software	For Upload / Download information from HART devices to Communicator and to Personal Computer		
	Language	English		
	Load Resistor	250 Ohms		
	Hazardous Location Certification	Factory Mutual (FM) - Intrinsic Safety Approval		
	Electromagnetic compatibility	EN 50081-1 :1992 & EN 50082-1:1992		

	Connections	Lead set - Two 4 mm banana plugs; USB port D- sub miniature socket. Memory Module - 26 Pin, 2 row 0.1 Pitch connector																																																
	Accessories	1. Connectors and alligator clips required for communication 2. Carrying case 3. Manual																																																
	Quantity	2 Set.																																																
12.00.00	Micro-processor based Loop Calibrators: 3 sets																																																	
12.01.01	<p>The Micro-processor based Loop Calibrators shall have the following features:</p> <ul style="list-style-type: none"> ➤ Simulation/ measurement of mV & mA ➤ Simulation/ measurement of Resistance ➤ Coarse & fine control ➤ Compact, portable & rugged with carry pouch ➤ Battery operated, low battery indication <table border="1"> <tr> <td>Input (measurement Range)</td> <td>mV – (0.00 to 199.99 mV) mA – (0.00 to 25.00 mA) Resistance – (0.00 to 1999.9 Ohm)</td> </tr> <tr> <td>Output (Simulation Range)</td> <td>mV – (0.00 to 199.99 mV) mA – (0.00 to 25.00 mA) Resistance – (0.00 to 999.9 Ohm)</td> </tr> <tr> <td>Accuracy</td> <td>± 0.1 % FS + 2 Digits</td> </tr> <tr> <td>Resolution</td> <td>0.01 mV / 0.01 mA/ 0.1 Ohm</td> </tr> <tr> <td>Max. loop resistance</td> <td>800 ohm @ 20 mA</td> </tr> <tr> <td>Power Supply</td> <td>Disposable/Re-chargeable batteries with Battery Holder</td> </tr> <tr> <td>Transmitter Power Supply</td> <td>24 V DC to be provided</td> </tr> <tr> <td>Quantity</td> <td>3 Sets.</td> </tr> </table>		Input (measurement Range)	mV – (0.00 to 199.99 mV) mA – (0.00 to 25.00 mA) Resistance – (0.00 to 1999.9 Ohm)	Output (Simulation Range)	mV – (0.00 to 199.99 mV) mA – (0.00 to 25.00 mA) Resistance – (0.00 to 999.9 Ohm)	Accuracy	± 0.1 % FS + 2 Digits	Resolution	0.01 mV / 0.01 mA/ 0.1 Ohm	Max. loop resistance	800 ohm @ 20 mA	Power Supply	Disposable/Re-chargeable batteries with Battery Holder	Transmitter Power Supply	24 V DC to be provided	Quantity	3 Sets.																																
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13.00.00	<p>Current to Pressure (I to P) Converter: 50 Nos.</p> <table border="1"> <tr> <td>1.</td> <td>Input signal</td> <td>4 to 20 mA. D.C</td> </tr> <tr> <td>2.</td> <td>Output air pressure</td> <td>0.2 to 1 kg/sq.cm</td> </tr> <tr> <td>3.</td> <td>Mode of action</td> <td>Direct & Reverse</td> </tr> <tr> <td>4.</td> <td>Maximum air pressure withstanding capacity</td> <td>7 kg/sq.cm</td> </tr> <tr> <td>5.</td> <td>Type of mounting</td> <td>Universal (pipe, panel, wall etc.)</td> </tr> <tr> <td>6.</td> <td>Accuracy</td> <td>< 0.5 %</td> </tr> <tr> <td>7.</td> <td>Sensitivity to supply pressure</td> <td>< 0.1 %</td> </tr> <tr> <td>8.</td> <td>Linearity</td> <td>< 0.5 % of Span</td> </tr> <tr> <td>9.</td> <td>Hysteresis</td> <td>< 0.5 %</td> </tr> <tr> <td>10.</td> <td>Repeatability</td> <td>< 0.5 % of Span</td> </tr> <tr> <td>11.</td> <td>Pneumatic connection</td> <td>6mm or ¼" NPT</td> </tr> <tr> <td>12.</td> <td>Working temperature (Max.)</td> <td>75 Deg. C max.</td> </tr> <tr> <td>13.</td> <td>Zero span adjustment</td> <td>Should be available</td> </tr> <tr> <td>14.</td> <td>Accessories</td> <td>Filter-regulator & Pressure gauges for I/P & O/P</td> </tr> <tr> <td>15.</td> <td>Flow capacity</td> <td>2.5 SCFM</td> </tr> <tr> <td>16.</td> <td>QUANTITY</td> <td>50 Nos</td> </tr> </table>		1.	Input signal	4 to 20 mA. D.C	2.	Output air pressure	0.2 to 1 kg/sq.cm	3.	Mode of action	Direct & Reverse	4.	Maximum air pressure withstanding capacity	7 kg/sq.cm	5.	Type of mounting	Universal (pipe, panel, wall etc.)	6.	Accuracy	< 0.5 %	7.	Sensitivity to supply pressure	< 0.1 %	8.	Linearity	< 0.5 % of Span	9.	Hysteresis	< 0.5 %	10.	Repeatability	< 0.5 % of Span	11.	Pneumatic connection	6mm or ¼" NPT	12.	Working temperature (Max.)	75 Deg. C max.	13.	Zero span adjustment	Should be available	14.	Accessories	Filter-regulator & Pressure gauges for I/P & O/P	15.	Flow capacity	2.5 SCFM	16.	QUANTITY	50 Nos
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14.00.00	Universal (R to I, TC to I, RTD to I) Converter: 10 Nos.	
	This Universal converters are required for Electrical actuator position feedback measurement application	
	1.	Type Single Channel loop powered (24 V DC) HART Compatible
	2.	Input 3 wire potentiometric linear variable resistance (0-400) ohm, RTD(Pt100),Thermocouples.
	3.	Output 4-20 mA
	4.	Span & Zero Adjustment to be provided
	5.	Galvanic isolation to be provided
	6.	Accuracy 0.1% of final value inclusive of linearity & Hysteresis
	7.	Mounting DIN Rail
	8.	QUANTITY 10 Nos
15.00.00	SMART POSITIONER – 60 Nos.	
	SL.NO	DESCRIPTION
	1	SITE CONDITION
		CLIMATIC CONDITION HOT, HUMID,SALTY AND CORROSIVE
	2	GENERAL
		FUNCTION: MA TO PNEUMATIC
		PRINCIPLE: Electronic type
		DEGREE OF PROTECTION IP65 as per IS13947 or better
		HOUSING MATERIAL Metallic, Die Cast Aluminium with Epoxy Paint
		MOUNTING With Control Valves
		STROKERANGE Minimum 5 - 100 mm
		AIR CONSUMPTION <0.01 scfm
		AIR SUPPLY Max 4.0 Kg/cm2 through AFR
		PNEUMATIC CONNECTION 6mm or 1/4" NPT (F)
	3	ELECTRICAL CHARATERISTICS
		PROCESSOR: 16 bit
		HART COMPATIBILITY Yes
		INPUT 4 -20 mA 2 wire + Hart Suitable for isolator MTL 5046 or equivalent
		OUT PUT Pneumatic signal to actuator
		ACTION Direct (field reversible)
		FEEDBACK TYPE Position retransmission Facility
		DISPLAY Graphic
		ELECTRICAL CONNECTION 1/2" NPT (F) + Al plug
		ACCURACY (LINEARITY) +/- 0.5%
		HYSTERESIS < 0.5%
		REPEATABILITY < 0.25%
		DEAD BAND 0.2 - 10% adjustable
		ZERO & SPAN ADJUSTMENT Yes
		TERMINAL BLOCK Shall be suitable for 2.5 sq.mm Conductors. Flying leads are not acceptable.
	4	ACCESSORIES
		MOUNTING Yes, Shall be mounted on Control valve
		NAME PLATE Yes. SS name Plate to be provided
		CABLE GLAND Yes. SS double Compression Gland.
		CATALOGUE/ MANUAL Required for the offered model
		CERTIFICATION Yes. ATEX (cenelec) ; CE Directives,EMC as per EEC & EN

15.01.01

Microprocessor based 32 Channel Chartless Recorder - 10 Nos.

No of Input Channels	30 or more
Digital Indication	All channels at a time in one screen with facility to enlarge display size
Type of Input	Universal (Various T/C, mA Volt, mV, Ohms, 3 wire RTD of PRT-100, Cu-53
Accuracy	Better than 0.5%
Range, Engg Units & scaling	User selectable through software Configuration
Display type	Bargraph, Trend, digital read out High contrast, Active matrix thin film transistor (TFT) color screen display
Alarm Function	6 Nos of relays programmable for any channel with a contact rating of 1 Amp @ 220 V DC
Bezel & Cut- out Size	288 x 288 mm; 281 x 281mm respectively
Configuration	Through touch screen or via soft membrane keys
Recording media	Any removable media or USB or Pen Drive
Sampling rate	0.5 sec or less
Programmable log rate	Group and individual channel log rate – to be varied by software configuration
Power supply	85 to 260 V ac, 50 Hz
Documents	One set of instruction, operation and configuration manual per recorder

- Calendar & real time clock should be available
- Auto and manual mode of data saving
- Panel flush mounting
- Input isolation more than 100 V DC (Channel to channel)
- In built flash memory of 8 Mb or more
- Viewing angle – The display should be clearly visible when viewed at an inclination of 45 deg (Horizontal) and Vertical [30 deg below and 15 deg above]

Provision to download the data to a PC, store and to view them in trend and data format shall be available. All necessary software (original) in CDs to download data from chartless recorder to a data analyzer.

Micro Processor Alarm Annunciator-9Nos.

This Microprocessor based alarm annunciators are required for the local control rooms like BFP/CWPH control rooms

Specification:

Microprocessor based alarm annunciator consisting of Power supply unit, CPU and Hooter with Push Buttons for Accept/ Reset/ Sound Cancel/Test etc.

Power Supply	230 ± 10 V AC single Phase
Input	Potential Free contact (NO or NC – field selectable)
No. of Windows	24 nos. with Bright LEDs
Each Window Size	45 x 45 mm
Window Colour	White – 16 Nos & Red – 8 Nos
Interrogating Voltage	24 V DC sourced by the Annunciator
Hooter	Hooters one for low tone & other for high tone to be supplied
Flasher	To be provided
Quantity	9Nos

Legends for Annunciator windows will be provided by TNPGL during detailed engineering.

16.00.00	HIGH PRESSURE VALVE:	
16.01.01	These valves are required for erection of smart transmitters	
	1/2" Globe valve Class 2500 Grade - XI AlloySteel Valve with Hand Wheel, Socket Weld on ends with IBR Certificate in Form III - C Maximum working temperature -540 Deg C	Qty -500Nos
	1/2" Globe valve Class 2500 Grade - III Carbon Steel with Hand Wheel, Socket Weld on ends with IBR Certificate in Form III - C Maximum working temperature -540 Deg C	Qty -500Nos
17.00.00	Impulse line for transmitter piping works	
17.01.01	The impulse lines are required for erection of Smart transmitters	
	Alloy Steel chrommoly seamless tube confirming to ASME SA213T22 , maximum withstanding pressure 250 Kg/ cm ² in standard length of 4 to 7 mtr., Size OD-17.1 mm, wall thickness 3.2mm with IBR Test Certificate in Form-III E	1500 mtr.
	Carbon Steel seamless tube confirming to ASME SA210 Gr A1 , maximum withstanding pressure 250 Kg/ cm ² in standard length of 4 to 7 mtr., Size OD-17.1 mm, wall thickness 3.2mm with IBR Test Certificate in Form-III E	1500 mtr.
18.00.00	Hydrogen Purity Analyser -2 Set	
18.01.01	The Analyser system shall be microprocessor based, mounted in a separate panel/ cubicle and contain one purity meter each with all accessories. The analyzer shall be suitable for H2 Purity analysis in Large Turbo-Generator.	
	Type of instrument	Sampling type for positive pressure Gas inlet Pr. 0 - 4 Kg/ cm ²
	Application	Monitor H2 Purity in Air and also for CO2 & Air analysis during maintenance cycle.
	Measurement Range	1. 100- 80 % of H2 in air 2. 0- 100% CO2 in air 3. 0-100% H2 in CO2 (Ranges field selectable within limits)
	Power Supply	110/ 230 V AC 50 Hz
	Display	LED Display
	Output	Two 0-1 V DC & Two 4-20 mA DC isolated output signals Linear with gas concentration for concentration & Range ID
	Zero & span adjustment	To be provided
	Calibration	Auto and remote zero calibration facility
	Linearization & Ranging	Automatic
	System Operating temp.	0-50 °C
	Sensor Type	Silicon micro-machined Thermal conductivity sensor with sealed reference cell.
	Sensor Material	SS cell block and nickel filaments, SS piping and end plates
	Materials in contact with sample	Stainless steel
	Tube Connection	1/4" compression Fitting
	Reference Gas	Not required
	Accuracy	± 1 % of F.S. at constant temp.

	Response time	10-90% in 50 Sec or Less																		
	Alarm relays	Two fully programmable alarm relays for gas concentration and one system fault alarm																		
	Communication Port	Full duplex RS-232 serial communication link for range/ alarm setting, diagnostics etc.																		
	Area Classification	FM & CSA Approved for use in hazardous area rated Class I, Div-1, Groups B,C,D																		
	Mounting	19" Rack mount for two Analyser control units																		
	Sampling system	Gas selector panel consisting of Sample/ref flow meters and control valves for metering input of sample/ calibration support gases																		
	Accessories	Separate port for zero & span gases and built in control valves electronically controlled to provide synchronization with Analyser operation																		
	Quantity	2 set																		
	<p>The analyzer shall be</p> <ul style="list-style-type: none"> ➤ intrinsically safe, packed in rugged weather-proof housing ➤ suitable for use in harsh, hazardous outdoor environments ➤ long life temperature controlled solid-state Thermal Conductivity Sensor having excellent zero & span stability over a wide temperature range. ➤ No reference gas is required for operation ➤ Two sets of H2 Purity analyzer shall be supplied. ➤ The analyzer measured H2 purity even though there is no flow through the cell. <p>The make, type and other details shall be subject to TNPGL approval.</p>																			
19.00.00	Stator water Specific Resistance Measuring Device																			
19.01.01	<p>Stator water Specific Resistance Measuring Device – 4 Sets</p> <p>Microprocessor based Field proven with LCD display and with necessary fault diagnostic features shall be provided for monitoring & protection of Turbo-Generator Stator Water Specific Resistance Measurement. The make, model, type and other specification details shall be as decided during detailed engineering stage and shall be subject to TNPGL's approval. The power supply to all the analysers/ monitors shall be supplied by Bidder from UPS system with all necessary switches, fuses, wiring/cabling and other required accessories etc. for distribution to individual requirements.</p>																			
19.01.02	<p><u>Minimum specifications of analysers cell</u></p> <table border="1"> <tr> <td>1</td> <td>Type</td> <td>Flow through insertion (Directly in-line) type conductivity cell with 4 wire Pt-100/ Pt-1000 Temp sensor & 100 mtr sensor cable to connect Analyser with no loss of signal</td> </tr> <tr> <td>2</td> <td>Cell Constant</td> <td>0.001 to 10.0 (freely programmable)</td> </tr> <tr> <td>3</td> <td>Range</td> <td>Conductivity: 0.100µS/cm – 10.00 mS/cm Resistivity: 10.0 KΩcm to 100.0 MΩcm (freely programmable)</td> </tr> <tr> <td>4</td> <td>Accuracy</td> <td><= +/- 1 % of span</td> </tr> <tr> <td>5</td> <td>Response Time (90% of Full Scale)</td> <td><= 1 Sec</td> </tr> <tr> <td>6</td> <td>Temp. Compensation</td> <td>Automatic</td> </tr> </table>		1	Type	Flow through insertion (Directly in-line) type conductivity cell with 4 wire Pt-100/ Pt-1000 Temp sensor & 100 mtr sensor cable to connect Analyser with no loss of signal	2	Cell Constant	0.001 to 10.0 (freely programmable)	3	Range	Conductivity: 0.100µS/cm – 10.00 mS/cm Resistivity: 10.0 KΩcm to 100.0 MΩcm (freely programmable)	4	Accuracy	<= +/- 1 % of span	5	Response Time (90% of Full Scale)	<= 1 Sec	6	Temp. Compensation	Automatic
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4	Accuracy	<= +/- 1 % of span																		
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6	Temp. Compensation	Automatic																		

	7	Output	Fully Isolated 4-20 mA into a max. load of 700 Ω. Shall be rescaled and offset anywhere within the is played range down to a min. of 10% FSD
	8	Relay Output	Two independent potential free contact (5 A @ 250 V AC) for set points 1 & 2 adjustable to any value within any range selectable High/ Low operation. Timers delay operation of set point relays from 0-1 Min in 1 Sec step.
	9	Power Supply	110 / 230 V AC selectable
	10	Quantity	4 Sets
20.00.00	Level Switch for H2/Seal oil system		
20.01.01	Level Switch for H2/Seal oil system – 10 Nos. These Level Switches are required for sensing Oil in Generator casing & Oil tanks in Hydrogen media. The switches shall be suitable for above application. The make, type and other details shall be subject to Employer's approval.		
	1	Type	Intrinsically safe Flame Proof External operated Magnetic float
	2	Process Connection	1" OD pipe with vessel and suitable 2 nos. isolating valves
	3	Process Pr. & Temp.	4 Kg/ Cm2 & 70 °C
	4	Contact	1 NO + 1 NC, 0.25 A @ 240 V DC
	5	Area Classification	For Group IIA / IIB Gases
	6	Quantity	10 nos.
21.00.00	HP/LP Bypass Converter Specification -10 Nos.		
	SL.NO	DESCRIPTION	
	1	Analog I/P	
		Lower limit	Working Range
		0 mA	4 to 20mA
			Upper Limit
			24 mA
		Maximum Impedance : 500 E Resistive	
	2	Digital I/P	
		Logic '0'	Logic '1'
		Lower Limit	Upper Limit
		-0.6 V	+5 V
			Lower Limit
			Upper Limit
			+10 V
			+30 V
		Loading (Max)	-
			Loading (Max) 10 mA
	3	Out Put Specifications	
		PWM Output (st):	Amplitude +/- 11.5 V(Tolerance +/- 5%)
			Frequency 60HZ
			Load Current +/- 90mA
			Tripping Current: +/-160 Ma (+/- 15%)
			PULSE to PULSE Current Monitoring
		Release O/P (Be):	-24 V Common, +24 V Controlled(Tolerance +/-5%)
			Load current 450mA, Trip current: +/- 720mA(+/-5%)
		Relay O/Ps:	1.(1NO +1NC Contacts of 1A Rating) for "Fault" Signal.
			2. (1NO +1NC Contacts of 1A Rating) for "Auto" Signal.

4	LED Indications	
	Fault:-	RED (Bright)
	INPUTS	
	P 24 V DC	GREEN Steady Glow
	N 24V DC	GREEN Steady Glow
	DI Auto	RED(Dim)
	DI Raise	RED(Dim)
	DI Lower	RED(Dim)
	OUTPUTS	
	Raise	YELLOW (Fast blinking)
	Lower	YELLOW (Fast blinking)
	Be	RED Steady Glow
	LCD Display	16 Character, 2 ROW Display
	Programmed Strings	Attributes
	Initialization. Please wait	System Initialization phase
	PS Fault, outputs Blocked	Input supply LOW/internal supply failed
	Sleep Mode,Output Blocked	Sleep Button Accivated
	O/P Over current,Output Blocked	St / Be Output current Trip Activated
	NO I/P Command, Outputs Blocked	Absence of B Close Open, Auto I/PS
	Conflict Command, Outputs Blocked	Both B Close, B open active
	Be Open circuit, Check connection	NO Connection in Be O/P circuit
	Auto Mode, NO Command	I/P Ma::<4,= <12,>20
	Auto Close, Executing	-
	Auto Open, Executing	-
	Manual Close, Executing	-
Manual Open, Executing		

CLAUSE	SECTION -1D INSTRUMENTATION CABLES
01.00.00	GENERAL
01.00.01	<p>The Bidder shall supply cables under this Section – D (01.07.00) for connecting the INPUT/ OUTPUT points to the DCS system.</p> <p>Annealed base copper conductor, PVC insulated, Individual pair, overall screened, overall FRLS PVC sheathed unarmored instrumentation cable.</p> <p>Other cables for Power Supply, communication, LAN & special cables are also under Bidders scope.</p>
01.00.02	<p>The Bidder shall supply, erect, terminate and test all instrumentation cables for control and instrumentation equipment/ devices/system and ensuring completeness of the control system.</p> <p>Bidder shall supply all cable erection and laying hardware like Cable trays supports, flexible conduits, cable glands, lugs, pull boxes etc. on as required basis for all the systems covered under this specification.</p> <p>The cables shall conform to the following Indian/International standards IS: 1554 (Part 1)-Cables, IS: 5831-Insulation sheath, IS: 8130-Copper, IS: 10418-Wooden Drums, IS: 3975- Armoring, IS: 3961- Current rating, IEE 383, IEC 60754-1, SS-4241475, ASTM D 2863, ASTM D 2843.</p>
01.00.03	<p>Any other application where it is felt that any special / communication/ fiber-optic cables are required due to system/ operating condition requirements, are also to be provided by Bidder.</p>
01.00.04	<p>Other type of cables like co-axial / communication/ fiber-optic cables, cables for system bus, cables for connection of peripherals etc. (under Bidder's scope) are also to be furnished by the Bidder.</p>
01.00.05	<p>In addition to above, Bidder shall supply all the cables including co-axial cables for Interconnecting remote server and control system in Bidder's scope.</p>
01.01.00	Instrumentation Cable Specifications.
01.01.01	<p>All the instrumentation cables i.e. twisted and shielded multi pair cables, compensating cables, pre-fabricated cables etc. shall be flame retardant low smoke type (FRLS). The Cable shall be provided in non-returnable drums. The drum length shall be 1000 mtr. (+5%) upto & including 12 pairs /24 core and 500 mtr. (+ 5%) above 12 pairs /24 cores.</p>
01.01.02	<p>Voltage grade of the instrumentation cables shall be 1100 V (peak value).</p> <p>All the cables supplied shall be ISI standard.</p>
01.01.03	<p>All instrumentation cables covered in this specification shall comply with relevant standards.</p>
01.01.04	<p>The conductor shall be of 0.5/1.5/2.5 sq.mm size as detailed in Clause under this section 1.07.00, high conductivity, multi-stranded copper for all types of instrumentation cables, except the thermocouple extension cables which shall be 1.31 mm² solid alloy type.</p>
01.01.05	<p>The insulation of individual conductor shall be extruded PVC. The outer sheath of instrumentation cables shall be extruded and shall be of flame retardant low smoke (FRLS) type. The cable shall be provided with marking including manufacturer's name, insulation material, conductor size, no of pairs, voltage ratings, type of cable, Year of manufacturing etc. Progressive sequential marking of the length of the cable at every one-meter.</p> <p>Markings to read 'FRLS' at every 5 meters shall be provided on tile outer sheath of all instrumentation cables. Pairs of Cables shall be identified by colour coding & colour banding. The colour of outer sheath shall be RED so that cables are easily distinguished from other cables.</p>

CLAUSE	SECTION -1D INSTRUMENTATION CABLES
01.01.06	Fillers in multiple conductor cables shall be flame retardant and moisture resistant. Cable accessories such as harnessing components, markers, bedding, cable jointer, binding tape etc. shall also have flame retardant quality.
01.01.07	All instrumentation cables shall be provided with overall shielding. However, multi pair cables shall be provided with individual pair shielding in addition to overall shielding. Shielding shall be of Aluminium Mylar tap with 100% coverage and with atleast 20% overlapping. The thickness of individual pair shield shall be 28 micron (minimum) and that of overall shield shall be 55 microns (minimum). Separate drain wires for individual pair shield (wherever applicable), as well as overall shield shall be provided. Drain wires shall be of seven (7) strand 20 AWG (0.51 sq.mm) tin coated copper conductor. Maximum lay of individual twisted pair shall be 50 mm. Insulation thickness of individual core shall be 0.40 mm (Tolerance +0.02 mm, - 0.05mm)
01.01.08	The outer sheath of the instrumentation cables shall meet the following minimum requirements: <ul style="list-style-type: none"> (i) An Oxygen index of not less than 29% and a Temperature index of not less than 250 deg.C as per ASTM D-2863. (ii) Maximum acid gas generation by weight as per IEC-754-1 shall not be more than 20%. (iii) Smoke Density Rating shall not be more than 60% during Smoke Density Test as per ASTM D-2843. The results of smoke density test shall be plotted on a curve indicating light absorption vs time as per ASTM D 2843. The average area under the curve (smoke density rating) shall not be more than 60%. (iv) Complete cable assembly shall pass Swedish Chimney test as per SEN-4241475 and flammability test as per IEEE-383.
01.01.09	The thickness of outer sheath shall not be less than 1.8 mm in any case. Allowable tolerance of overall diameter of the cables shall be ± 2 mm max. over the declared value in technical data sheets. The variation in diameter and the ovality at any cross section shall not be more than 0.1 mm. The outer sheath material shall be resistant to fungus, termite and rodent attack.
01.01.10	All instrumentation cables shall be suitable for continuous operation at 70 deg.C. except for high temperature resistant Teflon insulated cables which shall be suitable for continuous operation at 205 deg.C. The cables shall be suitable for laying in wet or dry locations in trays, conduits, ducts, trenches and Underground buried installations.
01.01.11	The thermocouple extension cables shall be of single/multi pair, twisted & shielded, PVC insulated. FRLS PVC sheathed and compatible for the type of thermocouples employed. The material of conductor shall be as per ANSI MC-96.1. The material and requirements of conductor insulation, shielding and outer sheath shall be as per clause nos. 1.01.04 to 1.01.07.
01.01.12	All cables near high temperature zone like burner front devices metal temperature thermo-couples on main steam & turbine casing etc. shall be high temperature cables, which shall be terminated at a junction box in normal temperature zone. Thermocouple extension cables and copper conductor cables for high temperature applications shall be with insulation of individual conductor and outer sheath of extruded FEP (i.e., Teflon). The thickness of insulation shall be 0.5 mm nominal (i.e. 0.4 mm minimum). These cables shall be single/ multipair, twisted & shielded
01.01.13	Identification of the cores & pairs shall be done with suitable colour coding & band

CLAUSE	SECTION -1D INSTRUMENTATION CABLES
	marking as well as by numbering of cores/pairs. The details of colour coding etc. shall be as approved by TNPGL during detailed stage.
01.01.14	The Bidder shall furnish all documentary evidence including cross-sectional drgs. test certificates to substantiate the suitability of cables offered for different applications.
01.01.15	All prefabricated cables shall have 10% spare cores, which will not be connected to pin connectors
01.01.16	<p>UPS CABLES:</p> <p>a) Supply and erection of 3 Core X 120 SQMM Aluminium armoured Power cable for extending 440 Volt from Switch gear room to UPS. 3 Runs of above such cable have to be provided one each for UPS1, UPS2 and By pass supply. The above cable shall have the rating of 1100V grade with standard shaped Aluminium conductors (Multi strand)XLPE insulated as per IS7098,cores colour coded (Red,Yellow&Blue),inner and outer sheath made of FRLS compound as per IS5831,Galvanised steel strip flat armoured as per IS3975,approx overall dia of cable is 35mm.The required length of cable to be 500 meters.</p> <p>b) Supply and erection of Power cables for extending 110V supply for the UPS System. The cable shall be 1100v grade single/multicore stranded electrolytic grade copper conductor, PVC insulated, aluminium wire armoured (for single core) and galvanized steel strip/ wire armoured (for multicore) cables with extruded outer sheath made of specially formulated fire retardant low smoke (FRLS) PVC compound. The cables shall conform to IS: 1554-Pt-I in all other respect.</p> <p>c) For DC system only single core cables shall be used, that is, between battery/battery charger and battery charger/inverter, to eliminate the possibility of positive to negative faults in the cables.</p> <p>d) Power distribution cable for each node, server, work station, LVS etc should be laid within the conduct pipes.</p>
01.01.17	<p>3 Core Teflon Insulated Screened cable</p> <p>Supply and erection of 3 Core Teflon Insulated Non Flammable high temperature screened instrumentation cable shall have the following specification.</p> <ul style="list-style-type: none"> ➤ Material : Silver plated copper ➤ Conductor Size : 1 mm dia (AWG 18/19/20) ➤ Core insulation : PTFE(Teflon) ➤ Insulation Thickness :0.2mm NOM ➤ Core dia :1.5 mm NOM ➤ No.of core :3 ➤ Construction :3 Core twisted shielded overall PTFE jacket. ➤ PTFE jacket thickness:0.3mm NOM ➤ Overall cable dia :4.3mm Max NOM ➤ Working Temp :260 deg C ➤ Packing Length :500 mtrs ➤ Required length :2000 mtrs.
01.02.00	Instrumentation Cable Interconnection and Termination Philosophy
01.02.01	The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group JB's at strategic locations (where large concentration of signals are available, e.g. switchgear) is done and consequently cable with higher number of pairs are extensively used. JB's to be furnished under this specification shall be of 12/24/36 way. The material

CLAUSE	SECTION -1D INSTRUMENTATION CABLES
	dimension and interior/exterior colour of JB's shall be subject to TNPGL approval.
01.03.00	Internal Panels/Cabinets/System Cabinets Wiring
01.03.01	Internal panel/ cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath.
01.03.02	Wiring to door mounted devices shall be done by 19 strand copper wire provided with adequate loop lengths of hinge wire so that multiple door opening shall not cause fatigue breaking of the conductor.
01.03.03	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferrules at both ends in TNPGL approved format. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule. All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.
01.03.04	It will be the responsibility of the bidder to provide all the internal wires on as required basis, and termination and interconnections of the same. The bidder shall do all modifications/ corrections, if required, make the system functional without any additional cost.
01.03.05	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.
01.03.06	All the special tools as may be required for solderless connections shall be provided by Bidder.
01.03.07	Wire sizes to be utilized for internal wiring. (i) Current (4-20 mA), low voltage signals (48V) - 0.5 Sq.mm. (ii) Ammeter/ voltmeter circuit, control switches etc., for electrical system - 1.5 Sq.mm. (iii) Power supply and internal illumination - 2.5 Sq.mm. minimum (shall be as per load requirement)
01.04.00	CABLE INSTALLATION AND ROUTING
01.04.01	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants.
01.04.02	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Fireproof sealing to prevent dust entry and propagation of fire shall be provided for all floor slots used for cable entrance.
01.04.03	All cables shall be identified by tag Nos. provided in TNPGL approved format at both the ends.
01.04.04	Line voltage drop due to high resistance splices, terminal contacts, insulation resistance at terminal block, very long transmission line etc. shall be reduced as far as practicable.
01.04.05	The cables emanating from redundant equipment/devices shall be routed through different routes.
01.05.00	CABLE ACCESSORIES AND FITTINGS
01.05.01	Bidder shall supply and install all cable accessories and fittings like cable glands, grommets, lugs, termination kits etc. on as required basis.
01.05.02	Bidder shall supply two completely new sets of cable termination kits like Crimping tools, Maxi-termi/wire-wrap tools, computer based Ferrule Printing machine, LAN cable continuity tester etc., which are required for maintenance of the system.

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01.06.00	CONDUITS																																																																																								
01.06.01	All rigid conduits, couplings and elbows shall be Hot dipped galvanized rigid mild steel in accordance with 15:9357 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have a continuous zinc coating with an overcoat of transparent enamel lacquer or zinc chromate. Flexible conduit shall be heat resistant lead coated steel, water leak, fire and rust proof. The temperature rating of flexible conduit shall be suitable for actual application.																																																																																								
01.07.00	<p>CABLE QUANTITY: The following quantity of cable shall be supplied for connecting the INPUT/ OUTPUT points to the DCS system.</p> <p>I. Copper cable:</p> <table border="1"> <thead> <tr> <th>Sl.No</th> <th>Cable size</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>I.</td> <td>Multi pair, individual pair & overall shielded, twisted pair instrumentation cable</td> <td>in km</td> </tr> <tr> <td>1</td> <td>12PX0.5 Sqmm</td> <td>2.0</td> </tr> <tr> <td>2</td> <td>24PX0.5 Sqmm</td> <td>1.0</td> </tr> <tr> <td>3</td> <td>1PX1.5 Sqmm</td> <td>4.0</td> </tr> <tr> <td>4</td> <td>2PX1.5 Sqmm</td> <td>30.0</td> </tr> <tr> <td>5</td> <td>4PX1.5 Sqmm</td> <td>20.0</td> </tr> <tr> <td>6</td> <td>8PX1.5 Sqmm</td> <td>27.0</td> </tr> <tr> <td>7</td> <td>12PX1.5 Sqmm</td> <td>33.0</td> </tr> <tr> <td>8</td> <td>16PX1.5 Sqmm</td> <td>15.0</td> </tr> <tr> <td>9</td> <td>2PX2.5 Sqmm</td> <td>21.0</td> </tr> <tr> <td>10</td> <td>4PX2.5 Sqmm</td> <td>16.0</td> </tr> <tr> <td>11</td> <td>8PX2.5 Sqmm</td> <td>12.0</td> </tr> <tr> <td>12</td> <td>12PX2.5 Sqmm</td> <td>1.0</td> </tr> <tr> <td>13</td> <td>16PX2.5 Sqmm</td> <td>0.5</td> </tr> <tr> <td>14</td> <td>3CX2.5 Sqmm</td> <td>7.0</td> </tr> <tr> <td>15</td> <td>2PX1.5 Twisted Tripple Shielded suitable for flame scanner</td> <td>2.0</td> </tr> <tr> <td>16</td> <td>4CX4 Sqmm</td> <td>1.0</td> </tr> <tr> <td>17</td> <td>3CX1mm dia. Teflon Insulated Screened cable</td> <td>2.0</td> </tr> <tr> <td>18</td> <td>Redundant Power supply cable for DCS, server, Network, EWS,OWS panels etc. (3C X 2.5 Sq.mm copper Armoured)</td> <td>3.0</td> </tr> </tbody> </table> <p>II. T/C Compensating cable:</p> <table border="1"> <thead> <tr> <th>Sl.No</th> <th>Cable size</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>A.</td> <td>Single pair shielded & twisted heat resistant Teflon insulation & outer sheath T/C extension cable ANSI Type KX 1.31 mm² solid Alloy conductor</td> <td>2.0 KM</td> </tr> <tr> <td>B</td> <td>Multi pair shielded & twisted T/C extension cable ANSI Type KX 1.31 mm² solid Alloy conductor</td> <td></td> </tr> <tr> <td>1.</td> <td>Two Pair (Teflon insulated)</td> <td>2.0 KM</td> </tr> <tr> <td>2.</td> <td>Four Pair</td> <td>1.0KM</td> </tr> <tr> <td>3.</td> <td>Eight Pair</td> <td>3.0 KM</td> </tr> <tr> <td>4.</td> <td>Twelve Pair</td> <td>1.0 KM</td> </tr> </tbody> </table> <p>III. Earthing Cable:</p> <table border="1"> <thead> <tr> <th>Sl.No</th> <th>Cable size</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>I.</td> <td>Single core multi-stranded copper cable with FRLS PVC insulation without shield and outer sheath</td> <td></td> </tr> </tbody> </table>		Sl.No	Cable size	Qty	I.	Multi pair, individual pair & overall shielded, twisted pair instrumentation cable	in km	1	12PX0.5 Sqmm	2.0	2	24PX0.5 Sqmm	1.0	3	1PX1.5 Sqmm	4.0	4	2PX1.5 Sqmm	30.0	5	4PX1.5 Sqmm	20.0	6	8PX1.5 Sqmm	27.0	7	12PX1.5 Sqmm	33.0	8	16PX1.5 Sqmm	15.0	9	2PX2.5 Sqmm	21.0	10	4PX2.5 Sqmm	16.0	11	8PX2.5 Sqmm	12.0	12	12PX2.5 Sqmm	1.0	13	16PX2.5 Sqmm	0.5	14	3CX2.5 Sqmm	7.0	15	2PX1.5 Twisted Tripple Shielded suitable for flame scanner	2.0	16	4CX4 Sqmm	1.0	17	3CX1mm dia. Teflon Insulated Screened cable	2.0	18	Redundant Power supply cable for DCS, server, Network, EWS,OWS panels etc. (3C X 2.5 Sq.mm copper Armoured)	3.0	Sl.No	Cable size	Qty	A.	Single pair shielded & twisted heat resistant Teflon insulation & outer sheath T/C extension cable ANSI Type KX 1.31 mm ² solid Alloy conductor	2.0 KM	B	Multi pair shielded & twisted T/C extension cable ANSI Type KX 1.31 mm ² solid Alloy conductor		1.	Two Pair (Teflon insulated)	2.0 KM	2.	Four Pair	1.0KM	3.	Eight Pair	3.0 KM	4.	Twelve Pair	1.0 KM	Sl.No	Cable size	Qty	I.	Single core multi-stranded copper cable with FRLS PVC insulation without shield and outer sheath	
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	IV UPS POWER CABLE																				
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	1.	3C X 120 sqmm Aluminium armoured cable for 440V incoming supply.	0.5 KM																		
	Vendor has to quote unit rates for these signals/ control cables. If required depending upon TTPS requirement vendor has to supply cables to meet the functional requirement.																				
01.08.00	<p>Cable tray Cable tray of ladder/punch type should be fabricated from 12 gauge (2.5mm thick) mild Steel Sheets and galvanized. The cable tray should be free from sharp edges and corners, burrs and unevenness. The length of cable tray should be 2500mm length. The both side of cable tray height should be 100mm. The tray shall be hot dip galvanizing as per IS2629 –1985. Suitable coupling plates (Two Nos. / tray) shall be supplied.</p> <p>The cable trays and the supporting system, to be generally used between Local/Group JB's and the main cable trays and the same shall be furnished and installed by the Vendor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure up to the main cable trays (trunk route).</p> <p>The covers on the cable trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded. Minimum 50% of the cable trays shall be covered. The cable trays shall not have sharp edges, burrs or projections injurious to the insulation or outer sheath of the cables. The supporting arrangement of cable tray system shall be able to withstand the weight of the cable and cable tray system. The supporting interval shall not be more than the recommended span for the above loading for the type of cable tray selected. The tray shall not overhang by more than one meter from the support at the dead end. As far as practicable the cable sub-tray system shall be supported from one side only, in order to facilitate installation and maintenance of cables. The Bidder shall furnish and install the estimated quantities and sizes of sub trays/troughs including all required fittings and adaptors on as required basis.</p> <p>The necessary Iron and Steel for erecting cable trays and GI sheets for covering cable trays are bidder scope. The following quantity of cable tray shall be supplied for laying Instrumentation cables.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sl.No</th> <th style="text-align: center;">Cable tray size</th> <th style="text-align: center;">Qty</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>600mm ladder type</td> <td style="text-align: center;">250 Nos.</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>600mm punch type</td> <td style="text-align: center;">350 Nos.</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>300mm ladder type</td> <td style="text-align: center;">250 Nos.</td> </tr> <tr> <td style="text-align: center;">4.</td> <td>300mm punch type</td> <td style="text-align: center;">300 Nos.</td> </tr> <tr> <td style="text-align: center;">5.</td> <td>150mm punch type</td> <td style="text-align: center;">700 Nos.</td> </tr> </tbody> </table> <p>Note: At the time of execution, if the quantity required is more than the above specified, the extra quantity shall be supplied and erected without any additional cost.</p>			Sl.No	Cable tray size	Qty	1.	600mm ladder type	250 Nos.	2.	600mm punch type	350 Nos.	3.	300mm ladder type	250 Nos.	4.	300mm punch type	300 Nos.	5.	150mm punch type	700 Nos.
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01.01.01	<p>DCS system with following I/O counts:</p> <p>A. For Closed loop system :</p> <p>Standard DCS system (Dual redundant processor, with redundant communication and power supplies arrangement, Integrated SER & Original licensed Software) with following I/O Counts.</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.a</td> <td>Thermo-couple type Analog Inputs</td> <td>328 Nos</td> </tr> <tr> <td>1.b</td> <td>RTD type Analog Inputs (Pt-100, Pt-1000,Cu53)</td> <td>417 Nos</td> </tr> <tr> <td>1.c</td> <td>4-20/0-20 mA & Voltage Inputs</td> <td>551 Nos</td> </tr> <tr> <td>2.a</td> <td>Digital Inputs</td> <td>331 Nos</td> </tr> <tr> <td>2.b</td> <td>SER type 1 mSec Resolution DI</td> <td>207 Nos</td> </tr> <tr> <td>3.</td> <td>Analog Output 4-20 mA</td> <td>219 Nos</td> </tr> <tr> <td>4.</td> <td>Digital Output with IPR Relay</td> <td>202 Nos</td> </tr> <tr> <td>5.</td> <td>Pulse Input</td> <td>12 Nos</td> </tr> </tbody> </table> <p>Note: If the system is unable to accept any of the above type, necessary current convertors shall also be supplied and installed in the Marshalling cabinet.</p> <p>B. For Turbine Protection System:</p> <p>A dedicated 2 out of 3 Controller for performing Open loop control and sequential operation of Turbine Protection system for LMW Turbine.</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>SER type 1 mSec Resolution DI</td> <td>70 Nos</td> </tr> <tr> <td>2.</td> <td>Digital Output with IPR Relay</td> <td>70 Nos</td> </tr> </tbody> </table> <p>C. For Open Loop System:</p> <p>Dedicated Controllers as per Drg No:3 for Open loop control and sequential operation of main equipments like ID/FD/PA fans, Mill, Air Pre Heater, Boiler feed pumps, condensate pumps, Cooling water pumps, Heaters, Generator Electrical Section etc.</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>4-20/0-20 mA & Voltage Inputs</td> <td>200 Nos</td> </tr> <tr> <td>2.</td> <td>Digital Inputs</td> <td>2300 Nos</td> </tr> <tr> <td>3.</td> <td>SER type 1 mSec Resolution DI</td> <td>400 Nos</td> </tr> <tr> <td>4.</td> <td>Analog Output 4-20 mA</td> <td>50 Nos</td> </tr> <tr> <td>5.</td> <td>Digital Output with IPR Relay</td> <td>1100 Nos</td> </tr> </tbody> </table> <p>D. For Burner Management System:</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Digital Inputs</td> <td>975 Nos</td> </tr> <tr> <td>2.</td> <td>SER type 1 mSec Resolution DI</td> <td>100 Nos</td> </tr> <tr> <td>3.</td> <td>4-20 mA/Voltage Input</td> <td>60 Nos</td> </tr> <tr> <td>4.</td> <td>4-20 mA Analog Output</td> <td>50 Nos</td> </tr> <tr> <td>5.</td> <td>Digital Outputs with IPR Relay</td> <td>700 Nos</td> </tr> </tbody> </table> <p>E. For Soot Blower System:</p> <p>A dedicated controller for performing Open loop control and sequential operation of Soot Blower System</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>4-20 mA/Voltage Input</td> <td>10 Nos</td> </tr> <tr> <td>2.</td> <td>Digital Inputs</td> <td>800 Nos</td> </tr> <tr> <td>3.</td> <td>Digital Outputs with IPR Relay</td> <td>250 Nos</td> </tr> </tbody> </table>	Sl. No	Description	Qty	1.a	Thermo-couple type Analog Inputs	328 Nos	1.b	RTD type Analog Inputs (Pt-100, Pt-1000,Cu53)	417 Nos	1.c	4-20/0-20 mA & Voltage Inputs	551 Nos	2.a	Digital Inputs	331 Nos	2.b	SER type 1 mSec Resolution DI	207 Nos	3.	Analog Output 4-20 mA	219 Nos	4.	Digital Output with IPR Relay	202 Nos	5.	Pulse Input	12 Nos	Sl. No	Description	Qty	1.	SER type 1 mSec Resolution DI	70 Nos	2.	Digital Output with IPR Relay	70 Nos	Sl. No	Description	Qty	1.	4-20/0-20 mA & Voltage Inputs	200 Nos	2.	Digital Inputs	2300 Nos	3.	SER type 1 mSec Resolution DI	400 Nos	4.	Analog Output 4-20 mA	50 Nos	5.	Digital Output with IPR Relay	1100 Nos	Sl. No	Description	Qty	1.	Digital Inputs	975 Nos	2.	SER type 1 mSec Resolution DI	100 Nos	3.	4-20 mA/Voltage Input	60 Nos	4.	4-20 mA Analog Output	50 Nos	5.	Digital Outputs with IPR Relay	700 Nos	Sl. No	Description	Qty	1.	4-20 mA/Voltage Input	10 Nos	2.	Digital Inputs	800 Nos	3.	Digital Outputs with IPR Relay	250 Nos
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CLAUSE	SECTION – IE SCOPE OF SUPPLY		
01.01.02	DCS Hardware:		
	Sl. No	Description	Qty
	1.	Server (if client server based architecture)	3 Nos
	2.	Windows –10 or latest version based Operator Station or Latest, MS Office with High resolution 24" Dual LED Monitor, Windows Key board, Optical Mouse & Console	7 Nos
	3.	Windows –10 or latest version based Engg. Station with MS Office High resolution 24" LED Monitor, Windows Key board, Optical Mouse & Console	5 Nos
	4.	Historian Node: Windows –10 or latest version with MS Office High resolution 24" LED Monitor, Windows Key board, Optical Mouse & Console	2 Nos
	5	MIS Web Server	1 No.
	6.	Remote service PC	1 No
	7.	SER PC connected to Main Data Bus	1 No.
	8.	Large Video Screen Display with controller for Operator Station	6 Nos.
	9.	MIS PC (2 Nos.) with networking hardware	2 complete set
	10.	High quality A4 size colour Ink Tank printers with scanner.	6 Nos.
	11.	High speed Line printer for OS, ES & Alarm Annunciation	2 Nos
	12.	Dot matrix Printer	3 Nos.
	13.	Furniture for DCS, Computers, printers etc	One lot (Chair-17 Nos Furniture-13 set)
	14.	Spare External hard disk drive capacity 2 TB	2 Nos.
01.01.03	DCS Software:		
	Sl. No	Description	Qty
	1.	Complete original licensed system and application software (In addition to the DCS system Software, Windows 10 or latest, MS OFFICE, ANTIVIRUS package for Server & Network PCs and any other package to meet the functional requirement)	One lot (19 Nos.)
	2.	Licensed Online performance calculation software	One lot (7 Nos.)
	3.	Complete original licensed image software for easy reinstallation purpose.	One lot (3 Nos.)
01.01.04	NON- DCS Hardware:		
	Sl. No	Description	Qty
	1	Field mountable Local Junction Boxes	12 way-200 Nos 24 way-280 Nos 36 way-36 Nos
	2	Push Button station	251 Nos.
	3	Smart Transmitters with Manifold valves a. Pressure Transmitter b. DP Transmitter c. HART Communicator	90 Nos 36 Nos 2 sets

CLAUSE	SECTION – IE SCOPE OF SUPPLY		
	d. Loop calibrator		3 sets
4	High Pressure Valve a. Carbon Steel b. Alloy Steel		500 Nos 500 Nos
5	Impulse line for transmitter piping works a. Carbon Steel b. Alloy Steel		1500 mtr 1500 mtr
6	Universal Convertors for Position Feed Back		10 Nos.
7	Smart Positioner for position feedback for pneumatic actuator		60 Nos
8	I to P Convertor		50 Nos
9	Redundant GPS Satellite Radio clock system		2 complete set. (including redundant)
10	32 Channel Chartless recorder		10 Nos
11	Transducers and meters a. Programmable Transducers for electrical parameters (Voltage/ Current/ Power) mounted in separate Transducer panel b. Panel Mounted Indicators for Electrical Parameters		One lot One lot
12	Latest state of the art Numerical based Turbo-Generator Auto Synchronizer		1 No.
13	Numerical Based Trip circuit supervision relay		1 Lot
14	Local panels		10 Nos
15	Micro processor based 24 windows alarm annunciator		9Nos.
16	HP/LP Bypass converter		10 Nos
17	Hydrogen Purity Analyser system		2set
18	Stator water Specific Resistance Measuring Device		4 Sets
19	Level Switch for H2/Seal oil system		10 Nos
20	Annunciation Facia 24 windows(back panel)		2 Nos
21	Pressure switches, Temperature switches, Local maintenance switches with mounting box for BMS.		One lot
22	Cable termination kit		2 Sets
23	Panel/Transmitter erection hardware (SS tube, adopter with ferrule fitting etc.)		As required
24	DCS system Earthing material		As required
25	UCD push buttons & Indications		One lot
26	Loosed terminal blocks		One lot
27	70 KVA – 110 Volt Parallel redundant UPS system (with Input Isolation Transformers & Two Battery Banks) SCVS and AC Distribution Panel.		1 set
28	Emergency Back Panel		2 Nos
29	Electrical system panel		1No

CLAUSE	SECTION – IE SCOPE OF SUPPLY																																						
	30	Scanner panel	1No																																				
	31	Turbine System panel	2Nos.																																				
	32	Ferrule Printing machine	2 Set.																																				
	33	Ferrule of different size for supplied control cable.	1 Lot.																																				
	34	Flame scanner system	1 Set.																																				
	35	Earth bit complete set	3 set.																																				
	36	Canopy for junction boxes	1 Lot																																				
01.01.05	<p>Lab Instruments:</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td> Lap-top computer LapTop Configuration ✓ Intel core i9 or above ✓ RAM 8GB ✓ Windows 10 (or) latest with latest service package ✓ HDD 2TB with latest MS Office ✓ Ports USBPort: 2xUSB2.0,1xUSB3.0 Serial port:1 No HDMI Port:1 No LAN RJ45 :1 No Line in, Mic in, Speaker out with Headset ✓ Communication: ETHERNET(Integrated 10/100 Ethernet LAN or above) Wi-Fi Blue tooth ✓ WEB Camera above 1Mega Pixel ✓ Battery back up-Up to 10 Hrs ✓ 2 Years warrenty ✓ Display:17 inch HD ✓ Latest version DVD writer </td> <td>2 Nos.</td> </tr> </tbody> </table>			Sl. No	Description	Qty	1.	Lap-top computer LapTop Configuration ✓ Intel core i9 or above ✓ RAM 8GB ✓ Windows 10 (or) latest with latest service package ✓ HDD 2TB with latest MS Office ✓ Ports USBPort: 2xUSB2.0,1xUSB3.0 Serial port:1 No HDMI Port:1 No LAN RJ45 :1 No Line in, Mic in, Speaker out with Headset ✓ Communication: ETHERNET(Integrated 10/100 Ethernet LAN or above) Wi-Fi Blue tooth ✓ WEB Camera above 1Mega Pixel ✓ Battery back up-Up to 10 Hrs ✓ 2 Years warrenty ✓ Display:17 inch HD ✓ Latest version DVD writer	2 Nos.																														
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01.02.01	<p>Cables:</p> <table border="1"> <thead> <tr> <th>Sl.No</th> <th>Cable size</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>I.</td> <td>Multi pair, individual pair & overall shielded, twisted pair instrumentation cable</td> <td>in km</td> </tr> <tr> <td>1</td> <td>12PX0.5 Sqmm</td> <td>2.0</td> </tr> <tr> <td>2</td> <td>24PX0.5 Sqmm</td> <td>1.0</td> </tr> <tr> <td>3</td> <td>1PX1.5 Sqmm</td> <td>4.0</td> </tr> <tr> <td>4</td> <td>2PX1.5 Sqmm</td> <td>30.0</td> </tr> <tr> <td>5</td> <td>4PX1.5 Sqmm</td> <td>20.0</td> </tr> <tr> <td>6</td> <td>8PX1.5 Sqmm</td> <td>27.0</td> </tr> <tr> <td>7</td> <td>12PX1.5 Sqmm</td> <td>35.0</td> </tr> <tr> <td>8</td> <td>16PX1.5 Sqmm</td> <td>15.0</td> </tr> <tr> <td>9</td> <td>2PX2.5 Sqmm</td> <td>21.0</td> </tr> <tr> <td>10</td> <td>4PX2.5 Sqmm</td> <td>16.0</td> </tr> </tbody> </table>			Sl.No	Cable size	Qty	I.	Multi pair, individual pair & overall shielded, twisted pair instrumentation cable	in km	1	12PX0.5 Sqmm	2.0	2	24PX0.5 Sqmm	1.0	3	1PX1.5 Sqmm	4.0	4	2PX1.5 Sqmm	30.0	5	4PX1.5 Sqmm	20.0	6	8PX1.5 Sqmm	27.0	7	12PX1.5 Sqmm	35.0	8	16PX1.5 Sqmm	15.0	9	2PX2.5 Sqmm	21.0	10	4PX2.5 Sqmm	16.0
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9	2PX2.5 Sqmm	21.0																																					
10	4PX2.5 Sqmm	16.0																																					

CLAUSE	SECTION – IE SCOPE OF SUPPLY		
	11	8PX2.5 Sqmm	12.0
	12	12PX2.5 Sqmm	1.0
	13	16PX2.5 Sqmm	0.5
	14	3CX2.5 Sqmm	7.0
	15	2PX1.5 Twisted Tripple Shielded suitable for flame scanner	2.0
	16	2PX4 Sqmm	1.0
	17	3CX1mm dia Tefflon Insulated Screened cable	2.0
	18	Redundant Power supply cable for DCS,server,Network, EWS,OWS panels etc. (3C X 2.5 Sq.mm copper Armoured)	3.0
	II. T/C Compensating cable:		
	Sl.No	Cable size	Qty
	A.	Single pair shielded & twisted heat resistant Teflon insulation & outer sheath T/C extension cable ANSI Type KX 1.31 sq.mm solid Alloy conductor	2.0 KM
	B	Multi pair shielded & twisted T/C extension cable ANSI Type KX 1.31 sq.mm solid Alloy conductor	
	1.	Two Pair (Teflon insulated)	2.0 KM
	2.	Four Pair	1.0 KM
	3.	Eight Pair	3.0 KM
	4	Twelve pair	1.0 KM
	III. Earthing Cable:		
	Sl.No	Cable size	Qty
	I.	Single core multi-stranded copper cable with FRLS PVC insulation without shield and outer sheath	
	1.	1C X 16 sq.mm	1 KM
	2.	1C X 70 sq.mm	1 KM
	IV UPS POWER CABLE		
	Sl.No	Cable size	Qty
	1.	3C X 120 sqmm Aluminium armoured cable for 440V incoming supply.	0.5 KM
	V Cable Trays & Iron and Steel		
	Sl.No	Description	Qty
	1.	Cable trays 600mm ladder type 600mm punch type 300mm ladder type 300mm punch type 150mm punch type	250 Nos. 350 Nos. 250 Nos. 300 Nos. 700 Nos.
	2.	Iron and Steel	One lot (As required for cable tray support, panel erection support etc.)
01.02.02	CONTROL DESKS AND PANELS		
	1. Arc shaped Control Desks & other furniture shall be provided as mentioned below.		
	Sl. No	Area	Item description for Qty
	1.	UNIT Control	a. Arc shaped Control Desks with chair for 5 Nos.OWS. 5 Nos.

CLAUSE	SECTION – IE SCOPE OF SUPPLY			
		Room	b. Unit In charge Desk Arc shaped Control Desks with chair for 1No. OWS.	1 No.
	2.	Historian PC Room	a. Chair b. Work station furniture	2 Nos. 1 Set (2 Nos.)
	3.	Engineering Station Room	a. Chair b. Workstation furniture	5 Nos. 1Set (5 Nos.)
	4	MIS PC	a. Chair b. Workstation furniture	2 Nos 1 Set. (2 nos.)
	5	MIS Web Server	a. Chair b. Workstation furniture	1 No 1 No.
	6	Remote PC	a. Chair b. Workstation furniture	1 No 1 No.
2.00.00	START UP & ESSENTIAL SPARES DCS SPARE			
02.01.01	S.No	Description	Qty	
	1	Server (complete set)(if client server architecture)	1 No.	
	2.	Controller rack with installed Redundant Processor/ Power supply/ Communication modules, sockets, communication cables, cooling fan etc complete.	Each type one set or if system is one type then 25% of whole set.	
	3.	Redundant I/O Communication Module	Each type 3 Sets	
	4.	I/O Cards	Each type Ten nos	
	5.	Power supply unit/modules for DCS Controller, I/O system etc	Each type 3 Sets	
	6.	Communication Cables with Connectors, socket etc	Each type 4 Sets	
	7.	Panel Cooling Fan	25% of total quantity.	
	8.	Complete spare Operator Station	1 set	
	9.	Redundant Communication Interface module for Operator Station	Each type 3 sets	
	10.	Complete spare Engg. Station	1 Set	
	11.	Redundant Communication Interface module for Engg. Station	Each type 3 sets	
	12.	Network Switch	3 Nos	
	13.	Transceiver for nodes	Each type 4 Sets	
	14.	Recommended spares for Large Video Screen	1 Lot	
	15.	LVS complete set including projectors, LEDs, accessories etc.	1 set.	
	16	LVS projectors LED Lamp	12 Nos	
	17.	UCD mounted devices	1 Set comprising 10% of each type subject to max. 5 nos. in each.	
	18.	LED lamp in each type.	100%	
	19.	MCBs	10% of each type and rating.	
	20.	Fuses	100% of each type and rating.	
	21.	Relays of all types including overload relays	10% in each type	

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	22.	DCS panels spare hinges and locks	50% in each type																																	
	23.	Flame scanner system	25% of each component.																																	
		Note: After successful completion of FAT the part number, quantity of the spare will be finalized as per the above requirement.																																		
02.01.02	<p>NON- DCS Spares:</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Smart Transmitters with Manifold valves a. DP Transmitter b. Pressure Transmitter</td> <td>10 Nos 5 Nos</td> </tr> <tr> <td>2.</td> <td>High Pressure Valves</td> <td>10 Nos</td> </tr> <tr> <td>3.</td> <td>Universal Convertors for Position Feed Back</td> <td>3 Nos.</td> </tr> <tr> <td>4.</td> <td>Smart Positioner for position feedback for pneumatic actuator</td> <td>10 Nos</td> </tr> <tr> <td>5.</td> <td>I to P Convertor</td> <td>10 Nos</td> </tr> <tr> <td>6.</td> <td>Transducer for electrical parameters (Voltage/Current/ Power)</td> <td>120 Nos</td> </tr> <tr> <td>7.</td> <td>Annunciation Facia window Lamp set</td> <td>10 Nos</td> </tr> <tr> <td>8.</td> <td>UPS System Spare a. IGBT b. Capacitor Bank c. Spare Cards d. Cooling Fan</td> <td>1 Set 1 Set each 1 no each 6 nos each</td> </tr> <tr> <td>9.</td> <td>Recommended spares for GPS Satellite Radio clock system.</td> <td>1 Set</td> </tr> <tr> <td>10</td> <td>Control panel door hinges and lockes</td> <td>50% each</td> </tr> </tbody> </table> <p>Note : Items, which are not noted in this list but covered elsewhere in this specification and items necessary for successful commissioning of this project shall also be quoted.</p> <p>Whenever the quantity is given in percentage only, the spare quantity shall be distributed, into various Ranges / Size / Rating / Type (As the case may be) in the same proportion of the main population. For the quantities coming less than 1 (One), shall be treated as 1 (One) only.</p>			Sl. No	Description	Qty	1.	Smart Transmitters with Manifold valves a. DP Transmitter b. Pressure Transmitter	10 Nos 5 Nos	2.	High Pressure Valves	10 Nos	3.	Universal Convertors for Position Feed Back	3 Nos.	4.	Smart Positioner for position feedback for pneumatic actuator	10 Nos	5.	I to P Convertor	10 Nos	6.	Transducer for electrical parameters (Voltage/Current/ Power)	120 Nos	7.	Annunciation Facia window Lamp set	10 Nos	8.	UPS System Spare a. IGBT b. Capacitor Bank c. Spare Cards d. Cooling Fan	1 Set 1 Set each 1 no each 6 nos each	9.	Recommended spares for GPS Satellite Radio clock system.	1 Set	10	Control panel door hinges and lockes	50% each
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03.00.00	<p>Delivery Schedule Tentative schedule for execution of major work suggested by TNPGL to the Bidder, after getting the TNPGL Order is given below.</p>		
Sl. No	Name of the Work	Clause	Period
1	DCS System	Sec 1E-01.01.01	100 th Day from the date of P.O
2	DCS Hardware	Sec 1E-01.01.02	110 th Day from the date of P.O
3	DCS Software	Sec 1E-01.01.03	150 th Day from the date of P.O
4	NON- DCS Hardware:		
		Sec 1E-01.01.04 Sl.No 1,2	75 th Day from the date of P.O
		Sec 1E-01.01.04 Sl.No 3,4,5	100 th Day from the date of P.O
		Sec 1E-01.01.04 Sl.No 6 to 26	120 th Day from the date of P.O

CLAUSE		SECTION – IE SCOPE OF SUPPLY	
		and 28 to 33,	
		Sec 1E-01.01.04 Sl.No 27	150 th Day from the date of P.O
5	Lab Instruments	Sec 1E-01.01.05	120 th Day from the date of P.O
6	Cables	Sec 1E-01.02.01 Sl.No I to IV	110 th Day from the date of P.O
7	Cable Trays , Iron & Steel	Sec 1E-01.02.01 Sl.No V	60 th Day from the date of P.O
8	Control Desk and Panel	Sec 1E-01.02.02	150 th Day from the date of P.O
9	Start Up and Essential Spare		
i)	DCS spare	Sec 1E-02.01.01	150 th Day from the date of FAT
ii)	Non DCS spare	Sec 1E-02.01.02	150 th Day from the date of FAT

Note: The materials which are not covered in the above schedule shall be supplied within the 150 days from the date of P.O.

CLAUSE	SECTION – IF SCOPE OF WORK															
01.00.00	GENERAL															
01.01.01	This work is intended to cover Dismantling, Erection, Testing and commissioning, Installation supervision, testing at Site including Site Acceptance Test (SAT) of the Distributed Control System (DCS), other field Instruments etc., with all spares, accessories, auxiliaries, interfaces and documentation, training, warranty, etc. and the whole system should be handed over in a fully operational condition acceptable to the TNPGL Engineers.															
01.01.02	<p>Erection, Calibration, testing & commissioning of the total system covering OLCS, BMS, BOP, CLCS System, UPS, etc.,</p> <p>The existing back panels at UCB shall be dismantled. However, for operation for vital equipments mentioned in the annexure (2), two system back panels, and one no electrical system panel, one no turbine system panel shall be provided beneath LVS/adjacent to the operator desk as indicated in the DRA.NO:05.</p> <p>The electrical system panel shall be designed and built for continuous operation with adequate size to perform the following functions described below.</p> <ol style="list-style-type: none"> 1. Generator synchronization. 2. 6.6 KV HT system synchronization. 3. 415 V LT system synchronization. 4. Generator Excitation control system, <p style="padding-left: 40px;">Above panel shall constitute Auto and Manual mode operation, All the equipments such as Synchroscope, Synchronizing relays, transducers, indicating meters, Switches, Indication lamps, interposing PTs and accessories etc., shall be provided in panel itself. This panel shall be designed as standalone mode for manual synchronization without waiting inputs from DCS. Information from this panel shall be interfaced with DCS for generating SOE, events and auto synchronizing.</p> <p>Monitoring & controlling of the unit shall be envisaged through LVS besides OWS. Also all the annunciation shall be incorporated in the LVS. Further important Annunciation (48 Nos.) shall be incorporated separately through Annunciation facia windows and the same will be finalized during detailed engineering.</p>															
01.01.03	All tools & tackles, special testing equipments and consumables required for erection & commissioning activities shall be arranged by the Bidder. The Bidder shall provide any other special instruments (eg. Portable hand held unit/ programmable unit) required for commissioning of DDCMIS. The bidder shall leave these special instruments in the plant after commissioning for the TNPGL use.															
01.01.04	Installation, testing and commissioning includes erection of all transmitters, indicators & recorders in UCD, Junction Boxes, transducers, Push button stations, laying & termination of cables with suitable ferrules, cable schedule preparation and other related works, if need be.															
01.01.05	<p>The Vendor shall furnish detailed erection schedule which shall be finalised with the TNPGL keeping in view of the overhaul schedule. The Vendor shall strictly adhere to the erection schedule as agreed with the TNPGL.</p> <p>ERECTION SCHEDULE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Sl.No</th> <th style="width: 60%;">Description</th> <th style="width: 30%;">Completion Period</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Open site office, appoint site in charge</td> <td>30 Days from the date of P.O</td> </tr> <tr> <td>02</td> <td>Erection of Cable trays, JBs & Push buttons.</td> <td>120 Days from the date of P.O</td> </tr> <tr> <td>03</td> <td>Successful erection of all DCS panel</td> <td>120 Days from the date of P.O</td> </tr> <tr> <td>04</td> <td>Laying of all cables</td> <td>170 Days from the date of P.O</td> </tr> </tbody> </table>	Sl.No	Description	Completion Period	01	Open site office, appoint site in charge	30 Days from the date of P.O	02	Erection of Cable trays, JBs & Push buttons.	120 Days from the date of P.O	03	Successful erection of all DCS panel	120 Days from the date of P.O	04	Laying of all cables	170 Days from the date of P.O
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CLAUSE	SECTION – IF SCOPE OF WORK		
	05	Loop checking and completion of Pre Shut Down works.	180 Days from the date of P.O
	However the vendor may submit the flowchart for this project within 30 days after getting the purchase order.		
01.01.06	The Vendor shall arrange all erection aids including cranes, welding machines, tools, tackles, slings and other consumables as may be necessary for the works at site. The Vendor shall also provide the necessary test equipments and aids.		
01.01.07	All the necessary Labour, skilled/ unskilled required for the execution of this contract, shall be arranged by the vendor directly. The work shall be directly supervised by the vendor's engineers/ supervisors.		
01.01.08	The scope shall also include Dismantling of the existing old cables, instrument, panels, control desks in the control room and other unforeseen items that arises at the time of execution of the work and transporting the same to the temporary storage area in the TTPS premises.		
01.01.09	<p>The CLCS system control Panels, OLCS system control Panels, BMS system control Panels, UPS panels, Battery Banks and all equipments in Control Equipment Room (CER) shall be erected in 0.8 meter high false flooring with two tiers of cable tray beneath the panels. The Vendor shall erect the floor panels in a steel structure to meet the above requirement. Supply & Erection of False Flooring with all required steel materials and erection hardware shall be Bidder's scope.</p> <p>I. Area of false flooring - Approx. 350 sq.mtrs.</p> <p>II. a) For floor panels 30mm thick MDF Board shall be used. Over that 2mm thick vinyl PVC sheets of approved quality and colour shall be pasted. The floor panels after erection shall be completely tight and even without any up and down.</p> <p>b) Two tiers of cable tray shall be provided below the panels.</p> <p>c) Clearance is 0.8 meter from the floor level.</p> <p>d) Necessary civil works including breaking of concrete for making holes for cable entry of the panels shall be bidder scope.</p> <p>e) After completion of laying of cables, the cable entry portion at anywhere shall be Properly covered by fire proof wool and white cement as per TTPS standard.</p>		
01.01.10	Existing back panel shall be removed and suitable Arc type panels for LVS shall be provided. Also five Nos.(5 Nos) system back panel shall be provided for Drum level indicators, Turbine protection switches, Emergency push button and one No Electrical system panel etc. In addition. For this purpose suitable Push Buttons/ Lamps/ Switches shall be Bidder's scope. The control plaque for instrument shall be supplied and fixed if need.		
01.01.11	All inter panel wiring, cabling in the existing control panels to accommodate the instruments shall be Bidder's scope. All existing ESP annunciator must driven from DCS. The Bidder to include all Terminal Blocks, lugs, glands, inter-connecting cables ,binding accessories and any other materials required for cabling works to ensure that the DCS is commissioned successfully. No additional charges shall be paid after placement of order.		
01.01.12	Meeting earthing requirement for the DCS System (Surface preparation, providing earth pits, flange and pipes with all earthing materials) shall be Bidder's scope.		
01.01.13	The scope of work shall also include all civil works like chipping, digging, including filling materials etc., and associated erection of instrumentation equipments. The civil works related to cable entry like making necessary holes in the wall, drilling of concrete blocks also bidder scope		
01.01.14	The erection scope includes: For Field Instruments:		

CLAUSE	SECTION – IF SCOPE OF WORK
	<ul style="list-style-type: none"> a. Fixing of Junction Boxes wherever necessary b. Fabrication and fixing of canopies for junction boxes, transmitters and field equipments wherever necessary c. Termination of field cables at DDCMIS cabinets & at junction boxes d. Interconnection between field instruments and junction boxes e. Loop checking <p>For Valves & Dampers:</p> <ul style="list-style-type: none"> a. Termination of Field cables at DDCMIS cabinets & at existing MCC panels b. Disconnection of old cables from MCC panels. <p>For HT and LT equipments:</p> <ul style="list-style-type: none"> a. Termination of field cables at DDCMIS cabinets and at MCC Panels. b. Disconnection of old cables from MCC Panels. c. Masking of excess hole in MCC panel and HT panel are bidder's scope. d. If field requires any critical wirings which found essential for DCS modification that must be under the scope of bidder. e. Necessary internal wiring and wiring modifications in local panel like Compressor Panel, MCP panel, Stator Water Primary Pump Panel, Main Steam Stop Valve panel, ESP panel(7 Panels), Seal oil panel, Lub Oil panel and Turbine protection panel etc for interfacing with DDCMIS. f. Necessary internal wiring and wiring modifications in MCCS and HT panels for interfacing with DDCMIS. Approximately 280 Nos. of MCCS and 35 Nos. of HT Panels. <p>FOR DG SET, SWITCH YARD, COOLING WATER PUMP</p> <ul style="list-style-type: none"> a. DG SET III, Fuel oil Pump House controls and operation shall be included in the DCS. b. Important status and parameters of the Switchyard shall be incorporated in the DCS. c. Cooling Water Pump operation shall be included in the DCS. d. Winding Temperature of all the Cooling Water Pump in the CWPH I shall be displayed in the Chart less Recorder which should be mounted in three panels at CWPH I. e. All important alarm of all the Cooling Water Pump in the CWPH I shall be displayed in the Local Annunciator system.
01.01.15	<p>The Vendor shall carry out cable scheduling and tagging of all cables. Laying of these cables from Field instruments like Flow/ Temp. / Pressure switches, Limit switches etc., Motor Control Centers of LT/ HTEquipments and Valves and Relay panels (Digital inputs) up to the Marshalling and Input / Output interfacing relay cabinets, connecting Indicators/ Recorders/ switches/lamps in the UCD(Panels to be located in control room) to DCS Marshalling cabinet is in the Vendor 's scope. Re-routing of certain old cables, termination of all these cables at both the ends after tagging, coring out, dressing, identification and ferruling is also in Vendor's scope.</p> <p>The Vendor shall supply all the consumables like lugs, cable glands (double compression brass), ferrules (tube type), tools etc required for this field cabling work.</p> <p>Necessary iron & steel for all erection works shall be supplied by the bidder. The Vendor shall erect cable trays wherever required. The cable trays and steel required for the work shall be supplied by the vendor. In Boiler Area and some Hazard area in Turbine area the Cable trays shall be covered by suitable covers by the Bidder. At the time of execution, if the quantity required is more than the specified in the Section D-01.08.00, the extra quantity shall be supplied and erected without any additional cost.</p>

CLAUSE	SECTION – IF SCOPE OF WORK
01.01.16	All cabinets, consoles, desks etc. required for completion of DDCMIS package shall be erected and wired as per relevant interconnection and termination drawings, as prepared by the Vendor, and agreed by the TNPGL.
01.01.17	As this is a ' Retrofit job ' the Vendor shall make necessary provision for works, which may be essential for completion of the contract, though not explicitly mentioned in this specification.
01.01.18	The Vendor shall take care to complete all pre-commissioning activities and simulation tests after erection to suit the over all start up of respective plant / equipment.
01.01.19	Inching operation of all Regulating valves and Dampers shall be checked and correctness of position feedback display ensured. Start / Stop operation of all equipments and Gate valves shall be checked by Bidder scope.
01.01.20	By simulating process conditions, Protection, Interlock and Sequence Operation schemes shall be checked.
01.01.21	The pre-commissioning activities of the system shall be completed atleast Three days in advance as per the schedule of plant start-up.
01.01.22	Third party inspection (if required) shall be arranged by Vendor
01.01.23	Factory Acceptance Test (FAT) shall be arranged by Vendor
01.02.00	DETAILS OF REQUIREMENT OF DAS/CLCS/TPS/ ANNUNCIATION SYSTEM
01.02.01	<p>The following salient features shall be contemplated:</p> <ul style="list-style-type: none"> a) Dismantling of existing Annunciation windows (970 Nos.) supplied by M/s.keltron, in UCD. The existing annunciation field contacts shall be acquired through the DCS and the annunciation system shall be implemented as an in-built function. Also all the annunciation shall be incorporated in the LVS. Further important Annunciation (48 Nos.) shall be incorporated separately through Annunciation facia windows and the same will be finalized during detailed engineering. b) Retaining the signal, the compensating cable for Thermocouple measurement and power cables to the extent possible and re-routing wherever necessary shall be Vendor's scope. c) All pre-fabricated cables for panel-to-panel wiring will be Bidder's scope. d) Erection of impulse line piping for smart transmitters up to first root valve envisaged in the scheme will be done by TNPGL. Beyond first root valve, erection of transmitter including fixtures, materials shall be Vendor's scope. Existing impulse pipe line for measurement and control shall be cut at the isolating valve location and new impulse line with new isolating valve and drain valves shall be fixed along with transmitters by Vendor. The existing pressure transmitters Apart from supplied pressure transmitters and DP transmitters TTPS will provide 84 Nos. pressure transmitters and 100 Nos. DP transmitter for DCS measurement and control. The bidder must erect and commission all the above Pressure transmitters and DP transmitters with necessary impulse line not exceeding 1500mtrs. carbon steel & 1500mtrs. alloy steel. e) All new cables that are required to be laid shall be Vendor's scope. F) Fixing of new JBs, cabling & termination for field instruments connected to the DCS shall be Vendor's scope.
01.02.02	<p>The following control loops are envisaged for renovation:</p> <ol style="list-style-type: none"> 1. Furnace pressure control. 2. Total air flow control 3. PA header pressure control 4. Secondary air damper control.

CLAUSE	SECTION – IF SCOPE OF WORK
	<ol style="list-style-type: none"> 5. Mill 'A' to 'F' hot air damper control 6. Mill 'A' to 'F' cold air damper control 7. Mill 'A' to 'F' raw coal variator control 8. Heavy oil temperature control 9. Heavy oil header pressure control 10. Heavy oil pump disch. pressure control 11. Light oil header pressure control 12. PRDS temp. control 13. PRDS pressure control 14. SH/RH spray control & Burner tilt control 15. Soot blower pressure & drain temp. control 16. CBD level control 17. DP across FCV (BFP scoop) control 18. FCV wide open for Drum level 19. Hotwell level control 20. Dearator pr. Control 21. Dearator level control 22. Gland seal steam header pressure control 23. Speeder gear control (load control on pr.Mode) 24. HP Heater-7 level control 25. HP Heater-6 level control 26. HP Heater-5 level control 27. LP Heater-4 level control 28. LP Heater-3 level control 29. LP Heater-2 level control 30. Gland cooler 2 level control 31. HP/LP BY Pass Control <p>Note : Control loops for Item No. 9,11,12 & 13 have final control element is electrical actuators. For other control loops, final control elements are pneumatic actuators. The controllers shall be tuned as per the process requirement. The control loops shall be put in Auto Mode as per the operational requirement in different phases including low load operation up to 40% to 45% of load ie. less than 90MW (as per CEA Norms). This shall be carried out after synchronization of the Unit and as and when the various process loops stabilizes for Auto. Before taking over of the plant by TNPGL, all the system and Auto Control loops shall run satisfactorily for one month at varying loads without disturbing any adjustments. During this period, supervision and maintenance of the system shall be in the scope and responsibility of the Vendor.</p> <p>HP, LP Bypass system consists of combined unit of servo valve and blocking units (10 Nos) supplied by M/s BHEL. If the servo valve operation is not supported by Vendor's DCS, the necessary suitable converter to be supplied by the Vendor's scope.</p>
01.03.00	TURBINE PROTECTION SYSTEM
01.03.01	<p>The existing field instruments will be retained and the signals from the field instruments shall be acquired to the DCS System. Similarly, the Operator Desk Control (ODC) Switch for Protection bypass, Control circuit reset, Turbine Trip, Speeder Gear Operation etc., shall be retained and the ON/OFF contacts shall be acquired to the DCS System. Necessary protection/ Interlocks logic shall be provided in DCS. It shall be possible to operate the Turbine Protection System through DCS as well as through ODC Switches. The above system will be accomplished in Turbine System Panel as per Annexure – 2.</p>

CLAUSE	SECTION – IF SCOPE OF WORK
01.03.02	All the necessary cabling works shall be Bidder's scope
01.03.03	The Bidder shall make thorough study of the existing system so that the offer includes all the necessary materials required to complete system and hand over in a fully operational condition acceptable to the TNPGL Engineers. No additional charges shall be paid after placement of order.
01.04.00	BMS/ SOOT BLOWER/OPEN LOOP CONTROL SYSTEM
01.04.01	Open loop control and sequential operation of the following main equipments shall be included <ol style="list-style-type: none"> 1. Burner Management System 2. Soot Blower System 3. ID/FD/PA fans, Mills, Air Pre Heaters, Boiler feed pumps, condensate pumps, Cooling water pumps, Heaters. 4. Seal Oil, Stator Water & Hydrogen System, TG lub oil system 5. Electrical System.
01.04.02	The signals from field instruments like Pressure/ Level/ Temp./ Flow switches, limit switches, local Start/ Stop Push Buttons and other field equipments shall be acquired to the DCS System. Similarly, the Operator Desk Control (ODC) Switch , Push Buttons, Indication lamps etc., shall be removed. New Pressure switches for Furnace draft, Light oil and Heavy oil and Temperature switches for Light oil and Heavy oil shall be erected. Necessary protection/ Interlocks logic shall be provided in DCS.
01.04.03	Supply, Erection, commissioning & testing the following instruments in Hydrogen / Seal Oil system shall be in Bidder's scope <ol style="list-style-type: none"> 1. Eleven (12) nos of Level switches 2. Two (2) nos Hydrogen Purity Analyser 3. Three (3) nos. Stator Water Specific Resistance Measuring Device
01.05.00	Generator Electrical Parameters with transducers for monitoring
01.05.01	Measurement and Data acquisition system of Generator & Electrical parameters shall be envisaged. Two or more transducer panels shall be supplied for Generator Transducers as per TNPGL's approval.
01.05.02	All the necessary cabling works shall be Bidder's scope
01.05.03	The information in the Numerical Relays, Digital AVR System, Motor Protection Relays, and Switchyard Disturbance Recorder shall be interfaced with the DCS system. A MIS server shall be provided for this LAN. All networking functions of LAN, shall also be made, details of which shall be worked out during detailed engineering. Two Nos. MIS PC may provide in the INST/MRT head office. Necessary cable should be supplied and erected. Necessary firewall shall be supplied.
02.00.00	DISMANTLING, INSTALLATION & COMMISSIONING
02.01.01	Specification for Dismantling, Installation & Commissioning The Bidder shall make a thorough study of the existing system, so that the offer includes all the necessary dismantling work to be done. This will ensure smooth execution before installation, testing and commissioning of the new DCS. The space availability in the control room varies widely. Therefore, the vendor has to adequately plan the dismantling of the old system and installation of the new system in a short period. The tentative annual/capital overhaul program of Unit-III will be in the month of September

CLAUSE	SECTION – IF SCOPE OF WORK
	<p>2026. However the exact date may be confirmed by the bidder from TTPS/TNPGCL. Before the shutdown, the Vendor shall dismantle certain existing panels in consultation with TTPS Engineers. Also the vendor shall install the new system, test and make the system ready for commissioning during Unit shutdown.</p> <p>Once shut down is granted, disconnecting the old wiring, removal of existing panels, installation of new panels, replacing the existing transmitters with new SMART transmitters (including impulse line modifications with necessary hardware wherever necessary), termination, testing and commissioning of the new system will be carried out and completed within 35 days.</p> <p>The vendor shall prepare all necessary documents regarding the existing interconnections between different system panels and equipments for getting prior approval from TNPGCL for trouble free reconnection. However, the TNPGCL will provide the existing available documents to the successful bidder.</p> <p>It is in the scope of the vendor to supply and erect all necessary TB's, cables (inter-connection Cables, power cables, communication cables) and any other erection of hardware to ensure that the DCS to be commissioned successfully.</p> <p>The vendor shall make arrangements to lift all the dismantled equipments etc., to the TTPS stores with suitable packing, marking and content list. The consolidated list of packages and equipment shall be handed over in a book form.</p>
02.01.02	<p>Vendor shall offer the services of the installation team, which would install the equipment in the control room, lay the interconnecting cabling inside the control room, checkout, test and commissioning the system.</p> <p>All technical personnel assigned to the site by the Vendor shall be fully conversant with the supplied system and software package. They shall have both hardware and software capability to bring the system online quickly and efficiently with other concurrent construction and commissioning activities in all the control rooms.</p>
02.01.03	<p>Vendor's responsibility at site shall include all activities necessary to be performed to complete the job as per Material Requisition including;</p> <ol style="list-style-type: none"> a. Receipt of hardware / software and checking for completeness of supplies. b. Installation of the system including field supply of equipment and field cable termination in the system. c. Check up of the equipment installation. d. Checking of interconnection, hardware and software configuration, overall system functioning etc. e. Loop checking f. Liaison with Vendor's home office g. Field tests h. Commissioning and on-line debugging of the system i. Performance of final acceptance test
02.02.00	Field Inspection

CLAUSE	SECTION – IF SCOPE OF WORK
02.02.01	All equipments shall be inspected thoroughly by Vendor after its receipt at site. The tests, as a minimum, shall include; <ul style="list-style-type: none"> a. Hardware verification as per packing list b. Visual and mechanical checking c. Complete system configuration loading d. Functioning of all Monitors, keyboard, disc drives, printer, hardcopy units, etc. e. Checking of correct change-over of redundant devices f. Checking of hardwired instruments g. Any other checking
02.02.02	The testing shall be carried out to ensure functional integrity of all hardware being supplied. Vendor must initiate the remedial action in case, unsatisfactory operation of any equipment or item is observed during this testing with intimation to Engineer-in-charge.
02.02.03	Vendor must document all observations including details of malfunctions observed if any. Items/ equipments requiring total replacement must document with reasons for the same.
02.02.04	The document indicating the size, length and termination details of cabling shall be furnished.
02.03.00	Loop Checking
02.03.01	Vendor shall be responsible for loop checking, which shall also include checking of the interconnection at control room end, configuration and ensuring over all system functioning.
02.03.02	Vendor's scope of work, as apart of system installation and loop checking shall include termination of all field cables in control room, ferruling and tagging of interconnecting cables in control room and performing overall loop check.
02.03.03	Loop checking shall be carried out to check the functional performance of all elements comprising the loop and thereby ensuring proper configuration, functioning and interconnection.
02.03.04	Vendor shall coordinate with the TNPGL / his representative for smooth and proper loop checking. Any discrepancy found during checking shall be brought to the notice of Engineer-in-charge or his authorized representative. All readings shall be recorded on a suitable format, completing calibration record of each field device. On the completion of loop checking the information related to loop checking shall be filled by the Vendor. Completely filled format duly signed shall be submitted for approval to Engineer-in-charge.
02.04.00	GENERAL INSTRUCTION
02.04.01	The Vendor upon signing of the Contract shall, in addition to a Project Coordinator, nominate another responsible officer as his representative at Site suitably designated for the purpose of overall responsibility and co-ordination of the Works to be performed at Site. Such a person shall function from the Site office of the Vendor during the pendency of Contract.
02.04.02	Qualification of Weld Procedures Only qualified welding procedures as per ASME Section IX shall be used by Vendor at site. Procedure qualification records along with WPS shall be submitted to TNPGL for review. Welding procedure shall indicate all essential and non-essential parameters as per ASME Section IX. Makes of welding consumables shall be subject to TNPGL approval.
02.04.03	Code Requirements The erection requirements and procedures to be followed during the installation of the equipment shall be in accordance with the relevant Indian Electricity Rules & Codes, Indian Boiler Regulations, ASME codes and accepted good practices, the TNPGL Drawings and other applicable Indian recognized codes and laws and regulations of the

CLAUSE	SECTION – IF SCOPE OF WORK
	Government of India.
02.04.04	<p>Electrical safety regulations</p> <p>In no circumstances will the Vendor interfere with fuses and electrical equipment belonging to the other Vendor or TNPGL. Before the Vendor connects any electrical appliances to any plug or socket belonging to the other Vendor or TNPGL, he shall:</p> <p>(a.) Satisfy the TNPGL that the appliance is in good working condition;</p> <p>(b.) Inform the TNPGL of the maximum current rating, voltage and phases of the appliances;</p> <p>(c.) Obtain permission of the TNPGL detailing the socket to which the appliances may be connected.</p> <p>The TNPGL will not grant permission to connect until he is satisfied that</p> <p>(1.) The appliance is in good condition and is fitted with a suitable plug.</p> <p>(2.) The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.</p>
02.04.05	No electric cable in use by the other Vendor/ TNPGL will be disturbed without permission. No weight of any description will be imposed on any such cable and ladder or similar equipment will rest against or be attached to it.
02.04.06	The Vendor shall employ the necessary number of qualified, full time electricians to maintain his temporary electrical installation.
02.04.07	<p>Removal of material</p> <p>No material brought to the Site shall be removed from the Site by the Vendor and/or his Sub-Vendors without the prior written approval of the Employer.</p>
02.04.08	The TNPGL shall have the right to re-inspect any equipment though previously inspected and approved by him at the Vendor's works, before and after the same are erected at Site. If by the above inspection, the TNPGL rejects any equipment, the Vendor shall make good for such rejections either by replacement or modification/ repairs as may be necessary to the satisfaction of the TNPGL. Such replacements will also include the replacements or re-execution of such of those works of other Vendor's and/or agencies, which might have got damaged or affected by the replacements or re-work done to the Vendor's work.
02.04.09	<p>Access to site and works on site</p> <p>Suitable access to site and permission to work at the Site shall be accorded to the Vendor by the TNPGL in reasonable time. The Vendor may arrange the transport for their workforce.</p>
02.04.10	In the execution of the Works, no person other than the Vendor or his duly appointed representative, Sub-Vendor and workmen, shall be allowed to do work on the Site, except by the special permission, in writing by the TNPGL or his representative
02.04.11	<p>Vendor's site office establishment</p> <p>The Vendor shall establish a Office at the Site and keep posted an authorized representative for the purpose of the Contract. Any written order or instruction of the TNPGL or his duly uthorized representative, shall be communicated to the said authorized resident representative of the Vendor and the same shall be deemed to have been communicated to the Vendor at his legal address.</p>
02.04.12	TNPGL shall have full access to visit the Vendor's site at any time for inspection and surveillance checks.

CLAUSE	SECTION – IF SCOPE OF WORK
02.04.13	The TNPGL shall determine the corrective measures if any, required to rectify this situation after inspection of the works and such decisions by the TNPGL shall be binding on the Vendor.
02.04.14	<p>Discipline of workmen</p> <p>The Vendor shall adhere to the disciplinary procedure set by the TNPGL in respect of his employees and workmen at Site. The TNPGL shall be at liberty to object to the presence of any representative or employee of the Vendor at the Site, if in the opinion of the TNPGL such employee has mis-conducted himself or is incompetent, negligent or otherwise undesirable then the Vendor shall remove such a person objected to and provide in his place a competent replacement.</p>
02.04.15	<p>Vendor's field operation</p> <p>The Vendor shall keep the TNPGL informed in advance regarding his field activity plans and schedules for carrying out each part of the works. Any review of such plan or schedule or method of work by the TNPGL shall not relieve the Vendor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the TNPGL or any of his representatives and no claim of the Vendor will be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The Vendor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods. The Vendor shall have the complete responsibility for the conditions of the Work Site including the safety of all persons employed by him or his Sub- Vendor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of the Contract and shall not be limited to normal working hours. The construction review by the TNPGL is not intended to include review of Vendor's safety measures in, on or near the Work Site, and their adequacy or otherwise.</p>
02.04.16	<p>Man-power report</p> <p>The Vendor shall submit to the TNPGL, on the first day of every month, a man hour schedule for the month, detailing the man hours scheduled for the month, skill wise and area-wise. The Vendor shall also submit to the TNPGL on the first day of every month, a man power report of the previous month detailing the number of persons scheduled to have been employed and actually employed, skill- wise and the areas of employment of such labour.</p>
02.04.17	<p>Protection of work</p> <p>The Vendor shall have total responsibility for protecting his works till it is finally taken over by the TNPGL. No claim will be entertained by the TNPGL or the representative of the TNPGL for any damage or loss to the Vendor's works and the Vendor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Vendor's Works occur because of other party not being under his supervision or control, the Vendor shall make his claim directly with the party concerned.</p>
02.04.18	All responsibilities regarding Labours including migrant labours who are related this works is Vendor's scope and the Vendor should obey the Government orders then and there. Vendor's employees shall wear identification badges while on work at Site.
02.04.19	<p>Electricity</p> <p>The Vendor shall submit to the TNPGL within thirty (30) days from the date of acceptance of the Notification of Award, his electrical power requirements, if any, to allow the planning of the same by the TNPGL. The Vendor shall be provided with free supply of electricity for the</p>

CLAUSE	SECTION – IF SCOPE OF WORK
	purposes of the Contract, only at two locations in the TNPGL Site and at 415V voltage level. The Vendor shall make his own further distribution arrangement. All temporary wiring must comply with local regulations and will be subject to TNPGL inspection and approval before connection to supply. The free supply of power will not be provided for the use in the labour and staff colony. Power supply for labour and staff colony shall be provided at one point and the Vendor shall be charged at rates prevalent at the site.
02.04.20	Vendor's site office establishment The Vendor shall establish a site office at the site within thirty (30) days from the date of acceptance of the Notification of Award and keep posted an authorized representative for the purpose of the contract, pursuant to GCC.
02.04.21	Cleanliness The Vendor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of Contract. The Vendor shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish and scrap material shall be stacked or disposed in a place to be identified by the TNPGL. Materials and stores shall be so arranged to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect the floor from such damage.
02.04.22	All the Vendor's supervisory personnel and sufficient number of workers shall be trained for fire-fighting and shall be assigned specific fire protection duties. Enough of such trained personnel must be available at the Site during the entire period of the Contract.
02.04.23	Security The Vendor shall have total responsibility for all equipment and materials in his custody stores, loose, semi-assembled and/or erected by him at Site. The Vendor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the Vendor shall enter and leave the TNPGL Site only with the written permission of the TNPGL in the prescribed manner.
02.04.24	The following activities shall be carried out by the Vendor, 30 days from the date after getting the P.O to schedule date of commissioning of the equipment/systems installed by him. (a.) The Vendor shall furnish the organization chart of his operation and commissioning engineers for the acceptance of TNPGL. Adequate number of operation and commissioning engineers shall be deployed by the Vendor to effectively meet the requirement of round the clock operation in shifts also, till the plant is taken over by the TNPGL. (b.) The Vendor shall submit the bio-data containing the details of experience of his operation and commissioning engineers for the acceptance of TNPGL. (c.) The Vendor shall furnish the deployment schedule of his operation and commissioning engineers for the acceptance of the TNPGL. (d.) Apart from above, Vendor shall ensure deployment of sufficient skilled/semi-skilled/unskilled manpower during pre-commissioning and commissioning activities.
02.04.25	All the equipments furnished under the Contract and arriving at Site shall be promptly received, unloaded and transported and stored
02.04.26	Vendor shall be responsible for examining all the shipment and notify the TNPGL immediately of any damage, shortage, discrepancy etc. for the purpose of TNPGL information only. The Vendor shall submit to the TNPGL every week a report

CLAUSE	SECTION – IF SCOPE OF WORK
	detailing all the receipts during the week. However, the Vendor shall be solely responsible for any shortages or damage in transit, handling and / or in storage and erection of the equipment at Site. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc. shall be to the account of the Vendor.
02.04.27	The TNPGL shall hold weekly meetings of all the Vendor's working at Site, at a time and place to be designated by the TNPGL. The Vendor shall attend such meetings and take notes of discussions during the meeting and the decisions of the TNPGL and shall strictly adhere to those decisions in performing his Works. In addition to the above weekly meeting, the TNPGL may call for other meeting either with individual Vendor or with selected number of Vendor and in such a case the Vendor if called, will also attend such meetings.
02.04.28	Time is the essence of the Contract and the Vendor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time, the Vendor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the TNPGL, satisfying that his action will compensate for the delay. The Vendor shall not be allowed any extra compensation for such action.
02.04.29	After the completion of the Works, the Vendor shall remove from the Site under the direction of the TNPGL, the materials such as construction equipment, erection tools and tackles, scaffolding etc. with the written permission of the TNPGL. If the Vendor fails to remove such materials, within fifteen (15) days of issue of a notice by the TNPGL to do so then the TNPGL shall have the liberty to dispose off such materials.
02.04.30	The Vendor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of the TTPS and the employees of other Vendor's and Sub- Vendor and all public and private property including structures, building, other plants and equipments and utilities either above or below the ground.
02.04.31	The Vendor shall follow TTPS Safety Rules as issued from time to time with respect to safety in construction & erection.
02.04.32	All equipments used in construction and erection by the Vendor shall meet BIS / International Standards and where such standards do not exist, the Vendor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the Vendor in accordance with manufacturer's operation manual. The Vendor should also follow Guidelines / Rules of the TNPGL in this regard.
02.04.33	The vendor shall provide suitable latest Personal Protective Equipments of prescribed standard to all their employees and workmen according to the need. The Engineer in charge shall have the right to examine these safety equipments to determine their suitability, reliability, acceptability and adaptability. The Vendor should also ensure these before their use at worksite.

Special and safety condition ----

Since Tuticorin Thermal Power Station is covered under the ESI & EPF Act, the Vendor who desires to take up works contracts for and inside the premises of TTPS is required to comply with all the relevant provisions stipulated in the ESI & EPF Act.

Annexure-1
APPREVIATIONS AND ITS EXPANSIONS

SL.NO.	APPREVIATION	EXPANSION
1	AI	ANALOG INPUT
2	AO	ANALOG OUTPUT
3	BMS	BURNER MANAGEMENT SYSTEMS
4	CER	CONTROL EQUIPMENT ROOM
5	CLCS	CLOSED LOOP CONTROL SYSTEMS
6	CMMS	COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM
7	CPU	CENTRAL PROCESSING UNIT
8	CRCA	COLD ROLLED CARBON ALLOY
9	DAS	DATA ACQUISITION SYSTEM
10	DCS	DIGITAL CONTROL SYSTEMS
11	DDCMIS	DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEMS
12	DDE	DYNAMIC DATA EXCHANGE
13	DI	DIGITAL INPUT
14	DO	DIGITAL OUTPUT
15	EMI	ELECTROMAGNETIC INTERFERENCE
16	ERP	ENTERPRISE RESOURCE PLANNING
17	EWS	ENGINEERING WORK STATION
18	FAT	FACTORY ACCEPTANCE TEST
19	FOR	FREIGHT ON RECEIPT
20	FRLS	FIRE RETARDENT LOW SMOKE
21	FSSS	FURNACE SAFE GUARD SUPERVISORY SYSTEMS
22	GPS	GLOBAL POSITIONING SYSTEMS
23	HMI	HUMAN MACHINE INTERFACE
24	I/O	INPUT/OUTPUT
25	ISGN	INSTRUMENT SYTEM GROUND NODE
26	LVS	LARGE VIDEO SCREEN
27	MFT	MASTER FUEL TRIP
28	MMIPIS	MAN MACHINE INTERFACE AND PLANT INFORMATION SYSTEMS
29	ODBC	OPEN DATA BASE CONNECTIVITY
30	OLCS	OPEN LOOP CONTROL SYSTEMS
31	OPC	OPEN PROTOCOL COMPLAINT
32	OPC	OLE FOR PROCESS CONTROL OBJECT LINKING & EMBEDDING
33	OWS	OPERATOR WORK STATION
34	SAT	SITE ACCEPTANCE TEST

SL.NO.	APPREVIATION	EXPANSION
35	SOE	SEQUENCE OF EVENTS
36	SPT	SUSTAINED PERFORMANCE TEST
37	SWC	SURGE WITHSTAND CAPABILITY
38	TPS	TURBINE PROTECTION SYSTEMS
39	UCD	UNIT CONTROL DESK
40	UPS	UNINTERRUPTED POWER SUPPLY
41	1v2 OR 1-o-o-2	ONE OUT OF TWO
42	2v3 OR 2-o-o-3	TWO OUT OF THREE

Annexure-2

UCD

Instrumentation-I

IMPORTANT BACK PANEL INSTRUMENTS:

1. Drum level indicator –Hydrastep (Left)
2. Drum level indicator –Hydrastep (Right)
3. Impulse safety Valve Auto/Manual switch
4. Light oil Flow Indicator
5. Turbine hand trip ILPB
6. Lub oil protection bypass ILPB
7. Condenser vacuum protection bypass ILPB
8. Axial shift protection bypass ILPB
9. Lub oil, condenser vacuum and axial shift protection reset ILPB
10. Speeder gear Raise/Lower ILPB
11. Auxiliary relay Type ANV-1SF -3 Nos
12. Auxiliary relay Type AVX-1S -3 Nos
13. Auxiliary relay Type AVX-2S -1 Nos
14. Auxiliary Relay Type ACX-1H -2 Nos
15. Siemens contactor -14 Nos.

MRT-I

BOILER AREA

- 1.ID A STOP-ILPB
- 2.ID B STOP-ILPB
- 3.FD A STOP-ILPB
- 4.FD B STOP-ILPB
- 5.PA A STOP-ILPB
- 6.PA B STOP-ILPB
- 7.AC LOP START-ILPB
- 8.DC LOP START-ILPB
- 9.AC SLOP START-ILPB
- 10.DC SLOP START-ILPB
- 11.COP A1 START-ILPB
- 12.COP A2 START-ILPB
- 13.COP B1 START-ILPB
- 14.COP B2 START-ILPB

- 15.APH A MAIN DRIVE START-ILPB
- 16.APH B MAIN DRIVE START-ILPB
- 17.V2-31(L) VALVE CLOSE-ILPB
18. V2-31(R) VALVE CLOSE-ILPB

TURBINE AREA

- 1.CWP A STOP-ILPB
- 2.CWP B STOP-ILPB
- 3.CWP C STOP-ILPB
- 4.CWP D STOP-ILPB
- 5.HOP A STOP-ILPB
- 6.HOP B STOP-ILPB
- 7.BFP A STOP-ILPB
- 8.BFP B STOP-ILPB
- 9.BFP C STOP-ILPB
- 10.MCP A STOP-ILPB
- 11.MCP B STOP-ILPB
- 12.MCP C STOP-ILPB
- 13.SOP START-ILPB
- 14.SOP STOP-ILPB
- 15.BEARING GEAR START-ILPB
- 16.SWPP A START-ILPB
17. SWPP B START-ILPB
- 18.SWPP A STOP-ILPB
19. SWPP B STOP-ILPB
- 20.VACUUM BKR OPEN-ILPB
21. VACUUM BKR CLOSE-ILPB

BMS

- 1.MAIN SCANNER FAN START-ILPB
2. MAIN SCANNER FAN STOP-ILPB
- 3.AB 1&3 START-ILPB
4. AB 1&3 STOP-ILPB
- 5.AB 2&4 START-ILPB
6. AB 2&4 STOP-ILPB
- 7.CD 1&3 START-ILPB
8. CD 1&3 STOP-ILPB
- 9.CD 2&4 START-ILPB
- 10.CD 2&4 STOP-ILPB
- 11.EF 1&3 START-ILPB
12. EF 1&3 STOP-ILPB
- 13.EF 2&4 START-ILPB
14. EF 2&4 STOP-ILPB
- 15.MILL A START-ILPB
- 16.MILL A STOP-ILPB
- 17.MILL B START-ILPB
- 18.MILL B STOP-ILPB
- 17.MILL C START-ILPB
- 18.MILL C STOP-ILPB
- 19.MILL D START-ILPB
- 20.MILL D STOP-ILPB
- 21.MILL E START-ILPB
- 22.MILL E STOP-ILPB
- 23.MILL F START-ILPB
- 24.MILL F STOP-ILPB

PANEL METERS

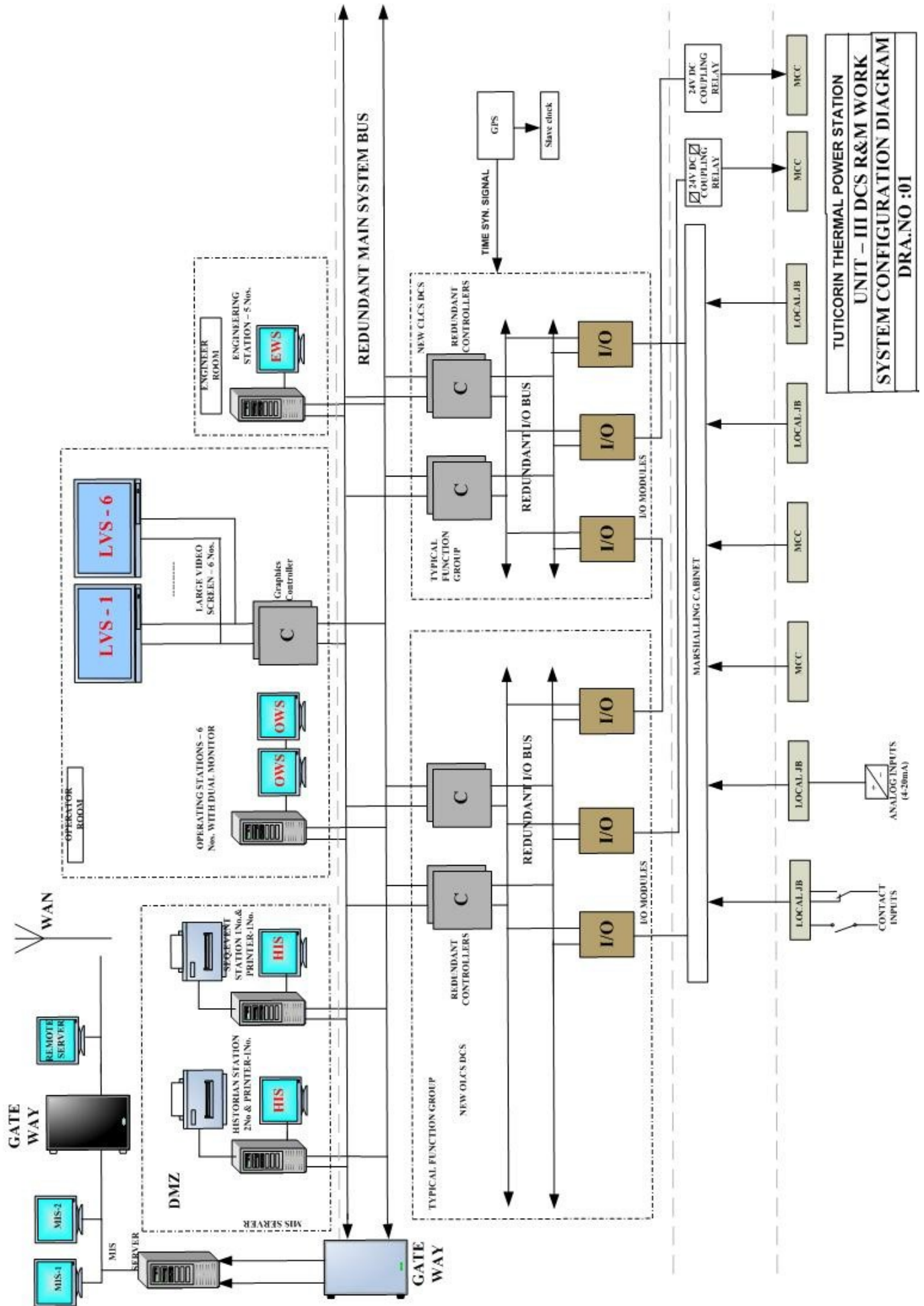
- 1.ID A AMMETER
- 2.ID B AMMETER
- 3.FD A AMMETER
- 4.FD B AMMETER
- 5.PA A AMMETER
- 6.PA B AMMETER
- 7.BFP A AMMETER
- 8.BFP B AMMETER
- 9.BFP C AMMETER
- 10.MCP A AMMETER
- 11.MCP B AMMETER
- 12.MCP C AMMETER
- 13.SOP AMMETER
- 14.BG AMMETER
- 15.CWP A AMMETER
- 16.CWP B AMMETER
- 17.CWP C AMMETER
- 18.CWP D AMMETER
- 19.MILL A AMMETER
- 20.MILL B AMMETER
- 19.MILL C AMMETER
- 20.MILL D AMMETER
- 21.MILL E AMMETER
- 22.MILL F AMMETER

List of spares for which support of the manufacture is required.

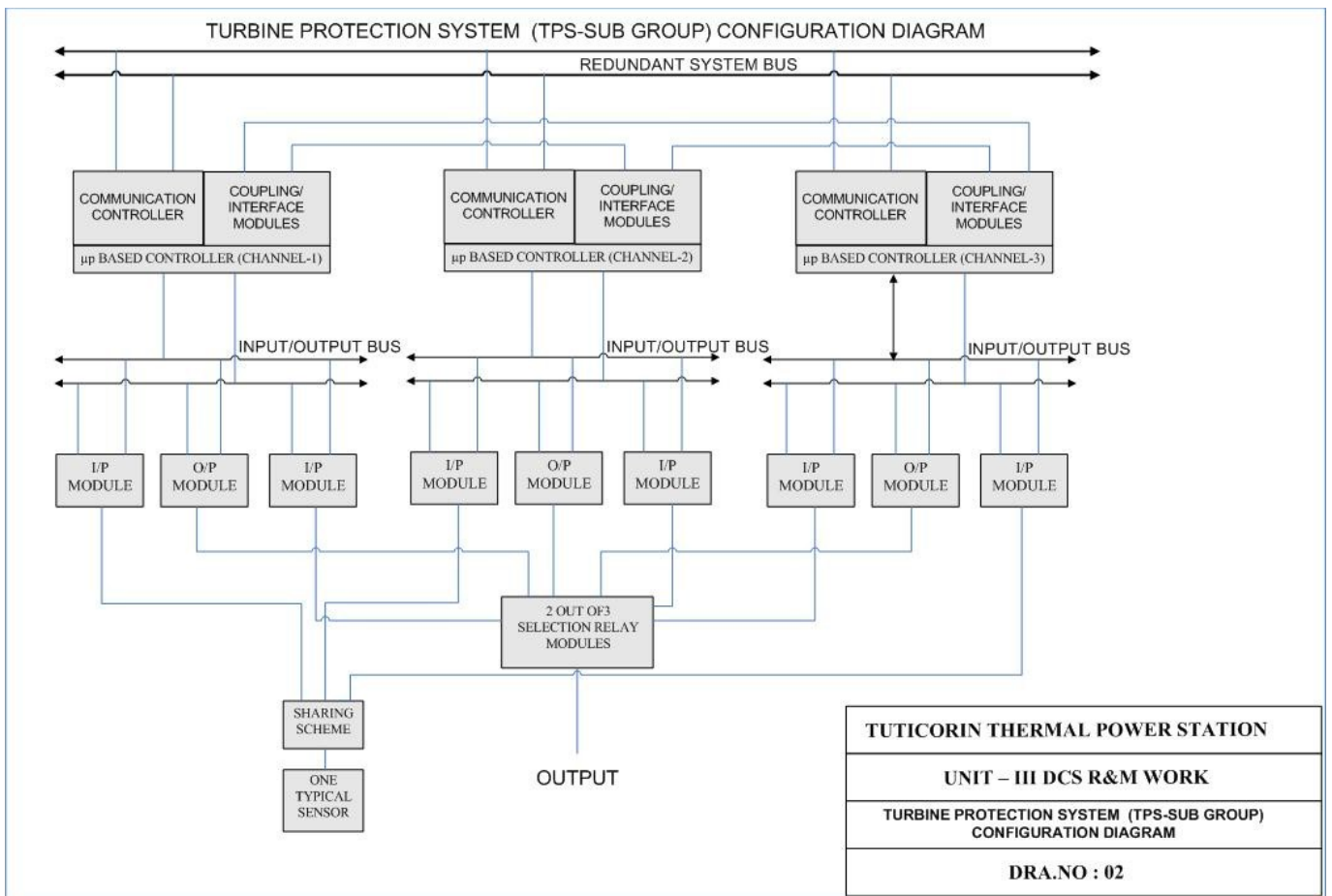
1. DCS Controllers
2. DCS Communication modules
3. DCS Input and output modules
4. DCS Engineering Software
5. DCS Operation software
6. Any other DCS related OEM's Proprietary related materials.

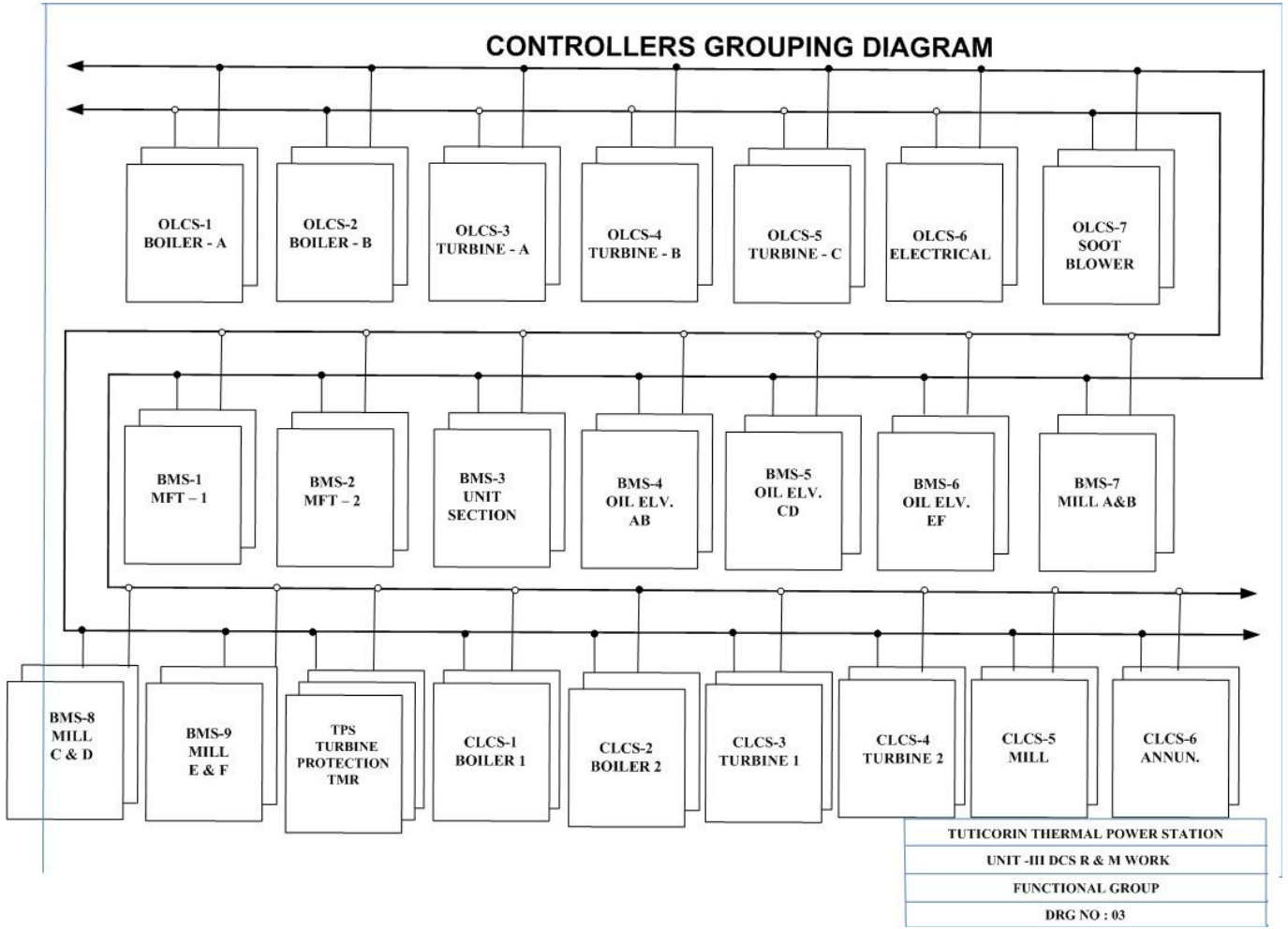
Sd/-

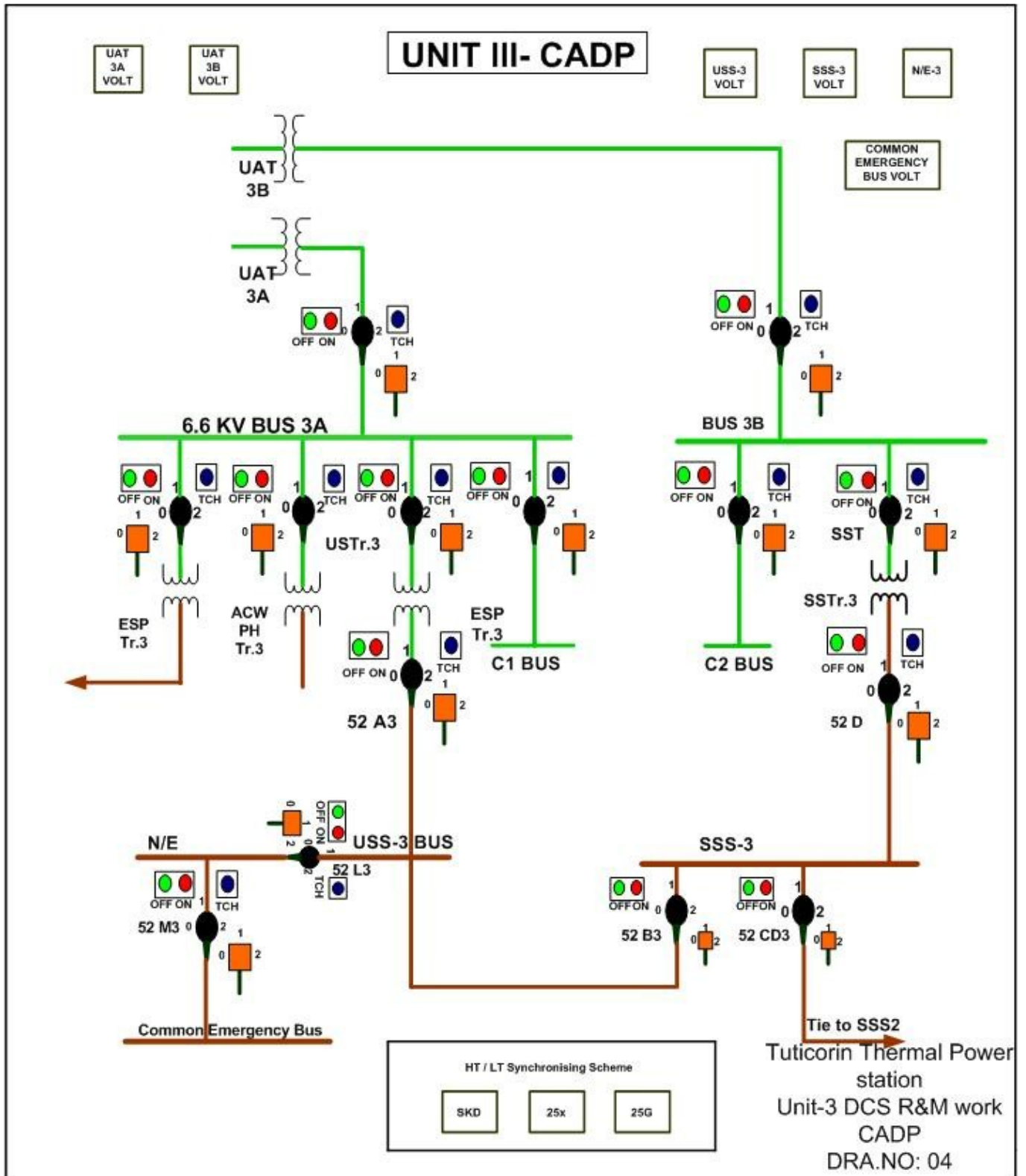
**CHIEF ENGINEER (FAC),
TTPS/TUTICORIN – 4.**



TUTICORIN THERMAL POWER STATION
UNIT - III DCS R&M WORK
SYSTEM CONFIGURATION DIAGRAM
DRA.NO :01

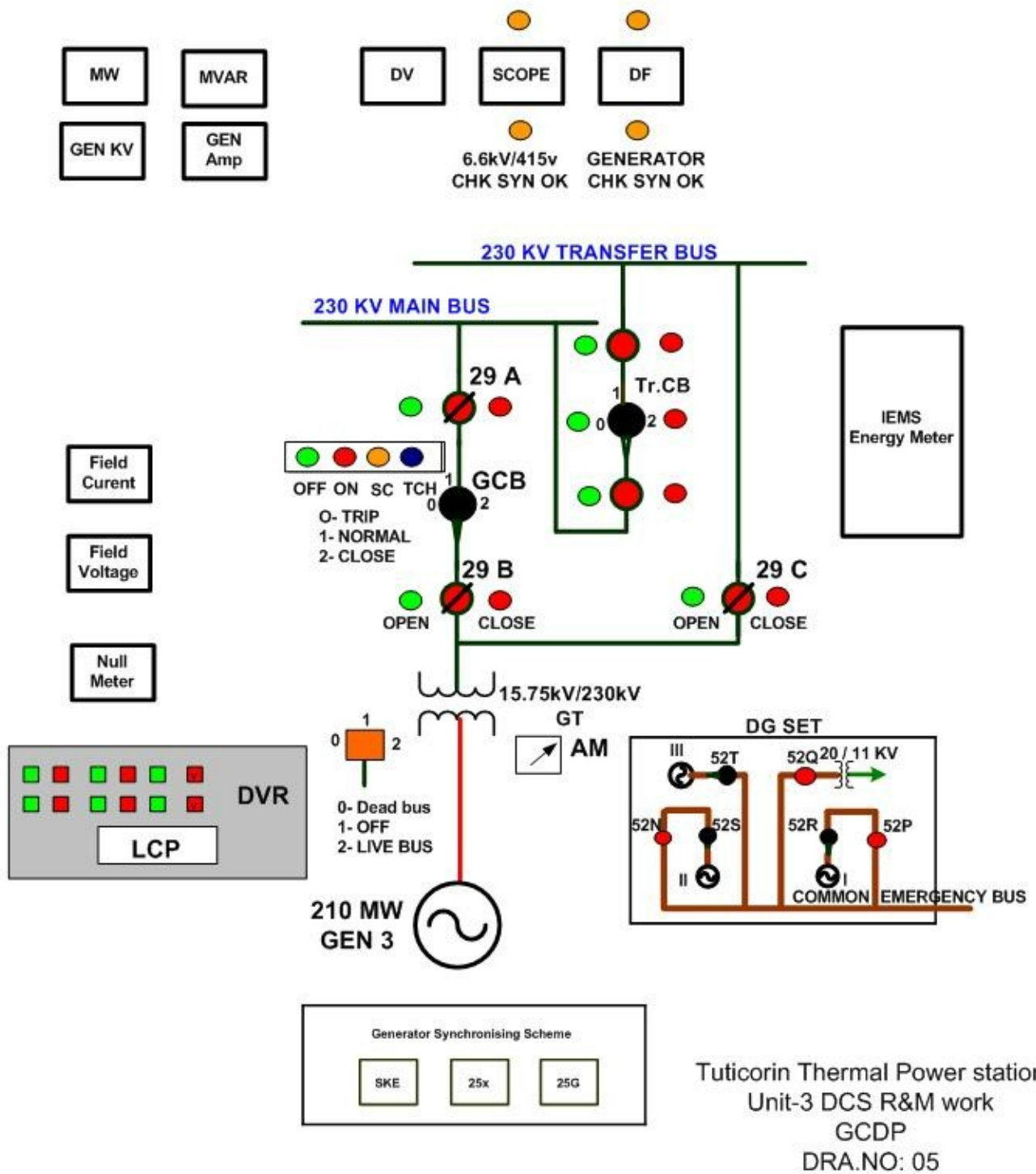






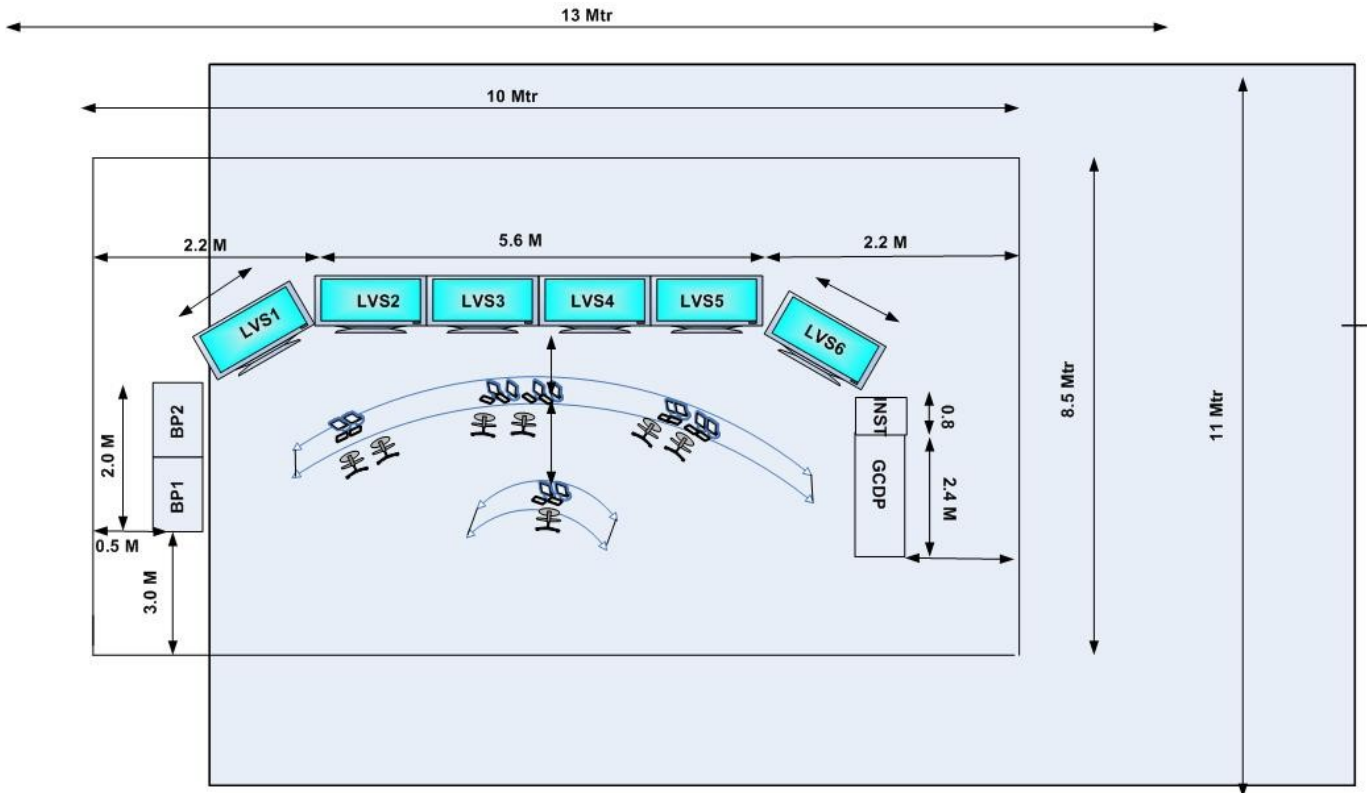
** The Exact drawing and instruments fixing place will be finalized during detailed Engineering

UNIT III - GCDP

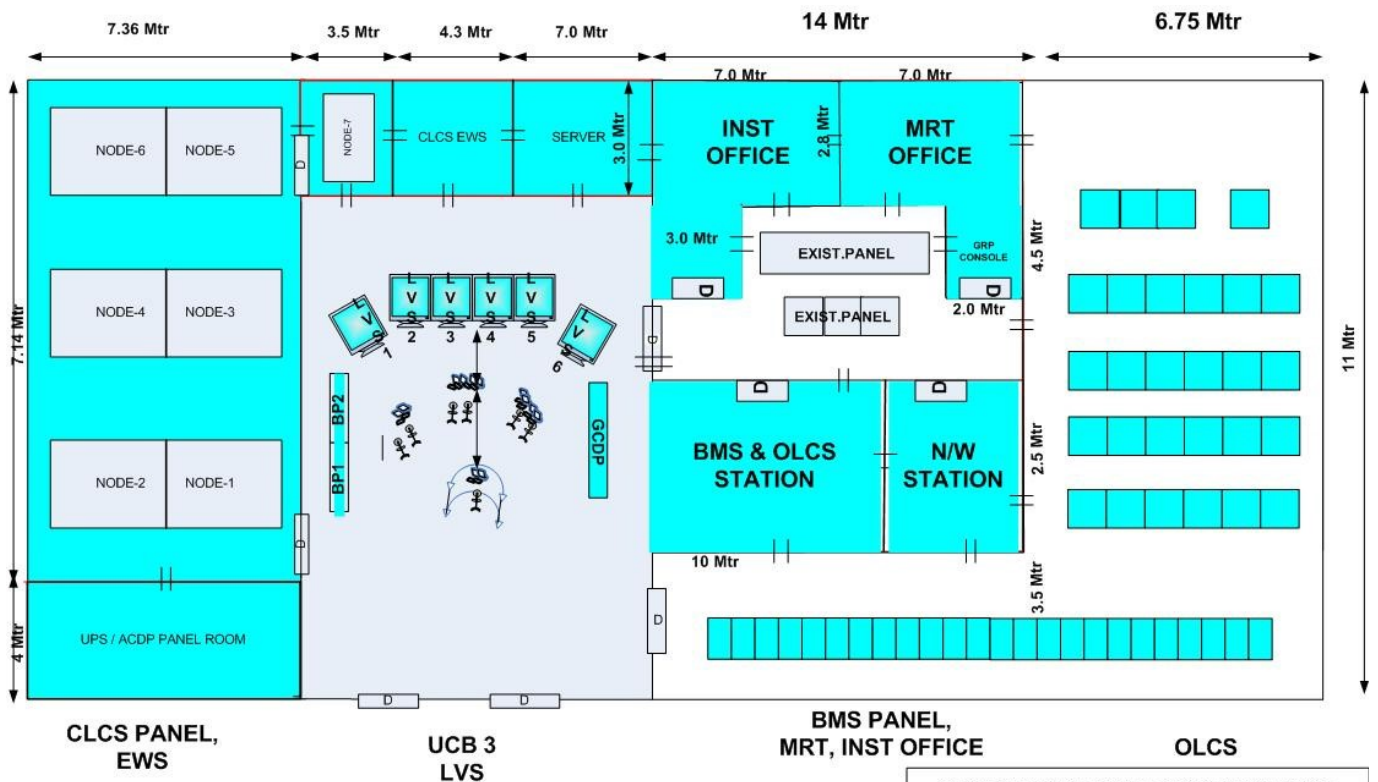


Tuticorin Thermal Power station
Unit-3 DCS R&M work
GCDP
DRA.NO: 05

** The Exact drawing and instruments fixing place will be finalized during detailed Engineering



TUTICORIN THERMAL POWER STATION
UNIT – III DCS R&M WORK
LVS ARRANGEMENT
DRA.NO : 06



CLCS PANEL,
EWS

UCB 3
LVS

BMS PANEL,
MRT, INST OFFICE

OLCS

|| = CLASS PATRICIAN PORTION

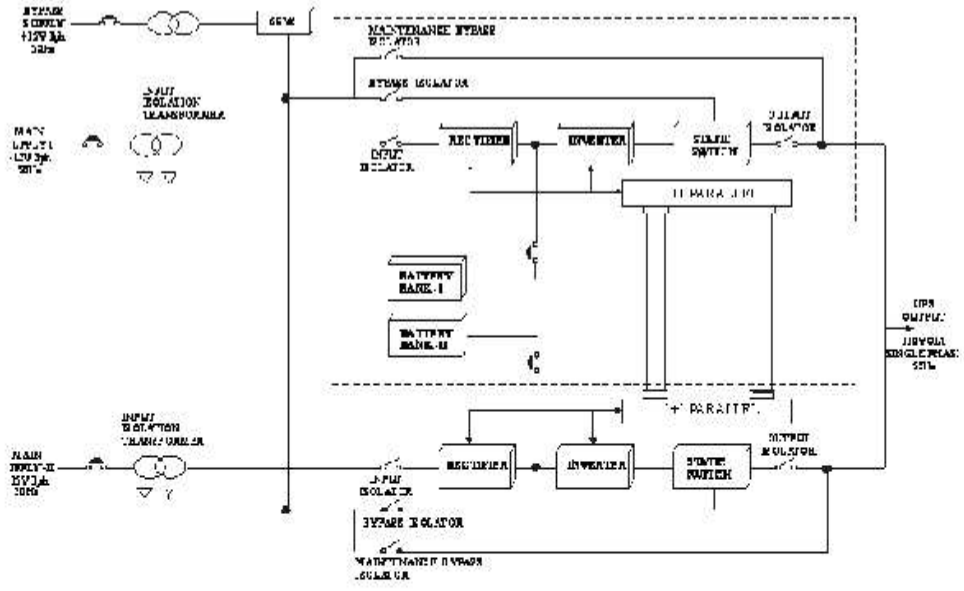
The proposed partition is tentative. The actual may vary according to the successful tenderer. Hence 25% addition provision may be provided in the estimate please.

Proposed Door

New works

TUTICORIN THERMAL POWER STATION
UNIT - III DCS R&M WORK
CER ARRANGEMENT
DRG NO : 07

MICRO-PROCESSOR BASED PARALLEL REDUNDANT UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM



NOTE: ALL THE SUPPLIES FROM THE IT EQUIPMENT SHOULD BE PROVIDED BY THE USER

TUTICORIN THERMAL POWER STATION
UPLI - I R & M WORKS
UPS SYSTEM
DRAWING NO: 1E 01