भारत सरकार
अंतरिक्ष विभाग
सतीश धवन अंतरिक्ष केंद्र शार
श्रीहरिकोटा रेंज डा.घ. 524 124
श्री पोट्टि श्रीरामुलु नेल्लूर जिला, आं.प्र., भारत
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सत्यमेव जयते

Goverment of India
Department of Space
Satish Dhawan Space Centre SHAR
Shriharikota Range P.O. 524 124
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निविदा सूचना सं. TENDER NOTICE NO. SDSC SHAR/Sr.HPS/PT/RO-LSSF/25/2025-2026

भारत के राष्ट्रपति की ओर से वरि. प्रधान क्रय एवं भंडार, सतीश धवन अंतरिक्ष केंद्र श्रीहरिकोटा निम्नलिखित वस्तुओं के लिए ऑनलाइन निविदाएं आमंत्रित करते हैं:- On behalf of President of India, Sr. Head, Purchase and Stores, SDSC SHAR, SRIHARIKOTA invites on line quotations for the following.

क्र.सं. Sl No	संदर्भ सं. Ref. No.	विवरण Description	मात्रा Qty.
01.	**SDSC SHAR /LSSF PURCHASE /LSSF/2025000985 [Public Tender – Two Part]**	**Supply, Installation and Commissioning of PLC based Process Automation Systems for First Launch Pad**	**1 Lot**

बोली-पूर्व आयोजन की तिथि Date of Pre-Bid Meeting : १०.09.2025 at 10:30 hrs.
निविदा दस्तावेजों को डाउनलोड करने की अंतिम तिथि Last Date for downloading of tender documents : 25.09.2025 at 14:00 hrs.
ऑनलाइन निविदा जमा करने की अंतिम तिथि Due Date for submission of bids online : 25.09.2025 at 14:00 hrs.
निविदाएं खोलने की नियत तिथि Due Date for opening of tenders : 25.09.2025 at 14:05 hrs.

निविदाकार के लिए निर्देश Instructions to Tenderers:

निविदाएं ईजीपीएस के माध्यम से ही भेजी जाएं तथा कोई निविदा शुल्क लागू नहीं होगा।
Bids shall be submitted on line through EGPS only and No tender fee shall be applicable.

1) कार्य के सम्पूर्ण विवरण/जानकारी तथा नियम व शर्तों इत्यादि के लिए संलग्न अनुलग्नक को देखें। / For full details/scope of work and terms and conditions etc., please see the enclosed annexures.
2) इच्छुक निविदाकार इसरो की ई-खरीद वेबसाइट इसरो न्यू ई-प्रोकुरमेंट www.eproc.isro.gov.in से ई-निविदा डाउनलोड और अपनी निविदा ई-खरीद पोर्टल पर ऑनलाइन जमा कर सकते हैं। डाक / वाहक / स्वयं द्वारा प्राप्त निविदाओं पर विचार नहीं किया जाएगा। / Interested tenderers can download the e-tender from ISRO e-procurement website www.eproc.isro.gov.in and submit the offer on line in the e-procurement portal. Offers sent physically by post/courier/in person will not be considered.
3) निविदा दस्तावेज इसरो की वेबसाइट www.isro.gov.in इसरो न्यू ई-प्रोकुरमेंट वेबसाइट www.eproc.isro.gov.in तथा सतीश धवन अंतरिक्ष केंद्र शार की वेबसाइट www.shar.gov.in पर भी उपलब्ध हैं। इन्हें केवल ई-खरीद पोर्टल से डाउनलोड और निविदा ऑनलाइन जमा कर सकते हैं। / Tender documents are also available on ISRO website www.isro.gov.in,ISRO New e-procurement website www.eproc.isro.gov.in and SDSC SHAR, Sriharikota website www.shar.gov.in. The same can be down loaded and offer submitted on line in the new e-procurement portal only.
4) निर्धारित तिथि/समय के पश्चात प्राप्त बोलियों पर विचार नहीं किया जाएगा। / Quotations received after the due date/time will not be considered.
5) वरि. प्रधान क्रय एवं भंडार, सतीश धवन अंतरिक्ष केंद्र श्रीहरिकोटा के पास किसी भी या सभी निविदाओं को स्वीकार / अस्वीकार करने का अधिकार है। / Sr. Head, Purchase and Stores, SDSC-SHAR, Sriharikota reserves the right to accept or reject any/or all the quotations.
6) GeM GARPTS Report ID: GEM/GARPTS /08082025/S6Y0EC6LL6IE

दिनांक DT: 25.08.2025

वरि. प्रधान क्रय एवं भंडार
Sr. HEAD PURCHASE AND STORES

Tender Specifications Document

Supply, Installation and Commissioning of PLC based Process Automation Systems

Indent Ref Number: SDSC SHAR/ SHLS/ 2025000985

Satish Dhawan Space Center – SDSC SHAR

Indian Space Research Organization (ISRO)

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Tender Specifications Document for Supply, Installation and Commissioning of PLC based Process Automation Systems

1 Introduction

SDSC SHAR is planning to replace the existing PLC based Process Automation Systems for launch servicing with new systems of state-of-the-art technology. The envisaged system must provide trouble free operation of the process, meeting the operational, functional and performance requirements with high degree of safety, availability, maintainability and reliability.

The scope of tender deals with removal of existing automation systems, detailed engineering, supply, Erection and Commissioning of PLC based Automation Systems while maintaining the interfaces with existing Instrumentation System.

1.1 List of Abbreviations:

Acronym	Description
PLC	– Programmable Logic Controller
SCADA	- Supervisory Control and Data Acquisition
TMR	– Triple Modular Redundant
I/O	- Input/output
OT	- Operator terminal
IJB	- Instrumentation Junction Box
IDE	- Integrated Development Environment
UPS	- Uninterruptible Power supply
SMPS	- Switched Mode Power Supply
MCB	- Miniature Circuit Breaker
LAN	- Local Area Network
NAS	- Network attached storage
OPC	- OLE for Process Communication
OLE	- Object Linking and Embedding
SDSC	– Satish Dhawan Space Centre
SHAR	– Sriharikota High Altitude Range
RL	- Remote Location
NTP	- Network Time Protocol
FO	- Fiber Optic
TCP	- Transmission Control Protocol
UDP	- User Datagram Protocol
ISA	- International Society of Automation
IEC	- International Electro technical Commission

Acronym	Description
TUV	- Technical Inspection Association
CE	- European Conformity
UL	- Underwriters Laboratories
AIP	- Analog Input Panel Triplicate
DIP	- Digital Input Panel Triplicate
PIP	- Pulse Input Panel Triplicate
DIF	- Digital Input Field Triplicate
AIF	- Analog Input Field Triplicate

1.2 Terms and Conditions

1.2.1 Instruction to bidders

1.2.1.1 Bidder must quote for all the items specified in the tender enquiry. Values quoted in the price bid only will be considered and any other price information in any part of the document will not be considered and bid will be rejected.

1.2.1.2 Original PLC manufacturers with the experience of executing similar projects in India and in operation for the last ten years before the date of tender enquiry are eligible to participate in the bidding process. Necessary documentary proof for the same shall be provided along with bid.

1.2.1.3 Authorized system integrators of PLC manufacturers with the experience of executing similar projects in India and the company in operation for the last 10 years before the date of tender enquiry can also participate in the bidding process. Necessary documentary proof for the same shall be provided along with bid and OEM of the offered PLC must authorize the bidder for this project and bidder must provide necessary supporting documents.

1.2.1.4 Bidder should have executed at least one purchase order value of Rs 6 crores or two purchase orders each of Rs 3 crores or three purchase orders each of Rs 2 crores of similar automation project in any PSU's/Central Govt establishment/reputed private firms in the last ten years (before 31/07/2025). Documentary proof of such as purchase orders or completion certificate for the same shall be provided along with bid.

1.2.1.5 As a pre-qualification criterion, offered PLC systems (same make and model) must be commissioned in India in the last ten years by OEM or authorized system integrator. Site visit for evaluation of bidder/system installed shall be arranged based on the request from department, wherever necessary. Documentary proof of project completion certificate must be provided.

1.2.1.6 Bidder should have at least ten years' experience as on 31/07/2025 in the field of Design, Supply of Hardware & Software, Erection & Commissioning of Process Automation Systems and the bidder should have installed &

commissioned at least one system using PLCs with minimum 3000 I/Os & respective SCADA systems & associated Instrumentation interfaces during last ten years. Documentary proof for the same shall be provided along with bid.

1.2.1.7 The Bidder should have average annual turnover of minimum Rs.10 crores per year for at least three years in the last five financial years ending with March 2025. Documentary proof for the same shall be provided along with bid.

1.2.1.8 Bidder in case of system integrators must have executed projects with reputed PLC OEM and should have been authorized by PLC OEM of same make for minimum of five years continuously till March 2025 and necessary document shall be provided.

1.2.1.9 Purchase/Price Preference will be extended to the MSMEs under the Public Procurement Policy for MSMEs formulated under the Micro, Small and Medium Enterprises Development Act, 2006 and instructions issued by Government of India from time to time. Vendors who would like to avail the benefit of MSME should clearly mention the same and submit all the documentary evidences to substantiate their claim along with tender itself.

1.2.1.10 For System integrators, the proposed system configuration/ architecture must be approved by OEM of PLC and the same shall be submitted along with the bid.

1.2.1.11 The bidder should have an establishment in India in providing services and maintenance support along with all type of spares for the offered system. Documentary proof of the establishment, service setup and other resources required for prompt service to be furnished by the bidder along with the offer.

1.2.1.12 The offered PLC controller and IO family should have a proven performance track record of continuous trouble-free operation at least for the last one year preceding from the date of technical bid opening. Bidder shall furnish the following details along with bid.

a) Name of the organization & Purchase order details
b) Make, model of the PLC system & End application use of the system
c) Date of project completion (Site Acceptance certificate and performance report by the end user)
d) Name, contact details of the end user along with e-mail id

1.2.1.13 Details of technical specifications & commercial terms are included in this document. Bidder shall sign and stamp each page of the document as a token of their acceptance & submit along with their offer. Document shall be scanned and uploaded in ISRO E-Procurement portal. In case it is not possible to upload due to higher file size, hard copy of the documents (without any

price figures) shall be submitted before due date to the PSO, Tender Cell, SDSC SHAR Sriharikota by indicating Tender number, Due Date and Time.

1.2.1.14 The proposal shall be completely filled in all respects and shall be submitted together with requisite information. Any offer incomplete in any particulars is liable for rejection.

1.2.1.15 Site visits are permitted for understanding the geographical conditions and the existing system to be replaced.

1.2.1.16 Non-comprehensive AMC charges, after warranty, for period of 3 years must be quoted in the bid and the same will be considered in evaluation and finalizing the bid.

1.2.1.16.1 For the cash flows pertaining to Annual Maintenance Contract (AMC) charges for THREE years, Net Present Value (NPV) method will be adopted for normalizing the different quotes from bidders to bring all the bidders at par for the purpose of evaluation.

1.2.1.16.2 For arriving L1, NPV of AMC charges quoted by the tenderers will be added to the Equipment Cost. To calculate NPV, the interest rate shall be as per prime lending rate of Reserve Bank of India (RBI) as on date of opening of the tender.

1.2.1.17 Separate PO shall be released for NC-AMC after the warranty period is over.

1.2.1.18 Commencement of Non-comprehensive AMC will be after successful commissioning of the system and completion of warranty period.

1.2.1.19 Bidder must provide assurance for NON-comprehensive AMC of the offered system for a period of 15 years after warranty period with mutually agreed terms & conditions. All the bidders must support the offered system for a period of minimum 15 years for spares from the date of commissioning. If the bidder is not OEM, then he must submit a copy of agreement with the OEM of the offered system to meet the above criteria.

1.2.1.20 Bidder must provide detailed BOM as part of technical bid. Offer will be rejected if price of BOM is included in technical bid.

1.2.1.21 Successful Bidder shall submit project execution plan and work break down chart, detailing the methodology of execution (process plan) within 15 days from the date of issue of purchase order.

1.2.1.22 Details of IO channel requirement is provided in this document. The tentative BOM based on existing system configuration is provided for your reference. However, if any item which is not mentioned explicitly but essentially required to meet the functional and performance requirements of system is

in the scope of the Bidder.

1.2.1.23 Department reserves the right to remove some of the items / services in the tender from the scope of supply if necessary.

1.2.2 **Make in India Clause**

1.2.2.1 General Terms & conditions for Vendors: For this procurement, bids from Class-I & class-II Local Vendors are admissible. Hence provisions contained in Public Procurement (Preference to Make in India), Order 2017 issued by Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce & Industries vide letter No. P-45021/2/2017-PP (BE-II) – Part(4) Vol.II dated 19.07.2024 and subsequent amendment & directives shall be followed. Accordingly, offer will be evaluated & processed in conformation with above referred GOI order (Specially mentioned below). The vendor shall provide compliance and undertaking as per order and hereafter amendments

1.2.2.2 Order no: F.No.6/18/2019 PPD dated 23.07.2020 of Department of Expenditure), Ministry of Finance Under Public procurement division for the General Financial rule (GFRs).

1.2.2.3 Class-I local Vendor means a Vendor or service provider, whose goods, service or works offered for procurement, has local content equal to or more than 50%, as defined under order

1.2.2.4 Class-II local Vendor means a Vendor or service provider, whose goods, services or works offered for procurement, has local content more than 20% but less than 50%, as defined under this Order

1.2.2.5 Verification of local content:

1.1.1.1.1 The Class I local Vendor/ Class- II local Vendor at the time to tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for Class-I local Vendor / Class II local Vendor as the case may be. They shall also give details of the location(s) at which the local value addition is made

1.1.1.1.2 In case bid value is in excess of Rs. 10 Cr., Class-I local Vendor / Class-II local Vendor shall be required to provide certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of Vendors other than companies) giving the percentage of local content

1.1.1.1.3 False declarations will be in breach of the code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules (GFR)for which a

vendor or its successors can be debarred for up to two years as per Rule 151(iii) of the general Financial Rules along with such other actions as may be permissible under Law

1.1.1.1.4 A Vendor who has been debarred by any procuring entry for violation of this order shall not be eligible for preference under this order for procurement by any other procuring entity for the duration of the debarment

1.2.2.6 The percentage of local content should be specifically mentioned in the offer, without which it will be summarily rejected

1.2.2.7 Preference will be given to Class-I Local Vendor and in their absence, Class-II Local Vendor will be considered

1.2.2.8 Overall Make In India (MII) content in % w.r.t overall cost shall be provided.

1.2.2.9 The % of MII content in each sub-system, excluding installation & commissioning, shall be given in the technical bid

1.2.2.10 Addition of % MII content of all sub-systems shall match with the overall % of MII of complete system

1.2.2.11 Only the % of MII content (w.r.t the overall cost) shall be submitted in Technical bid. **Cost shall NOT be quoted in technical bid**

1.2.3 **Technical Terms**

1.2.3.1 The configuration of major items like PLC, SCADA etc., shall be reviewed and approved by original equipment manufacturer (OEM). If any of the item supplied as part of this contract is not meeting the system requirement or any compatibility/ interface issues with other systems are found at any stage of the project, same shall be replaced by the bidder with suitable items without any additional cost.

1.2.3.2 Bidder shall arrange technical training on the offered System to the department engineers at SDSC SHAR by OEM trainers for PLC & SCADA system including programming for a period of at least 10 days.

1.2.3.3 Factory Acceptance Test (FAT) procedures (verification of BOM, functional checks, compliance to specifications, load test, burn-in test, software testing, diagnostics data, alarms and report generation check etc.,) and Site Acceptance Test (SAT) proceduresshall be submitted to department for approval prior to FAT/SAT.

1.2.3.4 During Factory Acceptance Test (FAT), system shall be demonstrated for a period of 72hrs continuous burn-in test in an integrated mode to meet the functional, performance and redundancy requirements.

1.2.3.5 All the supply items specified in tender will be inspected by department Central Level Inspection Panel engineers at factory during FAT for dispatch

clearance. Necessary test set up and test equipment shall be arranged by supplier.

1.2.3.6 Supply of PLC IDE licenses & SCADA SW licenses shall be provided within 8 weeks of PO release

1.2.3.7 After delivery of items to site, the Erection works shall be taken up after obtaining necessary clearance from the department.

1.2.3.8 System must tolerate any single point failure of elements in the chain.

1.2.3.9 Bidder will be responsible for meeting the Reliability, Availability, Maintainability and Safety (RAMS) requirements as per standards. Safety, Reliability and Quality Assurance (SR & QA) shall encompass all activities of design, procurement, manufacturing and site works.

1.2.3.10 During the warranty period, the bidder has to perform periodical maintenance once in every three months and unlimited breakdown calls by deploying a trained engineer and shall replace the failed/ malfunctioning items without any additional cost.

1.2.4 General Terms

1.2.4.1 Cost quoted shall be firm and fixed.

1.2.4.2 Bidder can award any part of the work under the scope of this tender to any sub vendor only after obtaining necessary approval from the department. Bidder shall submit relevant information as required by the department to evaluate the capabilities of sub vendor. Department has every right to accept or reject the proposal submitted. Approval of the sub vendor by the department is no way relieves the bidder from his responsibility and the bidder is wholly responsible for execution of work as per the specifications, terms and conditions mentioned in this document.

1.2.4.3 **All items in the bid are technically interrelated and hence overall L1 will be considered for placing the purchase order. Split up of the bid is not acceptable.**

1.2.4.4 Bidder must supply the details of international standard third party certifications of the items supplied.

1.2.4.5 Language of correspondence must be in English for all forms of communication.

1.2.4.6 Any charges towards documentation shall be borne by the bidder

1.2.4.7 Before starting the site work (at SDSC SHAR), the party shall provide insurance as per workman compensation act to all his personnel working at site in Sriharikota against accidents. Till commissioning of equipment, the safe storing and handling of all equipment is in the scope of supplier.

1.2.4.8 The transfer of title of PLC based automations systems to the Purchaser (SDSC SHAR) will take place only after satisfactory erection, testing and commissioning of the all equipment by the supplier and full acceptance by

the Purchaser (SDSC SHAR).

1.2.4.9 Quote shall be based on F.O.R. Sriharikota.

1.2.4.10 GST details are given below:

GSTIN	: **37HYDF00385A1DZ**
LEGAL NAME	: FINANCE AND ACCOUNTS DIVISION
TRADE NAME	: SATISH DHAWAN SPACE CENTRE SHAR
VALIDITY FROM	: 01/10/2018
TYPE OF REGISTRATION	: REGULAR

For Supply, Installation, Testing and Commissioning including Spares:

These items are used for propellant servicing of Launch Vehicles at launch pad. As per the Notification No. 6/2018-Central Tax (Rate) dt:25.01.2018 A(ix) S.No.243A as amended by Notification No.24/2018-Central Tax (Rate) Dt: 31.12.2018 b(viii) S.No.243B issued by Ministry of Finance (Dept. of Revenue) & Government of Andhra Pradesh, Revenue (Commercial Taxes-II) Department, G.O.MS.No. 93 Dated: 19-02-2018 A(ix) S.No.243A and as per the Notification No. 7/2018-Integrated Tax (Rate) dt:25.01.2018 A(ix) S.No.243A as amended by Notification No.25/2018-Integrated Tax (Rate) Dt: 31.12.2018 b(viii) S.No.243B issued by Ministry of Finance (Dept. of Revenue), SDSC SHAR is eligible to avail GST/IGST @5% for the procurements related to Scientific and technical instruments, apparatus, equipment, accessories, parts, components, spares, tools, mock ups and modules, raw material and consumables required for launch vehicles and satellites and payload. we will issue only End-Use Certificate for availing GST/IGST @5%. Hence, kindly confirm your acceptance and submit your price quotation accordingly.

FOR AMC: GST is applicable as per HSN.

1.2.4.11 Necessary care shall be taken during erection and commissioning of equipment at our site. Any damage to the property of Department shall be adequately compensated by the Party.

1.2.5 **Publicity Related to Tenders**

1.2.5.1 Advertisements, press release or other specialized publicity documents, which are related to or reveal the existence of a tender and are intended by the Bidder for public distribution and/or the press, broadcasting, or television, shall be cleared/approved by the Department.

1.2.5.2 The Department may direct the Bidder to withhold such publicity or to require modifications to the publicity material. The Bidder shall comply with such direction.

1.2.6 Site Visit

1.2.6.1 Bidders can visit and examine the site and its surrounding to familiarize themselves of the existing system, facilities and environment and may collect all other information which may help in preparing and submitting the Bid.

1.2.6.2 Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the Bid and during implementation.

1.2.7 Location Conditions

1.2.7.1 During the erection, testing and commissioning of equipment at site in Sriharikota, the supplier has to make his own arrangements for boarding, lodging and transportation of his men and materials. However, subjected to availability, hostel accommodation may be provided by the Purchaser (SDSC SHAR) on chargeable basis.

1.2.7.2 Party (successful bidder) shall adhere to good daily housekeeping practices during erection of the system. During erection, the party shall keep all work and storage areas used by them free from accumulation of waste materials. Scrap shall be removed from the site to the satisfaction of the purchaser.

1.2.7.3 Free electricity and water will be provided by the Purchaser (SDSC SHAR) for the erection, testing and commissioning works at the site.

1.2.7.4 Satish Dhawan Space Centre – SHAR (SDSC-SHAR) Sriharikota is declared as prohibited place under Official Secrets Act 1923. Necessary security requirements enforced by the department from time to time shall be followed strictly during the execution of site works.

1.2.8 Validity of Offer

1.2.8.1 Bid shall remain valid for acceptance for a **period of six months** from the due date of opening of the Bid.

1.2.8.2 The Bidder shall not be entitled during the above said period to revoke or cancel his Bid or to vary the Bid except and to the extent required by Department in writing.

1.2.9 Cost of Bidding

All direct and indirect costs associated with the preparation and submission of Bid (including clarification meetings and site visit, if any), shall be in the scope of Bidder's account and Department will not be responsible or liable for those costs, regardless of the conduct or outcome of the Bid process.

1.2.10 **Project Monitoring**

1.2.10.1 Bidder shall provide details of project team with their bio-data.

1.2.10.2 Party shall submit the project status report for every 15 days mentioning the status of various activities w.r.t. planned schedule for realization.

1.2.10.3 Party shall depute their Project team/ engineers for Monthly meeting to review the status and discuss/ resolve minor issues related to project execution at SDSC SHAR/ party's site based on mutual agreement on mutually agreeable dates.

1.2.11 **Arbitration**

1.2.11.1 In the event of any dispute/s, difference/s or claim/s arising out of or relating to the interpretation and application of the Contract, such dispute/s or difference/s or claim/s shall be settled amicably by mutual consultations of the good Offices of the respective Parties and recognizing their mutual interests attempt to reach a solution satisfactory to both the parties. If such a resolution is not possible, within 30 days from the date of receipt of written notice of the existence of such dispute/s, then the unresolved dispute/s or difference/s or claim/s shall be referred to the Sole Arbitrator appointed by the Parties by mutual consent in accordance with the rules and procedures of Arbitration and Conciliation Act 1996 as amended from time to time. The arbitration shall be conducted at SDSC SHAR, Sriharikota as per its rules and regulations. The expenses for the Arbitration shall be shared equally or as may be determined by the Arbitrator. The considered and written decision of the Arbitrator shall be final and binding between the Parties. The applicable language for Arbitration shall be "English" only

1.2.11.2 Work under the Contract shall be continued by the VENDOR/Service provider during the pendency of arbitration proceedings, without prejudice to a final adjustment in accordance with the decision of the Arbitrator unless otherwise directed in writing by the PURCHASER or unless the matter is such that the works cannot be possibly continued until the decision (whether final or interim) of the Arbitrator is obtained

1.2.11.3 In case order is concluded on the Public Sector Undertakings, the following Arbitration Clause will be applicable

1.2.11.4 In the event of any dispute(s) or difference(s) relating to the interpretation and application of the provisions of the commercial contracts between ISRO/SDSC SHAR & Central Public Sector Enterprises (CPSEs)/Port Trusts inter se and also between ISRO/SDSC SHAR & CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute(s) or difference(s) shall be taken by either party for resolution through the

"Administrative Mechanism for Resolution of CPSEs Disputes (AMRCD)", as mentioned in the Office Memorandum F No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22nd May, 2018 issued by the Director of the Department of Public Enterprises (DPE) under the Ministry of Heavy Industries and Public Enterprises, Government of India.

1.2.11.5 Applicable law and jurisdiction: The laws of India shall govern this RFP / tender for the time being in force. The courts of Andhra Pradesh, India only shall have jurisdiction to be with and decide any legal matters or disputes whatsoever arising out of the purchase order.

1.2.12 **Combined Bank Guarantee (Performance Security)**

1.2.12.1 The bidder shall guarantee for the performance of the contract by providing bank guarantee in favour of the purchaser for an amount of 3% of the total value of this contract (purchase order) within 15 days of award/release of Purchase Order (contract) as per the format issued by the purchaser.

1.2.12.2 Performance Security may be furnished in the form of Insurance Security Bonds, Account Payee Demand Draft, Fixed Deposit Receipt from a commercial Bank, Bank Guarantee (including e-Bank Guarantee) from a Commercial bank executed on Rs.200/- non-judicial stamp paper or online payment in an acceptable form and shall be valid till the completion of total contractual obligation (i.e., Supply period PLUS commissioning period PLUS warranty period PLUS 60 days).

1.2.12.3 The This will not carry any interest and shall be returned to you after successful completion of contractual obligations against your request.

1.2.12.4 In case of non-performance/poor performance/breach of contractual obligations, bank Guarantee shall be forfeited and in case if the vendor fails to furnish the performance security deposit within the specified date, the Purchase Order/Contract liable to be cancelled.

1.2.12.5 The format for the performance bank guarantee shall be obtained from purchaser.

1.2.13 The bidders should note that conditional discounts would not have edge in the evaluation process of tenders.

1.2.14 **Liquidated damage**

Time is the essence of this order. If the scope of work as per Purchase Order is not completed within the delivery schedule, liquidated damage will be levied @ 0.5 % per week or part thereof on undelivered portion as pre-estimated damages subject to a maximum of 10% of the order value.

1.2.15 Force majeure

A Force Majeure (FM) means extraordinary events or circumstance beyond human control such as an event described as an act of God (like a natural calamity) or events such as a war, strike, riots, crimes (but not including negligence or wrong-doing, predictable/seasonal rain and any other events specifically excluded in the clause). An FM clause in the contract frees both parties from contractual liability or obligation when prevented by such events from fulfilling their obligations under the contract. An FM clause does not excuse a party's non-performance entirely, but only suspends it for the duration of the FM. The firm has to give notice of FM as soon as it occurs (say, not later than 14 days after its occurrence), and it cannot be claimed ex-post facto. There may be a FM situation affecting the purchase organization only. In such a situation, the purchase organisation is to communicate with the supplier along similar lines as above for further necessary action. If the performance in whole or in part or any obligation under this contract is prevented or delayed by any reason of FM for a period exceeding 90 (Ninety) days, either party may at its option terminate the contract without any financial repercussion on either side.

Notwithstanding the punitive provisions contained in the contract for delay or breach of contract, the supplier would not be liable for imposition of any such sanction so long as the delay and/ or failure of the supplier in fulfilling its obligations under the contract is the result of an event covered in the FM clause.

1.2.16 Risk and Cost Purchase

1.2.16.1 The contractor shall arrange comprehensive risk coverage at his own cost covering the value of equipment including transportation to the site from manufacturer's works, storage at site, fabrication, erection, testing and commissioning at site. The period of such coverage shall be up to contractual completion period or any extension granted by Purchaser thereof

1.2.16.2 Timely delivery of goods/services is of prime importance and where the bidder fails to fulfil their contractual obligations, the Procuring Entity shall be entitled, and it shall be lawful on his part, to procure Stores and/ or services similar to those ordered/cancelled, with such terms and conditions and in such manner as it deems fit at the "Risk and Cost" of the Contractor and the Contractor shall be liable to the Procuring Entity for the extra expenditure, if any, incurred or accrued by the Procuring Entity for arranging such procurement. However, the

Contractor shall not be entitled to benefits if any, from such procurements

1.2.16.3 Prior to resorting to risk purchase the Purchaser shall consider impact of the default by the contractor, proper notice to the contractor to invoke risk purchase clause and method of recovering the additional amount spent by the Purchaser. The cost as per risk purchase exercise may be recovered from the Earnest Money Deposit/ Security Deposit/ Performance Security of the Vendor and/or bills submitted by the Vendor against the same contract or any other contract. GST will be charged / levied on Risk Purchase as per the provision of GST Act Rule thereon

1.2.16.4 Risk purchase action may be initiated under any of the following condition

- When the Vendor fails to deliver the materials even after extending the delivery period
- When the Vendor fails to respond to purchaser request for supply of the materials and fails to provide any genuine and bonafide reason for the delay in supply
- When the Vendor breaches any of the terms and conditions of the supply order/ contract and as a result fails to execute the order satisfactorily

1.2.17 **Warranty /Guarantee**

The PLC based Process Automation System and related accessories shall be guaranteed against any manufacturing defects for a period of 24 months from the date of supply or 18 months from date of commissioning whichever is earlier. During this period bidder has to provide and adhere to the following:

(a) For defects noticed during the guarantee period, replacement rectification should be arranged at free of cost within a reasonable period of such notification.

(b) Upon oral or written notification of defect in or malfunctioning of the goods during the warranty period which require corrective action, bidder shall send the necessary personnel to job site to supervise and assume responsibility for repair and/or replacement, if necessary, of the defective goods or material at his own cost. If bidder doesn't respond, within seven days after receipt of notification, the department has got every right to resolve reported problem and department may do so at the cost and expense of the bidder. Bidder shall reimburse to the department all expenses incurred by the department to repair

or replace malfunction or non-conforming goods and forfeit the performance security.

(c) Software updates or services shall be carried out during warranty period at free of cost.

(d) During the warranty period, the successful bidder has to attend quarterly visits for preventive maintenance and unlimited breakdown calls.

(e) Department will not provide any transport/accommodation for this purpose.

1.2.18 Non-acceptance of any conditions wherever called for related to Guarantee/ Warranty, Performance Security, Liquidated damages, the bids are liable for disqualification.

1.2.19 **Payment Terms**

Our Standard payment terms are 100 % + taxes after system commissioning and acceptance.

However, if the bidder insists, SDSC SHAR may consider milestone payment as given below

1.2.19.1 Not exceeding 30% advance on supply portion against submission of advance bank guaranteefrom Nationalized/scheduled bank on Rs. 100/- stamp paper valid till completion of scope of work.

1.2.19.2 60% on supply portion along with taxes after FAT by our department Center Level Inspection Panel (CLIP) and receipt of items at SDSC SHAR.

1.2.19.3 10% on supply portion along with 100% of Installation & commissioning charges after successful commissioning of the system/item and acceptance by our Centre Level Inspection Panel (CLIP)on submission of Performance Bank Guarantee (PBG).

1.2.19.4 Wherever advance payment is requested, Bank Guarantee from any commercial Bank on Rs.200 non-judicial stamp paper should be furnished for the equivalent amount valid till completion of total scope of work plus 60 days.

1.2.19.5 After drawl of advance payments, if the vendor/supplier is not supplying the material within the delivery schedule, the advance amount will be recovered and interest will be levied as per the Bank Lending Rate of SBI plus 2% penal interest.

1.2.19.6 In case of any delay attributable to the contractor/supplier in effecting the supply after the prescribed delivery date. Interest at MCLR of SBI will be charged for the period beyond the specified delivery date, on the amount of balance advance payment in addition to LD.

1.2.19.7 Interest will be loaded for advance payments/stage payments as per the Base rate of RBI and will be added to the landed cost for comparison purpose. In case of different milestone payments submitted by the parties, a standard and transparent methodology like NPV will be adopted for evaluating the offers.

1.2.20 **Delivery**

1.2.20.1 Delivery schedule is essence for this contract. Vendor shall adhere to the delivery date as per the following schedule.

S.No	Description	Schedule
1.	Purchase Order release	T_0
2.	Detailed Engineering Drawings	T_0 + 4 Weeks (T_1)
3.	Approval of Detailed Engineering drawings by department	T_1 + 2 weeks
4.	Supply of items in Purchase Order	T_0 + 28 weeks
5.	Installation and Commissioning of entire scope of PO	Site Clearance by Department + 12 weeks

Note: - LD is applicable for total scope of PO; that is supply, installation and commissioning as per LD clause.

1.2.21 **PURCHASE PREFERENCE TO MICRO AND SMALL ENTERPRISES (MSES)**

Purchase preference to Micro and Small Enterprises (MSEs): Purchase preference to Micro and Small Enterprises (MSEs): Purchase preference will be given to MSEs as defined in Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012 dated 23.03.2012 issued by Ministry of Micro, Small and Medium Enterprises and its subsequent Orders/Notifications issued by concerned Ministry. If the bidder wants to avail the Purchase preference, the bidder must be the manufacturer of the offered product in case of bid for supply of goods. Traders are excluded from the purview of Public Procurement Policy for Micro and Small Enterprises. In respect of bid for Services, the bidder must be the Service provider of the offered Service. Relevant documentary evidence in this regard shall be uploaded along with the bid in respect of the offered product or service. If L-1 is not an MSE and MSE Seller (s) has/have quoted price within L-1 plus 15% of margin of purchase preference/price band defined in relevant policy, such Seller shall be given opportunity to match L-1 price and contract will be awarded for 100% (selected by Buyer) percentage of total QUANTITY. Please specify whether you belong to MSE or not. If YES, supporting documents shall be uploaded.

1.2.22 Packing & Forwarding

1.2.22.1 The bidder shall arrange to have all the material suitably packed as per the standards & statutes and as specified in the contract. Unless otherwise provided for in the contract, all containers (including packing cases, boxes, tins, drums, and wrappings) used by the bidder shall be non-returnable. All packing and transport charges, transit handling costs, transit risk coverage and transport fees of agents employed at the place of delivery or elsewhere, shall be deemed included in the price to be paid to the bidder. Unloading support may be provided by department on chargeable basis, if requested by the supplier.

1.2.23 Exclusion of Tenders

The following tenders shall be summarily rejected from the procurement process

1.2.23.1 Tenders of bidders who have been removed from the vendor list or banned/debarred from having business dealings.

1.2.23.2 The tenders which materially depart from the requirements specified in the tender document or which contain false information.

1.2.24 **Drawings**

1.2.24.1 Each drawing submitted by the Bidder shall be clearly marked with the following details.

a) Name of the Owner: Satish Dhawan Space Centre -SDSC SHAR, ISRO
b) Project Title: Supply, Installation and Commissioning of PLC based Process Automation System
c) Purchase Order No:
d) Title of the Drawing clearly identifying the system, equipment or part.
e) Drawing, Revision Number and Date.
f) Name of the Bidder:
In case of Sub-Vendor or Manufacturer's drawing, name of the Bidder and Sub-Vendor or Manufacturer shall be incorporated.
g) Drawings duly signed in "checked" and “approved" columns.
h) Scale to which the drawing is drawn.
i) Cross references to all relevant drawings.

1.2.24.2 The drawings shall indicate all dimensions and details of equipment, materials of construction etc.

1.2.24.3 For all revisions of the drawing, Bidder shall ensure that all revisions are clearly encircled with revision numbers marked on the drawing.

1.2.24.4 Bidder shall also ensure that general details of revisions are indicated for each revision in the revision block of the drawing along with the date and signed by the approving authority.

1.2.25 **Documents Comprising the Bid**

1.2.25.1 Being an ISRO E-Procurement tender, all the necessary documents need to be scanned and attached to the bid under “documents solicited from Vendor” form. In case it is not possible to upload due to higher file size, hard copy of the documents (without any price figures) shall be submitted physically before due date.

1.2.25.2 Offers shall be sent online only using standard digital signature certificate of class III with encryption / decryption. The tenders authorized online on or before the open authorization date and time only will be considered as valid tenders even though the bids are submitted online.

1.2.25.3 The bidder must authorize bid opening within the time stipulated in the schedule by SDSC SHAR. Otherwise the online bid submitted will not be considered for evaluation.

1.2.25.4 The Tender shall be submitted in “two bid system” in two parts viz. PART-1 (Technical and un-priced commercial Bid) and PART-2 (Priced Commercial Bid) as detailed below through online mode only.

On-line bids shall consist of the following: –

Part – 1	**Technical &un-priced commercial Bid:** Technical & commercial aspects of the offer with **NO PRICE** indicated
Part – 2	**Price Bid:** This part shall contain only PRICE and **no conditions** whatsoever. Any condition mentioned in Part-2 of the tender shall not be considered at the time of evaluation of the tender and such offer will be rejected.

1.2.26 **Part – I: Technical and Un-Priced Commercial Part**

Technical and un-priced commercial part shall comprise the following documents/information. All the documents shall be scanned and uploaded in the ISRO E-Procurement portal.

1.2.26.1 Submission of bid letter along with one set of proposal document shall be duly signed and stamped as a token of acceptance. Scanned copy shall be uploaded in the ISRO E-Procurement portal.

1.2.26.2 Power of attorney in favour of authorized signatory of the bid/ proposal documents.

1.2.26.3 Latest income tax clearance certificate for the last 3 years.

1.2.26.4 Latest solvency certificate from any commercial bank as detailed in bid qualification criteria for an amount of not less than Rs. 200 Lakhs. Date of Solvency certificate should be on or after 01-01-2025.

1.2.26.5 List of projects in hand & completed during last seven financial year indicating the name of client with contact details.

1.2.26.6 Any other relevant document, bidder desires to submit.

1.2.26.7 Confirmation w.r.t bid qualification criteria as per Annexure -1.

1.2.26.8 Compliance statement as per Annexure -2 and Annexure -3.

1.2.26.9 Deviations, if any, w.r.t technical and commercial terms & conditions shall be clearly brought out under deviation list Annexure-4. If no deviations, NIL to be placed in the annexure-4 and to be submitted.

1.2.26.10 Technical literature/ catalogue, information of materials is under Contractor's scope of supply.

1.2.26.11 Submission of the information and details shall be done strictly in the manner described. **PRICE SHALL NOT APPEAR ANYWHERE IN PART – 1 OF THE TENDER.**

Note: All the above documents shall be uploaded in the ISRO E-Procurement Portal.

1.2.27 Part – II Price Bid

Priced commercial bid shall contain schedule of prices and shall be filled in ISRO E-Procurement portal. No deviations, terms and conditions, assumptions, discounts etc. shall be stipulated in price bid. Department will not take cognizance of any such statement and may at their discretion reject such bids. The price offered by the bidder shall not appear anywhere in any manner in the Technical Bid.

1.2.28 Pre-Bid Meeting

Vendors are requested to participate in the pre-bid meeting, if needed as per the details given in the tender for better understanding of the scope of work and get clarifications if any required. No modifications to the scope in Techno-commercial discussions. The Pre-Bid meeting will be held in Hybrid mode (Online mode or Offline mode). Bidder shall depute his authorized representatives for attending discussion or attend in online mode. Bidder shall intimate the preferred mode of attending the pre bid meeting through mail at least two days in advance before the pre- bid meeting schedule for arranging gate pass (indicate Name, Designation & Aadhaar No., Driver and Vehicle details if any for attending offline mode) or in case of attending online request for meeting link.

Please note that offline meeting venue will be 10 kms from Shiharikota Main Gate.

Please contact the following officers regarding the details of pre-bid meeting Shri Satyanarayana Ch V, Purchase & Stores Officer (LSSF), e-mail: psolssf@shar.gov.in.

1.2.29 Bid Submission

1.1.28.1. Offers should be submitted on ISRO E-procurement site only using standard digital signature of class -3 with encryption/decryption options.

1.1.28.2. The tenders authorized on or before the open authorization date and time will only be considered as valid tenders.

1.1.28.3. Prices shall be mentioned in the space/column provided in the ISRO E-Procurement portal only for such purpose.

1.1.28.4. Bids duly filled in by the Bidder should invariably be submitted as stipulated in the ISRO E-Procurement portal.

1.1.28.5. Department may open Part–1 of the bid on the due date of opening at convenience. Part-2 of the bid (technically and commercially acceptable bids) shall be opened at a later date.

1.1.28.6. Department reserves the right to reject any or all the Bids without assigning any reasons thereof.

1.2.30 Bid Evaluation

1.2.30.1 The bidder shall provide all the relevant data/information/details required for evaluating the bid technically and commercially in the specific formats enclosed with the tender. Apart from this, bidder is free to add any other relevant information.

1.2.30.2 During the evaluation, department may request Bidder for any clarification on the bid/ additional documents/ information required. Bidder shall submit all clarifications/ additional documents/ information requested in original. If not submitted within the stipulated time department has right to reject such bids.

1.2.30.3 Techno-commercial discussion shall be arranged with Bidder, if needed. Bidder shall depute his authorized representatives for attending discussion. Techno-commercial discussion is for the probable bidders to understand the requirements and site conditions better. No modifications to the scope in Techno-commercial discussions. Pre-bid meeting option should be provided but non-participation in the pre-bid meeting should not be taken as non-compliance for vendor qualification.

1.2.30.4 The complete scope of work is defined in the Proposal document. Those Bidders who undertake total responsibility for the complete scope of work as defined in the Proposal document will only be considered.
In case bid does not fully comply with the requirement of Proposal document and the bidder stipulates deviations to the clauses of the proposal, which are unacceptable to the Department, the bid will be rejected.

1.2.30.5 The time schedule for completion of the project is given in this document. Bidder is required to confirm the supply and commissioning period unconditionally.

1.2.30.6 Department shall not be obliged to furnish any information / clarification to unsuccessful bidder as regard to non-acceptance of their Bids.

List of Annexures

Sl. No.	Description
Annexure-1	Bid qualification criteria
Annexure-2	General Compliance Statement
Annexure-3	Technical Compliance Statement
Annexure-4	Deviations if any
Annexure-5	BOM of automation systems
Annexure-6	BOM of spares
Annexure-7	Bidder's Checklist
Annexure -8	Price Bid Format

2 Spares

Spares for all major items of PLC System (PLC Modules, necessary interface boards, DC power supplies, network switches, FO accessories, Panel accessories, pre-fab cables etc.,) in bill of materials of PLC based process Automation Systems must be supplied. Tentative BOM of spares to be supplied are provided in Annexure-6 as reference. However actual BOM shall be finalized based on BOM of Automation Systems and details shall be provided as per Annexure-6.

3 SDSC SHAR deliverables at Site

The following items will be provided by the department at site free of cost during installation and commissioning.

3.1. **Leech make Group authorization relays** used in DO interface chain.

3.2. Field cables with **MIL Connector's mating part** to interface the existing instrumentation system to the PLC IO panels. However, supply and wiring of MIL Connector's **receptacles part** is in supplier scope.

4 Scope of work

The Scope of work is broadly classified as given below:

4.1. Removal of existing old PLC panels from respective Control rooms and shifting to the identified location by retaining the existing instrumentation interfaces.

4.2. All Hardware and Software shall be STATE-OF-THE-ART at the time of delivery.

4.3. Supply of hardware related to Controllers with necessary accessories (interfacing circuitry, prefab cables with necessary mating connectors, relays etc.,) built-in at factory in fully pre-wired and tested cabinets as per specifications, maintenance spares and associated systems and sub-systems etc., provided in the tender document.

4.4. Supply, Installation and Commissioning of SCADA components such as Servers, network components and operator stations.

4.5. Supply of the necessary Operating system, Application software development tools / environments, standard libraries for process control applications, software packages and supporting tools for the Controller, SCADA and interface components.

4.6. Supply of receptacle part of MIL connectors for the **existing instrumentation interface** and required receptacle & mating connectors for additional I/O requirement within the PLC panel as per the details provided in the document.

4.7. Supply of necessary interface boards including relays for interfacing the IO Modules to the existing Instrumentation system.

4.8. PCB circuit design soft copy for interface boards (DI, DO, AI, AO & PI) shall be provided.

4.9. Erection of the system at site and integration with existing instrumentation system (including MIL connector terminations etc.,), testing and commissioning of the system as per approved test procedures.

4.10. Laying and termination of power / control and data cables as per the requirement.

4.11. All the miscellaneous items like Power cables from PDB to RPOP systems and RPOP systems to RIO nodes, cable glands, lugs, terminal blocks & internal wirings required for realizing the above systems. Party shall obtain approval prior to procurement of the above items for its make & model.

4.12. Supply of installation material required for system commissioning.

4.13. Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) to be conducted to demonstrate the functional specifications of each of the items being purchased and overall performance specification.

4.14. FAT & SAT documents shall be generated by the supplier as per mutually agreed test procedures.

4.15. Necessary test jigs for sub system level testing of pre-wired PLC panel during FAT and SAT for all the types of IO channels must be provided.

4.16. Ten days Training on the system to the SDSC SHAR engineers at SHAR. The training will include the following

a) Installation and configuration of control systems hardware
b) Configuration and usage of the system software
c) Application software development at controller, server and client
d) Hardware and software fault diagnostics and necessary maintenance

4.17. Technical support with expert developers during Application Software development activities shall be provided for minimum human-day requirement of 100 days. The expert developers shall be available at site based on the request from SDSC SHAR. This should be listed in BOM and the cost for 100 human days shall be provided in the price bid.

4.18. Laying and termination of Fiber optic patch cards as per configuration finalized during detailed engineering and generation of test reports.

4.19. Removal of existing Safety Hardline panel and installation, commissioning new Safety Hardline panel, the detailed works are mentioned in subsequent chapters.

4.20. Existing field instrumentation cables entering into PLC Panels are disturbed during commissioning for any reason shall be normalized (re-routing / re-connectorisation/ glanding) by the bidder as per the requirements.

4.21. List of documents to be submitted in English (3 sets of soft & 2 set of printed copy)

a) Full set of as built drawings (system configuration, GA, as built wiring, cable layout etc.,).
b) Final BOM with make & model number.
c) All technical catalogues and datasheets of all items.
d) PLC and SCADA System reference manual
e) All test results (Internal tests by bidder, FAT, software test results, SAT etc.,).
f) Warranty certificates.
g) Passwords/ Licenses/ Operating keys etc,
h) Any other relevant document not listed above.

4.22. Non-Comprehensive Annual maintenance contract of the system for a period of 3 years from the date of completion of warranty / guarantee period.

5 Detailed engineering

5.1. Preliminary design of the proposed system architecture with associated interfaces must be provided prior to detailed design.
5.2. Bidder shall obtain clearance for panel engineering drawings, I/O wiring schemes and Technical specifications of all the items from Department prior to the commencement of supply, erection and commissioning activities.
5.3. Detailed design of system architecture, power supply distribution, panel internal general arrangements, IO Module allocation, IO module wiring to interface boards and from interface boards to field MIL connectors.
5.4. Detailed engineering of the control system HW and interfacing schemes system shall be supplied along with necessary documents based on inputs given by the department.
5.5. The PLC racks will have provision for cable entry through metallic glands through false floor. All the cables entering or leaving the control systems racks should be through double compression type metallic cable glands and terminated in plug-in-type MIL standard circular multi- pin connector. The termination to the connectors will be of crimp type with suitable ferruling. The control DC wiring will be completely isolated from the AC wiring with in racks or consoles.
5.6. Detailed specifications and makes of all components used for the system shall be provided.
5.7. All the cables, terminal blocks, screws etc. shall be as per IS standard and all the cables should have overall shield.
5.8. Preparation of electrical interconnection loop drawings.
5.9. Plan for equipment layout in the proposed buildings depicting all interconnections including the power distribution.
5.10. Preparation of all drawings in CAD or equivalent. Drawings to be provided in both HARD and SOFT copies.

5.11. Panel Drawings/Specifications/catalogues and other documents for submission in two copies for approval and further revisions.
5.12. Layout plan as per requirement.
5.13. Point to point connection details for prefab cables used between modules to interface boards and from interface boards to connectors.
5.14. Fibre optic system engineering includes termination details of the patch cards in the LIU and the overall Fibre optic connectivity diagrams.
5.15. Gland plate and MIL connector fixing bracket details.
5.16. Preparing detailed functional design specifications, FAT and SAT documents.
5.17. Preparation of channel wise IO schedule having details from the module side till the MIL connector end.
5.18. System software configuration for the PLC and SCADA.
5.19. Providing all relevant test reports of major items used in the system.

6 Non-Comprehensive AMC for the systems

6.1 Terms & Conditions

6.1.1. Non-comprehensive AMC of the offered system must **include preventive maintenance and breakdown maintenance**. Separate PO shall be released for NC-AMC after the warranty period is over.

6.1.2. AMC shall include all the items in Automation System, Manual Safing System and RPOP Systems except third party Servers and Client Stations.

6.1.3. AMC team will not be paid any transport fare to reach SDSC SHAR. AMC team can make their own arrangements for boarding and lodging.

6.1.4. A week prior intimation will be given to the bidder regarding date and time of quarterly maintenance activity.

6.1.5. Bidder is solely responsible for coverage of their work force under different statutory regulations including workmen's compensation act, factory act, labour act, minimum wages act and other relevant statutory regulations.

6.1.6. Bidder shall ensure that all safety precautions are invariably taken to safeguard accidents and injuries to their own workmen.

6.1.7. SECURITY DEPOSIT (SD) for AMC: If Order value exceeds Rs.5 Lakh, Security Deposit shall be submitted for 3% of the order value (or as notified by Govt. Of India/ISRO from time to time) in single instalment through Insurance Surety Bonds/ Account Payee Demand Draft/ Bankers Cheque/ Fixed Deposit Receipts or Bank Guarantee (including e-Bank Guarantee) from a Commercial bank executed on Rs.200/- non-judicial stamp paper or payment online in an

acceptable form within 14 days after receipt of Purchase Order valid till completion of the Delivery period plus 60 days claim period. This security deposit shall not carry any interest and shall be returned to you only after successful completion of total scope of work. In case of poor performance/ non performance/breach of the contractual obligation security deposit shall be forfeited. In case of non submission of Security deposit within the stipulated period, this order shall be liable to be cancelled.

6.1.8. PENALTY CLAUSE: In case, services provided by the contractor is unsatisfactory during any period and any breach of contract occurs, no payment will be made on that particular service and 5% penalty will be levied on the Bill of contractor for that period.

6.1.9. FALL CLAUSE: The service charges quoted by you shall in no event exceed the lowest charges at which you service the machines of identical description to any other party during the period of this Contract. If at any time during the said period, you reduce the service charges of such item to any other customers, it shall be forth with done after the date of coming in to force of such reduction of service charges shall stand correspondingly reduced.

6.1.10. Down-Time Compensation will be levied @ 0.5% of each maintenance charge per day subjected to maximum of 5% of total AMC value, in case the successful bidder fails to report the preventive or break down maintenance call within the allotted intimation period (one week of preventive maintenance and 48 hrs for break down maintenance) from the date of receipt of information from SDSC SHAR (including Sunday and Holidays).

6.1.11. The bidder shall pay all the relevant insurance, wages and taxes as per rules and regulations prevailing at the time of payment to the AMC team and department shall not entertain any claim whatsoever in this respect.

6.1.12. The bidder should make necessary arrangement for reception of maintenance calls during working hours. Maintaining a Call register is mandatory.

6.1.13. The maintenance Agency should observe the security procedures applicable at SDSC SHAR. SDSC SHAR, Sriharikota is declared as Prohibited Place under Official Secrets Act, 1923 and infiltrators in to the Premises of SDSC SHAR are liable for prosecution. The bidder should ensure that persons of trustworthy bearing good Character, discipline and Antecedents are only posted/employed to carry out works related to contract awarded and take the responsibility for their proper conduct during the period of employment.

6.1.14. SDSC SHAR will not be responsible for any injury to your personnel, damage to your property, caused at site.

6.1.15. The security regulations of the centre should be faithfully observed and any loss or damage incurred by us on account of your failure of any nature to follow such security regulations will be to your account.

6.1.16. SDSC SHAR will identify one/two Contract coordinator/s and he/she will

a) Supervise/Follow up the maintenance activity.
b) Recommend the quarterly payments.
c) Evaluate the spares being replaced, if needed.

The bidder shall carry out the instructions of Contract Coordinator / authorized representative in all technical aspects. Bidder should provide detailed report about maintenance status and Preventive maintenance activities whenever the Coordinator requests the same.

6.2 **Frequency of visits**

6.2.1 Preventive Maintenance visits: 4 Normal visits in a year.

6.2.2 Breakdown Maintenance: As and when required.

6.2.3 In case of breakdown maintenance Bidder should attend the problem within 48 hours from the date of receipt of information (including Sunday and Holiday). The department will provide the necessary spares for rectification.

6.3 **Payment Conditions**

6.3.1 Invoice along with the detailed report of the maintenance should be sent to the department by the end of every quarter. Payment will be approved within one month after submission of the invoice and maintenance report.

6.3.2 No payment will be made in advance by the SDSC SHAR.

6.3.3 No payment will be made for break down maintenance separately during the AMC period.

6.3.4 In case the bidder knowingly or unknowingly found causing any damage to systems in SDSC SHAR, suitable cost as worked out by SDSC SHAR will be recovered.

6.4 **Scope of Work for AMC**

6.4.1 Test and verify the functionality of PLC hardware in the system to ensure satisfactory performance of the same.

a) Redundancy checks of PLC CPU
b) Testing of all the PLC modules for proper functioning

c) Diagnostics check of the PLC CPU module and error identification
d) Testing of the PLC communication modules and communication errors identifying using Diagnostics in Status Words
e) Diagnostics testing of all the PLC DI, DO, AI, AO & PI modules status and fault identification
f) Checking of PLC module error logs
g) Testing of rack Power supply modules & DC power supply modules.
h) Checking the healthiness of the batteries & EPROM/Flash PROMs and battery back-up RAM modules
i) Reloading of system software into PLC modules in case of any need/corruption

6.4.2 PLC firmware up gradation.

6.4.3 Ensure Firmware compatibility of all modules including spares.

6.4.4 Logging/recording, of maintenance activities done, problems faced, report generation on tests carried out.

6.4.5 Attending to all the system related problems reported by the department.

6.4.6 Checking of software program through diagnostic routines and status bits.

6.4.7 Check the SCADA system health

a) Redundancy checks of SCADA Servers
b) Communication & Network Healthiness checks of PLC & SCADA systems
c) Checking of Software program for diagnostics and communication status.
d) Checking the healthiness of network components, servers, operator stations and dongles
e) Checking the overall network connectivity at all levels and integrity

6.4.8 Checking the functionality of interface modules and other third party items configured in the system.

6.4.9 Verifying the health of the total system as per the configuration and ensure its normalcy.

6.4.10 Fault finding, troubleshooting and rectification of problems in PLC & SCADA system and Engineering / operator stations, Report generation in case of break down maintenance

6.4.11 Overall checking of the system performance and taking complete backup of PLC & SCADA Software / system files periodically.

6.4.12 Any module(s), software is/are obsolete, the same to be communicated to SDSC at least 6 months in advance.

6.4.13 In any case maintenance/repair activities to be carried out should be briefed to the identified contract co-ordinator and it should be carried out with consent of the contract co-ordinator.

6.4.14 Recovery of license if it gets corrupted or damaged.

6.4.15 Checking healthiness of PLC memory modules and SCADA dongles.

6.4.16 Sample checking of the inputs and outputs (Random Checking).

6.4.17 Voltage & Grounding checks on the PLC Panels.

6.4.18 Supervisory category: Following activities shall be supervised by your Service engineer

a) Cleaning of all panels & checking of Air circulation, Panel temperature, humidity and corrections as applicable.
b) Cleaning of hardware modules, backplanes and contact points and module guide connectors in case needed

6.4.19 Test report on AMC checks carried out shall be submitted as per department standard test procedure.

6.5 **Breakdown maintenance**

6.5.1 Identification of fault in the system.

6.5.2 Rectification of fault by changing the hardware modules with spare unit or by rectifying the software etc.

6.5.3 Checking the entire system after rectification of the fault and ensuring the normalcy of system performance (On Load).

6.5.4 Analyzing the cause of failure and recommending preventive maintenance.

7 Overview of the Proposed System Requirements

The proposed system consists of PLC based process automation system described in detail in this document will be referred as Automation System.

7.1 PLC based Process Automation System

PLC based Automation System consists of a set of four PLC systems (PLC-1 to PLC-4) with hot standby Controllers and associated IOs distributed across four remote locations and redundant SCADA system. Additional PLC system (PLC-5) with hot standby Controller (with Serial and Ethernet interfaces) to acquire data from external system and with other PLC systems. Details of PLC systems with associated IO channel requirement is provided in Table-1,2 &3. The proposed configuration diagram of Process Automation System is provided in Figure-1.

System	CPUs	RIOs
	Hot-Standby CPU	I/O nodes (Configured in TMR)
PLC-1	1	15
PLC-2	1	15
PLC-3	1	18
PLC-4	1	15
PLC-5	1	-
Total	5	63

Table 1:PLC systems & RIO nodes

Card	PLC-1	PLC-2	PLC-3	PLC-4
DO	1056	1056	1248	1248
DI	3072	3072	4032	2880
AI	432	432	480	552
PI	45	45	15	45
AO	12	12	24	36

Table 2:List of IO channels considering TMR I/Os

Table 3: List of IO channels location wise considering TMR I/Os

I/O	PLC-1		Sub-	PLC-2		Sub-	PLC-3			Sub-	PLC-4	Sub-	
CARD	RL1	RL2	Total	RL1	RL3	Total	RL1	RL3	RL4	Total	RL5	Total	Total
DO	288	768	**1056**	288	768	**1056**	768	192	**288**	**1248**	1248	1248	**4608**
DI	768	2304	**3072**	768	2304	**3072**	2496	480	**1056**	**4032**	2880	2880	**13056**
AI	72	360	**432**	72	360	**432**	240	120	**120**	**480**	552	552	**1896**
PI	15	30	**45**	15	30	**45**	0	15	**0**	**15**	45	45	**150**
AO	-	12	**12**	-	12	**12**	0	24	**0**	**24**	36	36	**84**

7.2 RIO deployment configuration

The configuration shown below is for one main node in TMR configuration. Similarly, redundant and triplicate nodes shall be configured. **Modbus Serial modules are shown in absolute numbers need not be triplicated.**

PLC1: RIO Configuration (For one node)

Location	I/O node	DO	DI (DO IR)	DI (DIFT)	DI (DIPT)	AO	AI (AO AI)	DO (AODO)	DI (AODI)	AI (AIPT)	PI	Modbus Serial module
RL1	L1	3	3	4	1	0	0	0	0	3	1	2
RL2	R1	2	2	4	1	0	0	0	0	5	1	2
	R2	2	2	4	1	0	0	0	0	4	1	0
	R3	2	2	4	0	1	1	1	1	3	0	0
	R4	1	1	0	2	0	0	0	0	2	0	0

PLC2: RIO Configuration (For one node)

Location	I/O node	DO	DI (DO IR)	DI (DIFT)	DI (DIPT)	AO	AI (AO AI)	DO (AODO)	DI (AODI)	AI (AIPT)	PI	Modbus serial module
RL1	L1	3	3	4	1	0	0	0	0	3	1	0
RL3	R1	2	2	4	1	0	0	0	0	5	1	2
	R2	2	2	4	1	0	0	0	0	4	1	0
	R3	2	2	4	0	1	1	1	1	3	0	0
	R4	1	1	0	2	0	0	0	0	2	0	0

PLC3: RIO Configuration (For one node)

Location	I/O node	DO	DI (DO IR)	DI (DIFT)	DI (DIPT)	AO	AI (AO AI)	DO (AODO)	DI (AODI)	AI (AIPT)	PI	Modbus serial module
RL1	L1	2	2	4	2	0	0	0	0	2	0	0
	L2	3	3	6	2	0	0	0	0	1	0	0
	L3	3	3	4	0	0	0	0	0	1	0	0
RL3	GR3	1	1	2	1	2	1	1	1	2	1	2
RL4	R1	1	1	2	1	0	0	0	0	2	0	0
	R2	2	2	4	1	0	0	0	0	1	0	0

PLC4: RIO Configuration (For one node)

Location	I/O node	DO	DI (DO IR)	DI (DIFT)	DI (DIPT)	AO	AI (AO AI)	DO (AODO)	DI (AODI)	AI (AIPT)	PI	Modbus serial module
RL5	R1	2	2	0	2	3	2	1	1	4	1	2
	R2	2	2	4	1	0	0	0	0	4	1	2
	R3	4	4	1	0	0	0	0	0	4	1	0
	R4	3	3	6	1	0	0	0	0	0	0	0
	R5	1	1	2	0	0	0	0	0	9	0	0

Abbreviations & Chanel density considered

DI - Digital input (32 channels)
DO - Digital output (32 channels)
AI - Analog input (8 channels)
AO - Analog output (4 channels)
PI - Pulse input (5 channels)
DOIR - DI read back for DO
DIFT – DI field triplicated
DIPT - DI panel triplicated
AIPT - AI panel triplicated
AO_AI - AI read back for AO
AO_DO- DO for AO selection
AO_DI - DI for selection AO

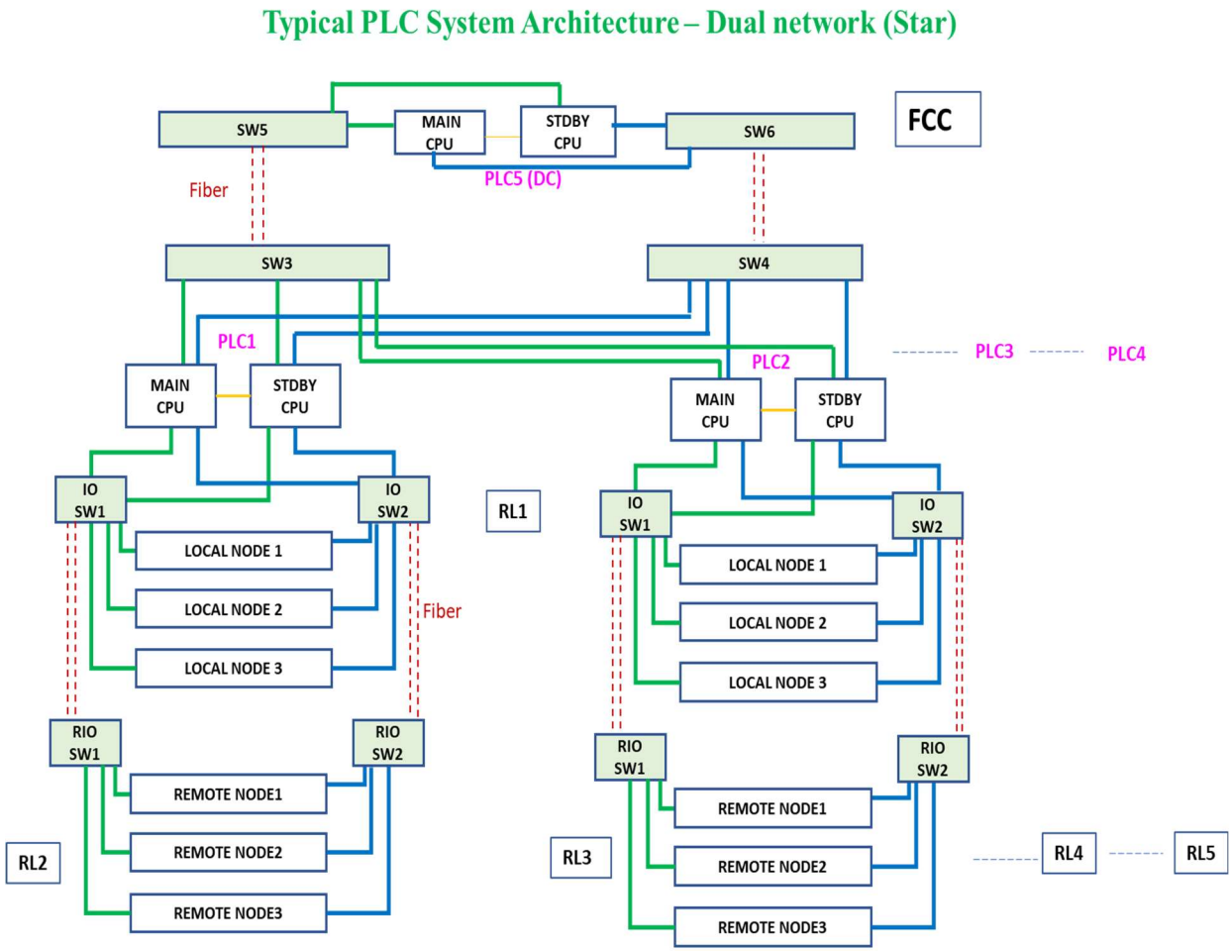


Figure 1Typical PLC System Configuration with Star topology (Hot Standby Controller with TMR IOs)

8 List of major items / sub systems in Process Automation System

Major items / sub systems of the Process Automation System are listed here and their detailed specifications are given in sub-sequent sections.

8.1 PLC Based Controllers with IO's configured in Triple Modular Redundant (TMR) mode:

The proposed control system, based on latest state-of-the-art technology, will be a Dual redundant/Hot standby PLC based system, with IOs configured in TMR mode. The system shall have fault tolerance and self-diagnostic features. The Input/output modules reside in the remote I/O units connected to their respective main controllers. The remote I/O units will be configured based on the functional requirements. The Controllers along with the associated remote I/O units are to be realized for each system and the I/O modules must be interfaced to the existing instrumentation system through interface boards. All the PLCs in a system should be interconnected on a Network (Say Control Network) with dual redundancy. Modbus serial communication modules shall be supplied as per RIO configuration in each location. The PLC systems are henceforth referred to as 'Controllers' as part of this document.

8.2 PLC based Data Acquisition System (Data Concentrator)- Serial/ Ethernet:

The function of the data concentrator is to acquire data from third party communication devices and provide these data to the controllers. The Data concentrator need to interface to RS422 and Ethernet data interfaces. The Data Concentrator should co-exist along with the controllers on the Control Network and provide data to the controllers at the scan cycle rate. The Data Concentrator System should have Hot-Standby redundancy with fault tolerance features built-in.

8.3 SCADA System:

The Controllers must be interfaced to the SCADA System and the user must be able to monitor all IO and program data, control the process from the Control Centre. The SCADA Servers connect to the PLC systems and Data Concentrators on the Control Network. The SCADA client operator terminals must connect to the server in an independent dual redundant network (say Operator Network). Provision should exist, for extending the SCADA client stations to remote IO areas at remote location control rooms to enable operations from these locations. SCADA system should provide centralized database storage in real-time with features like online trending, alarm / event recording, data archival tools with necessary fault tolerance incorporated.

8.4 **Remote Power ON/OFF of the Control System elements and monitoring of panel environment:**

All the Remote IO systems provided at the remote locations at various distributed locations and control centre should be installed in necessary rack mounted enclosures. All the PLC racks and IO racks shall be powered using dual redundant power supply outlets. Each of the independent power outlets should be controllable (Switching ON / OFF) remotely from the Control Centre using mini PLC/Controller (smart MCB/Intelligent MCB).

A Separate Network (independent of the Automation System network) based system to be provided for meeting this requirement with necessary graphical interface to monitor environment parameters (Temperature, Humidity, Voltage, Current, Trip status etc.,) and control power outlets.

8.5 **Manual Safing System**

Manual Safing systems is an Independent standalone PLC system for safing the process systems in case of main Automation Systems fails. The system shall be configured with star topology to connect the SCADA system at Control. Separate SCADA systems with license shall be provided. It shall not be interfaced with main Automation Systems and RPOP PLCs.

8.6 **HART monitoring system for Mass Flow Meters**

A mini PLC/Controller based system with a provision for communicating with the flow meters located at field using HART protocol to acquire and log the configuration and diagnostics parameters of flow meters. The remote controllers shall be positioned at remote locations and the diagnostic data shall be transmitted to the control room. The necessary DTM (Device Type Manager) software shall be suppled. The communication between the Client PC located at the Control room and the field device using FDT (Field Device Tool) environment is to be supplied.

9 Overall Configuration of the Automation systems

9.1 Geographical Distribution of Process Automation System:

The proposed automation system requires set of four dual redundant/ hot stand-by controllers with respective remote IO units, redundant servers, client stations and network systems. The SCADA system to be located at the Control centre and the controller & remote IO units are to be placed at a distance of 7 Km from Control Center.

The Controllers have their I/Os distributed at the remote-control rooms (RL1) near to the launch pad and also at the propellant storage areas (remote locations RL2, RL3, RL4, RL5 in Figure 4) slightly away from launch pad (1km). The Controllers need to interface to their I/Os in dual redundant network (say IO network) and perform the acquisition and control actions.

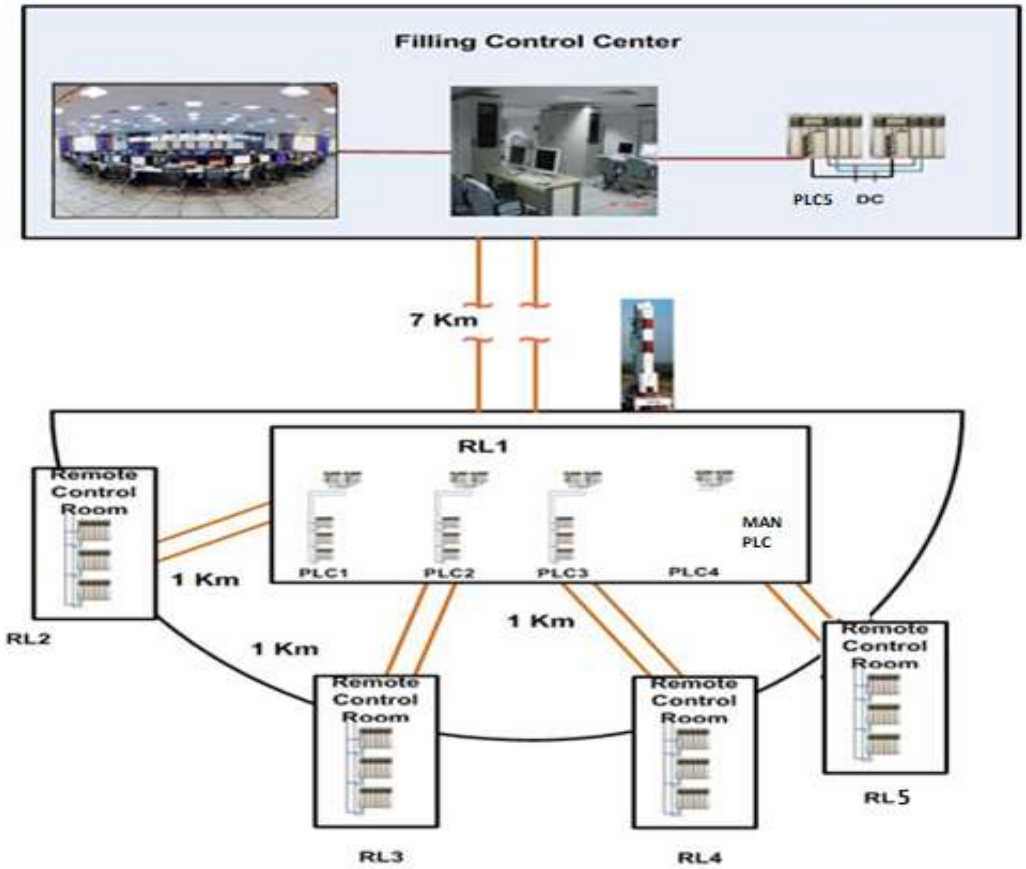


Figure 2 Geographical distribution of Automation System

9.2 Proposed Configurations & Connectivity Diagram:

The PLC controllers must be of dual redundant/hot standby with bump less switchover. All the IOs are to be configured in TMR with necessary hardware voters and software logics for fault tolerance. One set of main, redundant and triplicate nodes form one IO panel. Multiple such IO panels are to be configured as per IO requirements of the corresponding PLC system, the details of which are mentioned in the subsequent sections. Each node (CPU and IO) must be powered by dual redundant power supplies on the same backplane.

Some of the Inputs are available as single input from the field. These IOs are to be triplicated in the panel and given to the main, redundant and triplicate input cards (panel triplicated inputs, DIP/AIP/PIP). The inputs that are available as TMR inputs from field are to be directly interfaced to the respective cards (field triplicated inputs, DIF/AIF). The details of panel triplicated and field triplicated IOs are given in the subsequent chapters. Software voting of the inputs will be implemented and the voted value will be considered by the application. The PLC CPU will post the computed output to the main, redundant and triplicate output cards. Hardware based 2oo3 relay voter will vote the outputs from the three digital output cards and the voted outputs will be fed to the field for energizing main and redundant solenoids. The detailed scheme is provided in the subsequent chapters.

The PLCs should also be able to exchange data with each other on the control network. The Data concentrator must acquire data from third party devices and distribute the processed data on the control network so that other PLCs on the network can access the data at the same scan cycle rate.

The Controllers should connect to the SCADA system (redundant servers) on the control network and the SCADA software must acquire the data (IO and program) and provide supervisory control for all the PLCs. The SCADA clients should be able to access runtime servers for monitoring, control and real time trending on the operator network. The operator network must be extended to the remote-control room and other remote locations so that clients can communicate to server from their respective locations.

The total system configuration must be designed such a way that, single point failure should not be available anywhere in the system and should tolerate at least two dissimilar failures without affecting the functionality. The IO network, Control network and the Operator network must be separate/independent from each other and must be of dual redundant type. The total system (PLCs, servers and clients) must be synchronized to Universal time using NTP servers.

Overall network connectivity diagram is shown in the Figure 3

Overall network Configuration

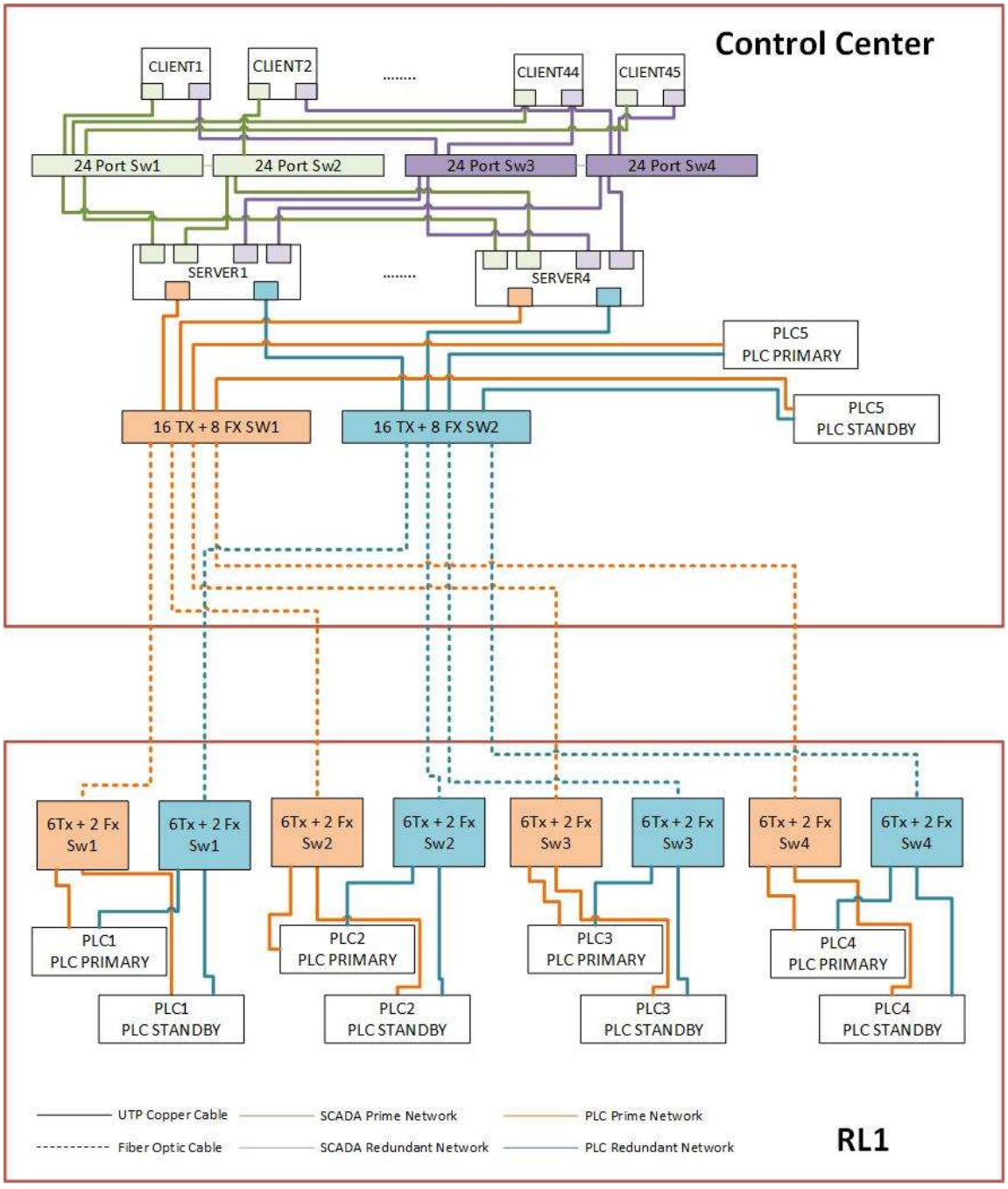


Figure 3: Overall network Configuration

9.3 Overall System Specification of Automation System

System Features	Specification
PLC System	
Controller redundancy	Dual Redundant/Hot Standby The redundancy controllers shall take over from the main controller instantaneously in case of failure of main controller.
Controller Synchronization	Event or Cyclic
Controller Switch over time from main to redundant	Less than a scan cycle and should be bump less
Controller to IO Rack distance	Minimum 2 Km
No. of IO Nodes/ Drops per Controller	IO requirement must be configured without exceeding 30 IO nodes
Deterministic scan Time (with system software, voting logic and application software of 250K lines of code) including fault tolerance	Less than 100ms
Turnaround time of the system (Reaction time from input reading to output posting)	Not more than two scan cycles
Controller rack backplane	Redundancy in backplanes for main and redundant controllers with dual redundant power supply and communication modules (independent for IO Network and Control Network)
Inter-PLC communication	TCP/UDP communication – Full duplex
Number of PLCs that can be configured for inter-PLC communication	Minimum 8
Diagnostic levels	Information should be available at System level, Module level and Group/Channel level
Operating system for PLC Programming software or IDE	Should be supported by latest Windows or Linux based OS
PLC simulator feature	Programming IDE should have simulation feature. User must be able to test the application software with SCADA without the PLC hardware.

System Features	Specification
Run time programming requirements	Program modification done in Main controller should automatically get updated in stand-by controller
IO redundancy	TMR configurable (Input voting-by software, output voting – by Hardware)
Backplane Power supply for each IO nodes/drops	Dual Redundant
Minimum No. of IO channels per IO drop	416 digital IO or 112 Analog IO
Hot swap ability	IO modules and Power supply modules
Posting of predefined values in case of PLC failure or communication failure between PLC and IO rack	Configurable by user at Channel level
Conformal Coating for all PLC system modules	As per ISA G3 and Conformal coated at OEM factory
Cyber security for PLC	Compliance to the IEC – 62443 standards
Third party certifications	TUV or CE or equivalent

System Features	Specification
SCADA (Corresponding PLC OEM supplied)	
SCADA system	Client - Server architecture. Response time of SCADA system must be 1 second or lesser
CPU to SCADA communication - Control network	Dual Redundant
SCADA server to client communication redundancy – Operator network	Dual Redundant
SCADA server configuration with redundancy	Should be configurable as runtime, trend, alarm and Report
Switchover from main to redundant server	less than 5 sec
SCADA Engineering Server	Development and deploying the project in runtime servers without disturbance to the operations

System Features	Specification
Number of SCADA Tags	Unlimited tags (w.r.t software license)
Operating system for SCADA software	Should be compatible with latest Windows or Linux based Operating system
Third party certifications	International standard Certifications

10 Controllers and I/O card specifications

10.1 Main Controller specifications

Feature	Specifications
IO capacity per controller	Minimum 5000 Digital IOs and 1000 Analog IOs
Memory Size-RAM	Minimum 16MB for application program
Maximum Application Size	30% memory margin should be available for an executable code of 250K lines of code
RTC resolution	1ms
Scan Cycle	Must be user configurable or cyclic
Real time Operating System	Must support multitasking with different scan rates
Watch dog timer	Must be user configurable
Programming languages supported	IEC 61131 languages (must support structured text)
Built in communication ports	USB or Ethernet for monitoring/debug port
PLC CPU to IO node - Network connectivity	Dual Ring or Star topology or better Must be able to support dual redundant IO network with 100 Mbps or higher speed. Each IO node should have dual communication modules and connectivity to PLC CPU
PLC CPU to SCADA servers – network connectivity	Must be able to support dual redundant network to avoid single point failure for each PLC CPU
Communication Protocol for SCADA to PLC	Minimum 100Mbps must be supported
Time Synchronization	NTP support must be available for time synchronization
Diagnostic features	Detailed error log should be provided

Feature	Specifications
Online Program Modification	Provision must be available to change the logic and download to PLC without disturbance to the operations
Memory Protection	Provision must be available to avoid inadvertent downloading of logic to PLC
Remote restart feature	User must be able to give cold restart through programming IDE
OPC compatibility	Shall be supported
Retaining program context in case of power failure	Must be available
Timers / Counters supported	Minimum 255

10.2 IO Card Specifications

The various I/O cards that are envisaged in the overall system should have the following minimum specifications. The IO cards must be of same make as the main controllers

10.2.1 Digital Output Card Specifications:

Number of outputs	Minimum 32
Sink/Source Output	Source type
Output switching	Solid-state
Switching voltage	24V nominal
Number of outputs that can be triggered simultaneously	All outputs
Minimum Current Per Channel	0.1A
Isolation ➢ Between channel and backplane ➢ Between group to group	 500V DC 500V DC
Switching delays	Less than 1.2ms
Internal protective circuit	Overload protection must be available
Front Panel display	Must indicate the module health status and command status for all channels
No Inter channel interference	Essential
Diagnostics ➢ Module level ➢ Group or Channel level	 ➢ Essential ➢ Essential

10.2.2 Digital Input Card Specifications:

Number of Inputs	Minimum 32
Number of inputs that can be triggered simultaneously	All inputs
Sink/Source mode	Sink
Isolation ➢ Between channel and backplane ➢ Between group to group	 500V DC 500V DC
Input voltage	24V nominal
Switching threshold ➢ Low Range (0) ➢ High Range (1)	 ➢ <5 VDC ➢ >11 or >15 VDC
Input Resistance	Min 2.4 K Ohms
Input Switching delay from '0 to '1'	1 to 10ms
Front Panel display	Must indicate the health status and ON/OFF status for all channels
No Inter channel interference	Essential
Diagnostics ➢ Module level ➢ Group or Channel level	 ➢ Essential ➢ Essential

10.2.3 Analog Input Card Specifications:

Input type	Current – differential type
No of channels	8/16
ADC Resolution	16 bit or better
Input Measuring ranges	0-20mA/4-20mA
Input Impedance	50 - 275 Ohms
Accuracy	0.2% or better at 25 ºC
CPU read time	Less than 25 ms
Update Time for all channels	Less than 25 ms
Input Filter	Essential
Diagnostics ➢ Module level ➢ Channel level	 ➢ Essential ➢ Essential
Isolation Between channel and backplane	500V DC
CMRR between channels	70dB or better
Front Panel display	module health status shall be displayed

No Inter channel interference	Essential

10.2.4 **Analog Output Card Specifications:**

Output type	Current – differential type
No of channels	4/8
DAC Resolution	16-bit or better
Output range	4-20mA
Accuracy	0.25% or better at 25 °C
Load Resistance	Minimum 500 ohms or as to meet TMR Configuration – refer to interface diagram* as shown in Figure 5 and Figure 8
Update Time	10 ms without ramp or better
Diagnostics ➢ Module level ➢ Channel level	 ➢ Essential ➢ Essential
Isolation Voltage between channel and backplane	500V DC
Front Panel display	module health status shall be displayed
No Inter channel interference	Essential

*The maximum load resistance that must be supported by the AO card must meet the TMR configuration requirement for the output and associated read back as input to the TMR AI cards.

10.2.5 **Pulse Input Card Specifications**

No of channels	4 or more
Counter Inputs (Voltage)	24V nominal
Counter Operating Modes	Totalizer mode/Rate mode
Counter Resolution	32 bit
Counter Frequency Range	10 KHz and above
Switching threshold ➢ Low Range (0) ➢ High Range(1)	 ➢ Low <5 VDC ➢ High >15 VDC
Field to Channel Isolation	500V DC
Internal protective circuit	Essential
Indications and Diagnostics ➢ Module level ➢ Channel level	 ➢ Essential ➢ Essential

Front Panel display	module health status shall be displayed
No Inter channel interference	Essential

10.2.6 Programming Interfaces

The controller should be programmable by the user and the following features are expected

System Features	Specification
Programming languages Support	IEC61131-3 compliant programming languages. Structured Text for user application task development is mandatory
Integrated development environment (IDE) for program development	Must be User-friendly. The user should be able to configure the controllers and IO cards as per the functional requirements, develop, compile, and download the application task
Online debugging and real time monitoring	The IDE should provide features for monitoring the watch variables in real-time, and debugging of application software
Online modification of application logic	The user should be able to modify the configuration or change the logic without disturbance to the operations
PLC simulator	The user must be able to simulate and test the application logic without the PLC hardware. SCADA communication should be possible while testing in simulator mode
All the device drivers, libraries for PID control and communication interface handling	Must be available for all the system modules and also the third-party communication devices such as timing interfaces and serial interfaces
Provision for programming and downloading over network interface	Essential

Apart from the above features the IDE should have extensive context sensitive help facility for the programmer on the library functions, language references, diagnostic functions and other features. Provision for maintaining version control of the application software with the additional feature to compare the differences between versions is desirable.

10.2.7 Diagnostic features

The controller should be able to provide the user through its own interface and to the SCADA system for online display to the user, the following diagnostic information and provide necessary information to overcome the faults.

10.2.7.1 CPU should collect all diagnostic information about accessories connected to it. The status of all the modules (controller, communication modules, power supply modules and IO Cards), Channel healthiness, overload status etc., should be indicated to the user. This information should be made available at SCADA system.

10.2.7.2 A comprehensive internal log facility for each controller to report all types of fatal errors (runtime, application triggered fatal errors and system faults) and major status events. This information should be available to the user preferably in the form of report.

10.3 PLC CPU to IO Connectivity

The Controller (each PLC CPU) should have dual redundant interfaces to connect with each IO Nodes. Each IO node must have dual redundant network and dual communication modules connecting to the PLC CPU.

10.4 SCADA System Connectivity

The controller (each PLC CPU) should connect to the server on the dual redundant control network. SCADA Server should have the capability to provide at least 32,000 Digital and 3,200 Analog tags for each PLC system. The scan time of the controller must include the SCADA communication load also.

10.5 Performance Characteristics

The following performance characteristics are expected from the Controllers.

10.5.1 The CPUs should be able to work at a deterministic maximum cycle time of 100ms (including application software) which should accommodate the following functions within the cycle with sufficient margin for future modifications / additions.

10.5.2 Data Acquisition tasks (from I/Os and from SCADA) including acquisition of the health status of various components of the Controller.

10.5.3 Voting of input data, Engineering value calculations for analog parameters

10.5.4 Acquisition of parameters over network from other controllers and the External Data interfaces

10.5.5 User application task

10.5.6 Output data to I/Os, SCADA and to other controllers / external communication interfaces (Data Concentrators) over network.

10.5.7 System internal health monitoring and other housekeeping activities

10.5.8 Should be able to recover from communication errors (from I/O interfaces or from external units) and perform the tasks within the given time.

10.5.9 Inter-PLC or Inter-Controller data transfer in full duplex mode should be supported, on the Ethernet network, with suitable driver interfaces, for user customization of the number of variables to be transferred along with user defined data types and data buffer sizes of at least 1 KB.

10.6 **IO Interfaces configuratio**n

10.6.1 Necessary interface circuit boards for fault tolerant operation of I/O cards and MIL connector receptacles should be supplied as part of the system. The inputs (analog and digital) that are available from the field as single input without redundancy must be triplicated at the IO rack and fed to the input cards. Such inputs are referred as Panel triplicated inputs. The inputs (analog and digital) that are available in TMR mode from the field are to be fed to the respective input cards directly. These inputs are referred as field triplicated inputs.

10.6.2 The interface board for panel triplication (one board for one set of main, redundant and triplicate input cards) must ensure that even if one input card fails (open or short) the inputs to the other cards must not be disturbed. The interface boards for panel triplication, and the IO cards for the field triplicated inputs are connected to the Instrumentation junction box using MIL connectors. Prefab cables must be provided for connections between MIL connectors and interface boards. All the cables used for connections to the terminal blocks of IO cards must be prefab cables. Proposed input and output interface boards are given below.

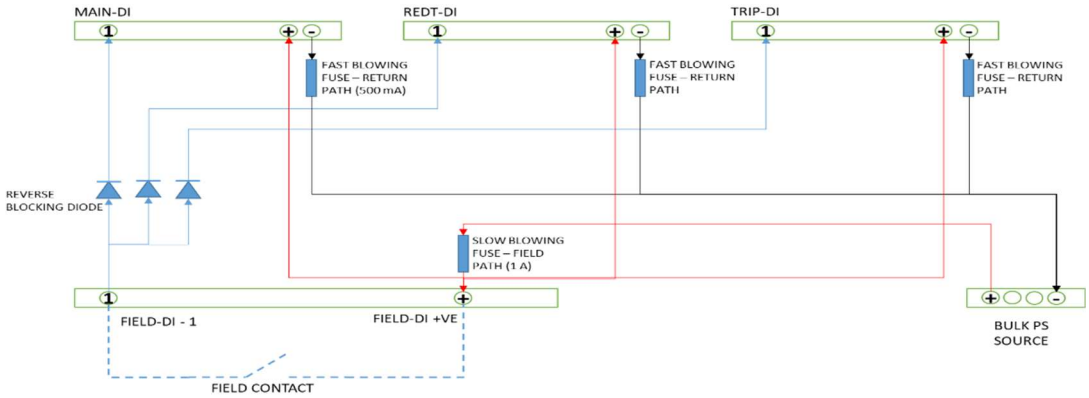
10.6.2.1 **Digital Input:**

The open/close status of EP valves, pressure switches status and ON/ OFF status of pumps is acquired as digital values. The 2oo3 voting logic is implemented in system software as SIFT logic. Any discrepancy of the individual channels is available at the main controllers and monitored at the operator terminals as part of the system health monitoring. For status monitoring of EP valves, three potential free contacts of micro-switches of the actuator are used for open & close status. The three inputs, each for open and close used in the 2oo3 logic circuits implemented through in-built software-based voter.

Status of intermediate relays of EP valve command and status of external voter relays are connected to I/O cards for monitoring. Failure detection is monitored at the operator terminals.

The IO Wiring should be as shown in the Figure 4 Or any technical equivalent solution of similar functionality to be provided by supplier in line with the following functional diagram.

Figure 4 Typical TMR digital input cards with interface board for a single field input with triplication in IO Panel



10.6.2.2 **Analog Input:**

The analog input transmitters are single in field. The transmitter output shall be triplicated by the interface module and fed to all the three nodes (Main, Redundant and Triplicate). The input at the AI card shall be always taken as 4-20mA.

All the analog inputs in the system are of non-loop fed type (i.e. the card should not supply 24V in the current loop). The excitation power to all the analog sensors will be from an external power supply which does not come under the supplier's scope. The IO Wiring should be as shown in the Figure 5 Or any technical equivalent solution of similar functionality to be provided by supplier in line with the following functional diagram.

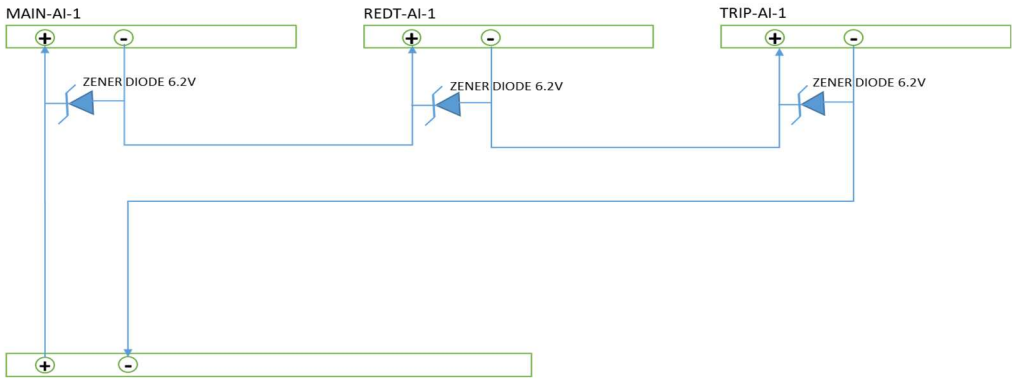


Figure 5 Typical TMR Analog input cards with interface board for a single field input with triplication in IO Panel

10.6.2.3 **Pulse Input:**

All the pulse inputs in the system are of panel triplicated type. The interface board must not add any distortion to the input pulse signals.

The IO Wiring should be as shown in the Figure 6 Or any technical equivalent solution of similar functionality to be provided by supplier in line with the following functional diagram.

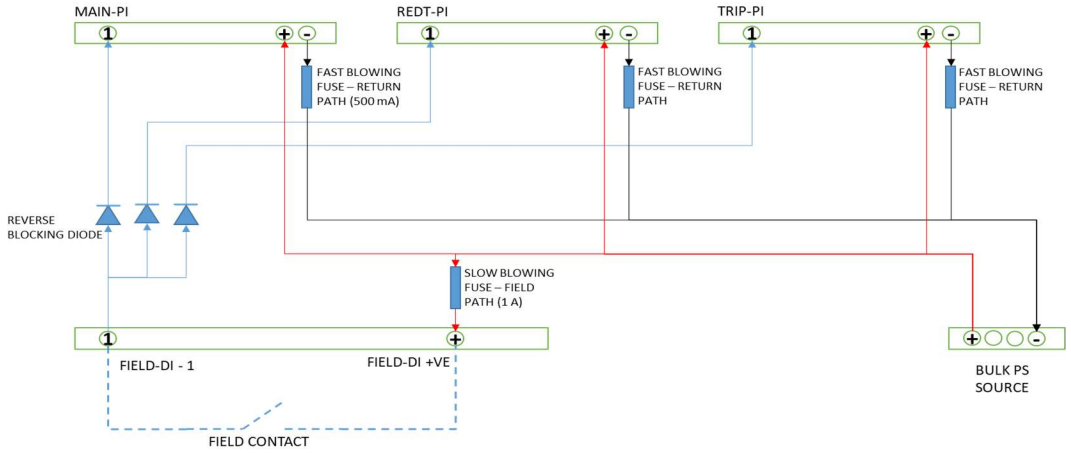


Figure 6 Typical TMR Pulse input cards with interface board for a single field input with triplication in IO Panel

10.6.2.4 **Digital Output:**

DO commands are issued for operating Electro-pneumatic (EP) valves or pumps through the instrumentation interfaces. Hardware voter must be provided for 2oo3 voting of the TMR outputs. The hardware voter must provide two outputs to the field to drive main and redundant solenoids of electro pneumatic valve (refer to hardware interface diagram for details). The power supplies in the IO rack are used for energizing the relays in this hardware voter module. The power supplies to drive the solenoids do not come under the supplier's scope. The command read back must be provided for the main, redundant and triplicate outputs separately. The relays used for digital output hardware voters shall have minimum 6 contacts of JSS or equivalent standard and have a minimum contact rating of 7A.

The IO Wiring should be as shown in the Figure 7 Or any technical equivalent solution of similar functionality to be provided by supplier in line with the following functional diagram.

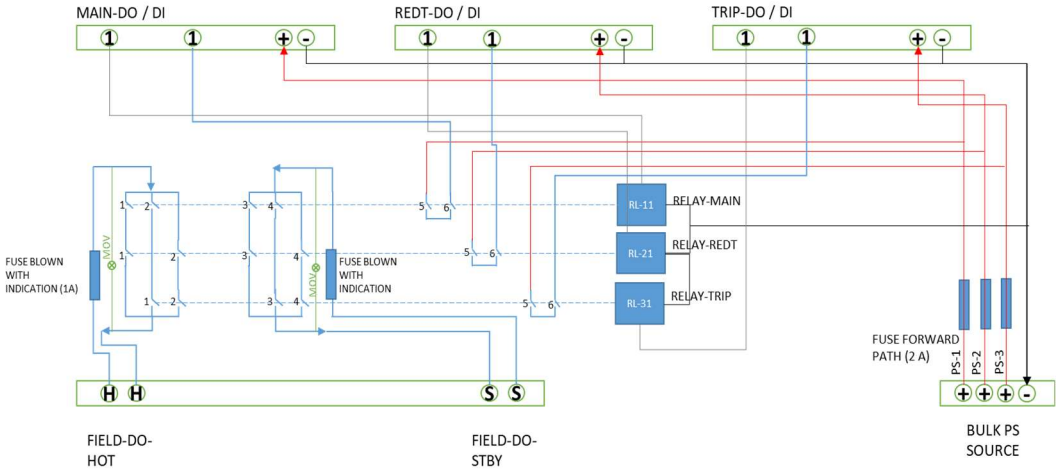


Figure 7 Typical TMR Digital Output interface board for a single channel

Analog Output:

AO commands are used for operating Continuous control valves (for PID loops) through the instrumentation interfaces. Analog output is switched in 1oo3 logic i.e. the outputs are multiplexed and only one output is used at a time. The switching takes place by commanding the selection relays by DO command based on the current feedback read by the AI module. This voting and selection of one AO for field command is executed as a part of application software.

The IO Wiring should be as shown in the Figure 8 Or any technical equivalent solution of similar functionality to be provided by supplier in line with the following functional diagram.

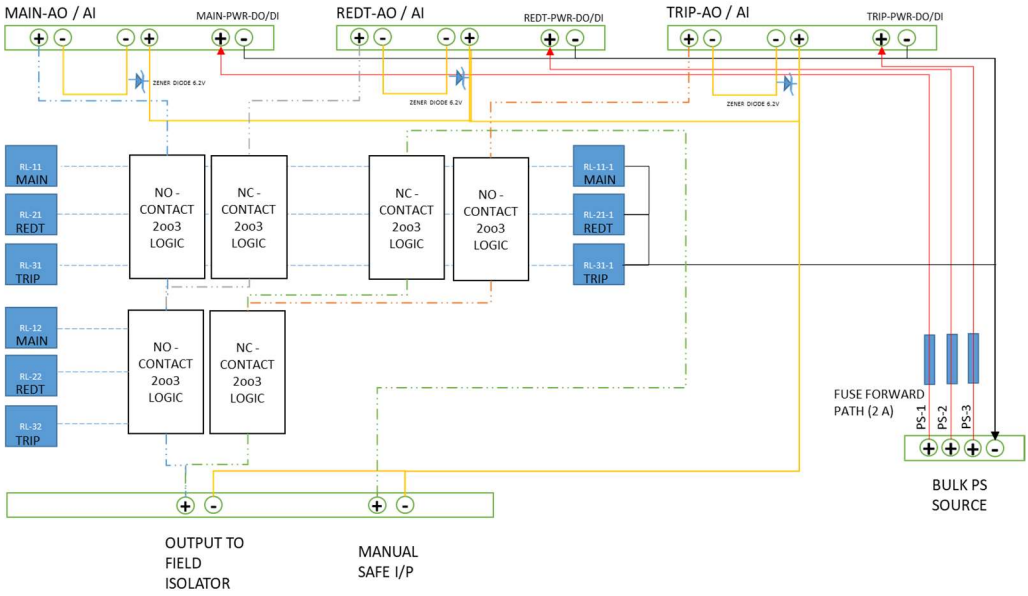


Figure 8 Typical TMR Analog Output interface board for a single channel

Components Involved in the Wiring of all the TMR interface are as follows

i. Wiring Arm.
ii. Prefab Cable (from MIL Connector to Interface boards, Interface board to IO module, MIL Connector to IO module) as per the requirement of the module wiring Connections.
iii. Harting Connector (Male and Female) to Interface between Wiring Arm and Interface board.
iv. Harting Pins should be gold plated with dust-hood coverings.
v. MIL Connectors as per the existing system configuration along with Prefab cables.
vi. Interface or Triplicated boards should be multi-layered PCB with Track ratings as per the current requirement of Modules and Contact ratings.
vii. Required Terminal Blocks and wiring are to be considered as per the Wiring schematics.
viii. Fuse protected terminal blocks shall be provided wherever required either for isolation or short circuit protection to avoid damages to boards / modules.
ix. All cables should be prefab cable with the identification marking on each core. No Single or individual cable is allowed for module and power supply wiring.

x. The cables should be tagged with unique number for each panel.
xi. The Number of triplication boards should be decided based on the requirement as per system configurations.
xii. Protection for failure of one module or power supply should not disturb the other module or should not indicate any discrepancy.

10.6.3 Necessary Field / Load Power supplies (DC) for operating the Digital Outputs and interrogating Digital inputs and voting of other types of hardware should be part of the system with necessary dual redundancy. Remote health monitoring provision must be available in Power supply. The specifications of the power supplies are given below:

- SMPS Type Power Supplies
- Built-in diode for output OR ing should be available
- Remote diagnostics monitoring
- 24V DC, 10A, Load Regulation: 1%
- 230VAC Input, ±10%, 50Hz±2%
- Overload and Short Circuit protection
- Dual Power Supplies which share power during normal operation modes and take care of total load during failure of one set of power supplies are to be used

10.6.4 The interface circuits required are to be provided as part of the IO racks. The details of the logic circuits should be worked out during the Detailed Engineering phase. All components that will be used to meet the interface requirements must be of standard type and should be approved by the department prior to the installation in the rack.

10.6.5 MIL Connectors to be supplied for Interfacing the Interface boards with Instrumentation systems. The following tables show the part numbers and the count of connectors required

	Module Type	MIL Type	Part Number	Quantity
1.	Digital Output	61 pin Female	MS3470 W 24-61S	110
2.	Digital Input	41 pin Female	MS3470 W 20-41S	270
3.	Analog Input	32 pin Male	MS3470 W 18-32P	50
4.	Analog output	10 pin Male	MS3470 W 12-10P	35
5.	Pulse Input	10 pin Male	MS3470 W 12 -10P	
6.	Digital Output-IS Power Supply	4 pin Male	MS3470 W 14-4P	110

Apart from the supply of above PLC side connectors, 5 numbers of each type of above connectors along with their mating part as a set shall be supplied for additional

channels re-routing because of optimization. These two items shall be mentioned in BOM.

10.7 SAFETY HARD LINE PANEL RELOCATION SCOPE OF WORK

- **Supply of Safety hardline panel which consists of BOM as mentioned in below table**

Sl.No.	Bill of Materials	Quantity
1	ON/OFF switch cum indicator	50
2	ON/OFF Push Button Switch	12
3	Authorization Keys	5
4	Joystick	4
5	Status Indicators	6
6	MIL-C 26482G Series II 41 pin connectors set along with Pins female receptacle: MS3470W2041SN Male plug: MS3476W2041PN Back shell: M85049-52-120W	03
7	MIL-C 26482G Series II 55 pin connectors set along with Pins female receptacle: MS3470W2055SN Male plug: MS3476W2055PN Back shell: M85049-52-122W	1
8	Panel Box dimensions 620mm (L)*390mm(H)*230mm(D) (approx..)	1
9	Wago Terminal blocks - 1:1 (2.5SQ.MM)	200
10	Wago Terminal blocks - 1:1 (4.0 SQ.MM)	50
11	1CX0.5 Sq.mm HDPE Grey colour hook up wire for internal wiring	500 Mtr

- **Replacement, Installation, erection, commissioning and testing works**

Removal of existing Safety Hardline panel and installation, commissioning new Safety Hardline panel

Sl.No.	Description of work	Quantity
1.	Removal of 11/2” BSP glands in side panel	4 Nos
2.	Removal of pins from connectors	150 Nos
3.	Preparation of 75 core cable and 11/2” BSP Glanding inside panel	4 Nos
4.	Crimping and pin insertion in connectors	150 Nos
5.	Removal of 75 cores cable from FCC-I to Cable trench	400 Mtr
6.	Laying of 75 cores cable- 2no from cable trench to FCC-II	1100 Mtr

7.	Laying of 4CX2.5 Sq.mm Power cable from UPS panel to Safety hard line panel	40 Mtr
8.	Interfaces from safety hardline panel related elements like switch/ status Indicator/Auth.key/ Joystick to Terminal blocks in external junction box with ferrule	As per BOM in supply
9.	Interfaces from Terminal blocks to Mil Connectors with ferrule	

11 Data Concentrator (PLC5)

The Data Concentrator system should consist of one number of Hot Standby Controller (should be of the same family as the other controllers) connected on the Control Network, at the Control Centre with the following features.

- The scan rate for the controller must be less than or equal to 100ms
- Data Concentrators should provide interface for acquiring / sending data with frame size up to 1KB data over
  - RS-422 Serial – 115.2 Kbps
  - Ethernet using UDP/IP or TCP/IP – 100Mbps
- Data Concentrator should be able to synchronize its system clocks with the Universal time by reading them over the network using NTP protocol.
- The data concentrator should be able to process the data from the four communication ports/modules (Serial/Ethernet ports either in same or different modules) and provide the processed data to the Controllers for performing their control activities. The data concentrator should be able to communicate (send data and receive data) at least at 100 ms on the Control Network.
- The data concentrator should have provision to communicate with the SCADA runtime servers for data display, logging, archival and accepting supervisory control commands.
- Necessary programming interfaces for Configuration and data acquisition of the communication interfaces should be provided.

- Serial data Interface – RS422:

  Data is obtained on RS-422 serial frame. Four such links are available at control center, which have custom frame formats, with 1024 (or more) bytes per frame. These serial data are available at a data rate of 100ms per frame continuously at a baud rate of 115.2 kbps (or better). The mode of the communication interface is asynchronous.

- Ethernet:

  Custom data is available through four Ethernet links in UDP/IP frame or TCP/IP frame for full duplex communication at 100Mbps rate.

  The data captured at the communication interface, will be extracted and processed and data will be provided to PLC1 to PLC4 for using in the control application.

12 SCADA System

The SCADA system is to be implemented in multi-tier architecture with the Client-Server configuration. The servers or equivalent system should provide facility as a central repository of the real-time data, contain tasks for online and offline trending of real-time and historical parameters, event, report generation and alarm logging and provide user defined logics for the graphic user displays. All SCADA components should be of the state-of-the-art technology as on the date of supply. SCADA Software package should support open protocols and have OPC compliance.

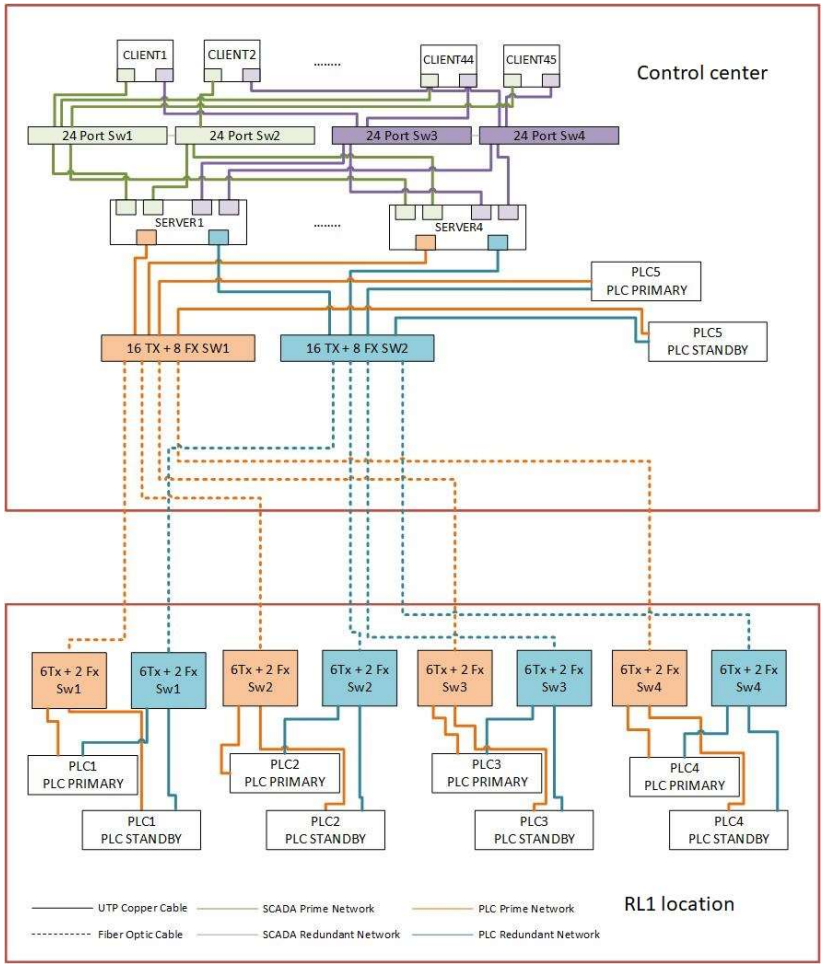


Figure 9: SCADA network configuration

12.1 Servers deployment

Type of Server	Quantity	System Usage
Runtime, Logging, Report and Alarm Servers	4	Communication to PLCs and logging of data, Report and Alarm
Development (engineering) /Testing Server/Cold Standby Server	2	Development, Testing and Cold Standby for Runtime / Trend & Alarm Servers

12.2 Servers

The SCADA servers should be supplied with the following major hardware specifications.

S.No	Name	Description
1.	Make	HP / Dell
2.	Form factor	2 U rack form with Rail Kit
3.	Processor Model	Intel Xeon Gold dual processor with 24 Core or more per processor having hyper-threading feature and support for Virtualization
4.	L3 cache	36 MB or better
5.	Number of processors	2
6.	RAM Memory	ECC DDR5 128 GB (32 GB x 4) or better with Memory mirroring feature available in BIOS
7.	Storage Controller	Integrated SAS / SATA controller which supports RAID 0,1,5 & 6 along with Battery Backup Unit Module.
8.	Internal Hard Drive	2 x 2 TB SSD for OS(Mirrored), 4 x 4TB SSD
9.	Power Supply type	Hot Swappable, Redundant
10.	Power Supply Capacity	800W or better
11.	Network Interface ports	8 * 1Gbps port or better Additional cards may be considered if required by configuration
12.	Monitor Display Interfaces	Display Port, HDMI
13.	Operating System	Latest PLC SCADA OEM required OS
14.	Removable Media	Necessary software installation media must be provided along with required licenses
15.	Sever health/diagnostics port	Must be available

* Monitors need not be considered

12.3 Development Capabilities

The development package should be able to provide facility to configure the SCADA Server based on the requirements of the user and the necessary tools to develop graphic user interfaces (both static and dynamic parts), configure and program Events/Alarms, Trend configuration, Report formatting tools, standard library tools for meeting the above requirements and provision to develop custom libraries. The following are the detailed requirement on the capabilities of the development tool.

12.3.1 Mimic development IDE or tool should support the following features

- 12.3.1.1 Provide a collection of customizable shape libraries for mimic development.
- 12.3.1.2 Libraries can optionally have provision to combine related objects into groups which can be configured collectively to form a template. When templates are used in development, instance specific information must be passed to the template.
- 12.3.1.3 Support user configuration for dynamic / animation of the graphic objects in Runtime environment
- 12.3.1.4 Any update in the library must be automatically updated in all associated pages
- 12.3.1.5 The Graphic building utility should provide necessary support to import custom photographs as background images.

12.3.2 Provision must exist for creation of custom popup messages and event based popup messages with the following features

- 12.3.2.1 Graphical objects must respond to user click action and generate pop ups with relevant controls and messages for user interaction
- 12.3.2.2 Multiple level of pop up display is required.
- 12.3.2.3 These pop ups provide the user control over the elements and display relevant status messages
- 12.3.2.4 The pop ups creation, generation and modification control must be provided to the users
- 12.3.2.5 Each pop up and contained elements must be configured with privilege levels for interaction and display
- 12.3.2.6 Event based popup must be displayed based on user defined variable states or action event from the operator

12.3.3 The Development environment should provide development of the project by multiple programmers and finally merge the project for overall functionality before generating the runtime version.

12.3.4 The development package shall provide facility to maintain **versions of the total software being developed**.

12.3.5 The development package should consist of help system with provision for context sensitive help.

12.3.6 The SCADA package should allow updating the existing runtime system with a new version with minimal downtime.

12.3.7 User defined Alarms and Events should have configurable properties and messages. All Alarms and Events should be logged in a time tagged database.

12.3.8 NTP based time synchronization support is required

12.3.9 The Alarm/ Event database access for online / offline viewing and extracting data should be provided. Necessary tools for customization of the Event/Alarm reports should be provided.

12.3.10 Provision for configuring trends (development and runtime) should be provided. User customizable trend data options to log trend data either periodically or based on the change of data with a minimum of third decimal should be provided. Necessary tools for extracting the logged data from database, with and without SCADA software should be provided.

12.3.11 **Provision for generating user configurable reports which display the current and historic data. The triggering of these reports may be time based or event based**.

12.3.12 Provision to assign security rights for the user interfaces.

12.3.13 Scripting feature must be provided in the SCADA system with the following features

12.3.13.1 User scripts can be stored in procedures for multiple reuse and centralized maintenance

12.3.13.2 Script function must perform basic arithmetic, logic and control tasks and display and manipulate data in graphics pages. Editor must be provided for writing, editing and debugging of the generated scripts

12.3.14 Health of server and client tasks and resources utilization to be extended for display, monitoring and logging in SCADA

12.4 **Runtime System Capabilities**

12.4.1 The Runtime system should have the capability to refresh the display data at 1 second or lesser interval with maximum 32000 tags per PLC per and the user commands to be transmitted to the Controllers within 2 seconds of user command.

12.4.2 The runtime system should have necessary fault tolerance features to perform the following activities in case of any failure of any task running in the server.

12.4.2.1 Switchover automatically from Primary Server to Standby Server such that the changeover occurs within 5 seconds without any impact on operator stations and the controllers.

12.4.2.2 Redundancy in Data Storage mechanism to maintain continuity in data in case of failures.

12.4.2.3 Commands issued by the operator from SCADA must not be

withdrawn during Primary and Standby Server switch over

12.4.2.4 Server tasks stopped due to any system or network failure must start automatically when the system normalizes

12.4.3 The Runtime system should allow change of the current user logged in without having to close the current display window. Should have provision to login a new user with different rights over the existing operator for performing any special operations if required. Provision should exist for default user login, which allows only view only functions.

12.4.4 The Runtime system should allow querying for online or recorded events / alarms / trends / user actions (audit) without any impact on the system performance. These data should be generated as reports (text based or graphical) with user customizable formats.

12.4.5 The system must support logging of variables as trends at 1 second or lesser. Shall support logging at 500 ms or lesser for selected 100 variables.

12.5 **Performance Capabilities**

12.5.1 The SCADA system should support communication of maximum 32000 tags per PLC.

12.5.2 The SCADA system should support communication of 150000 tags for the overall system.

12.5.3 The SCADA System overall response time should be 1 second for display update and 1 second for execution of user command from the time the command is issued to the time it is posted on the Controller's Output

12.5.4 The SCADA server must support minimum 25 Operator clients and 25 Web clients without any degradation in overall SCADA response time and data log time.

12.6 **Network Management & Monitoring, Time servers (NTP) and Security Tools**

12.6.1 Necessary Network Management and monitoring tools for online monitoring and remote management of the network (PLC and SCADA). The tools should support performance analysis of the network without adding any delays to the process control application related communication jobs. The tools should generate alarms and reports in case of network failure or degradation.

12.6.2 Full licensed version of software for protection of system from external threats must be supplied. This software must provide protection from virus and malware attacks. The details of these software will be finalized during detailed engineering based on the Software platform of the supplied system.

System end point antivirus software license for operator stations, servers and clients	100 no.s of licenses (two groups)

12.6.3 Network Time servers (NTP) shall be supplied for time synchronization of PLC and SCADA systems. Two NTP time servers shall be provided of Accord make.

12.7 **Operator Stations (SCADA Clients)**

The Operator Stations should be Workstation based PC systems with following major hardware specifications and state-of-the-art as on the date of supply.

S.No	Name	Description
1.	Make	HP / Dell
2.	Processor Model	Intel Core i7 13thGen or better
3.	Processor speed	5.2 Ghz or better
4.	L3 Cache	30 MB or better
5.	Number of cores	16 or better
6.	RAM Memory Capacity	DDR5 16GB or better
7.	Internal Hard Drives	1TB SSD or better
8.	Graphics	Intel UHD graphics 770 or latest
9.	Expansion slots	2 no. of M.2; 1 no. of PCIex16;1 no. of PCIex1
10.	Network Interface ports	Three numbers of 1Gbps or better speed ports (additional cards may be considered if required by configuration)
11.	USB Ports	Type A 5 Gbps or better (4 Nos)
12.	Monitor Display Interfaces	HDMI-out 1.4b, DP
13.	Operating System	Latest Version of OS suitable for SCADA
14.	Removable Media	Necessary software installation media must be provided along with required licenses

* Monitors need not be considered

12.7.1 The Operator Station should be loaded with the Client version of the SCADA package. The following are to be considered while supplying the operator stations.

12.7.2 The Operator Stations should support network redundancy at Operating system or SCADA package level.

12.7.3 The Operator stations should have provision to load the Controller's programming interface along with the runtime client software to allow programming of the Controller / interfacing with the controller for debugging the application.

12.7.4 The Operator Stations should work with "Any Station – Any Display" logic where the control activity is governed by the rights of the operator logged into the station.

12.7.5 Operator Stations should be able to synchronize their local clocks with the Server Clock or Time Server over the network using NTP Protocol in real-time.

12.7.6 One Laptop for Automation system must be provided for PLC system configuration, troubleshooting and maintenance activities. This system must include the necessary license for PLC programming, network monitoring tools and associated software.

Specifications of Mobile programming Station (Laptop) is shown below

S.No	Name	Description
1.	Make	HP / Dell
2.	Processor Model	Intel Core i7 13 Gen or better
3.	Processor Speed	5.2 Ghz or higher
4.	Number of Cores	16 or better
5.	RAM Memory	DDR5 16 GB or better
6.	Internal Hard Drive	SSD 1TB or better
7.	Network Interface ports	1 Gbps LAN and Wireless LAN IEEE 802.11ac
8.	USB Ports	1 or higher of Type-A
9.	Monitor Size	12.3'' or better
10.	Monitor Display Resolution	2736 x 1824 or better
11.	Operating System	Latest Version of OS suitable for SCADA
12.	Accessories	Battery charger, Carry case/laptop bag

12.8 SCADA Software licenses

The following table gives the tentative list of SCADA software license to be supplied. The actual license count will be finalized after detailed engineering

S.No	Description	Automation System (PLC1-PLC5)	Manual Safing Systems	RPOP system
1.	Unlimited SCADA Server licenses	6	-	-
2.	SCADA Client licenses	25	-	-
3.	Web Client Licenses	25	-	-
4.	SCADA runtime licenses suitable for other PLC systems	-	2	2

12.9 Control Network, Operator Network and SCADA Network

The SCADA network between Server and clients must be of star topology with rack mountable switches of the following specification

S.No	Name	Number of ports	Quantity	Make
1	Industrial Ethernet switch with 100 Mbps or better Copper ports and 1 Gbps or better SFP ports for PLC connectivity at Control Center with redundant power supply	16 Copper and 8 Fiber SFP module (1 Gbps)	2	Belden, Antaira, Allied Telesis or equivalent
2	Industrial Ethernet switch with 100 Mbps or better Copper ports and 1 Gbps or better Ethernet ports for PLC connectivity at RL1 location with redundant power supply	6 Copper and 2 Fiber SFP module (1 Gbps)	8	Belden, Antaira, Allied Telesis or equivalent

Note: Ethernet switches (4 Nos) required for SCADA server to Clients connectivity at control center is in the scope of department

12.9.1 **Control Network: Ethernet switches or media connectors and associated accessories required for PLC- RIO network should be supplied based on PLC RIO configuration. Those elements are listed explicitly.**

12.9.2 The communication equipment used for Communication between Server to PLC Controller and PLC Controller to IO stations must be of industrial grade with sufficient interfaces for all connectivity and avoid single point failure.

12.9.3 All network elements in the commissioned system should comply with practices and procedures as IEC 62443 guidelines.

13 Application Software Component Development

The application software for both PLC and SCADA systems will be developed by SDSC SHAR team. However, to speed up the development activity, support from bidder may be utilized on human day basis at SDSC SHAR premises for minimum of 100 human days. Successful bidder has to depute trained personnel (expert developer in PLC and SCADA) with at least 3 years' experience and certified by OEM for both PLC and SCADA during the application software development at site. The cost for support during development must be quoted as human day basis and payment for the same will be on pro-rata basis.

14 Housing Racks

- All the Site equipment has to be housed in suitable racks with necessary hardware housing mechanisms included.
- The Rack should contain necessary earthing protection mechanisms inbuilt for both protective ground and signal ground separately. The Rack should be provided with suitable mechanisms for intake of cool air and purging hot air as well as protection against moisture condensing inside the rack / humidity control.

- Power should be taken from two UPS Sources for the Control equipment and other systems with necessary Fuse / MCB protections and current limiters/surge arrester wherever applicable. Single point failures and failures due to non-critical items should be avoided. The rack should have necessary lighting and locking arrangements in-built.
- Rack health Monitoring: Status of necessary rack power supplies, DC power supplies, fan, network switch, fan failure detection units, etc shall be monitored remotely in SCADA system. Necessary interfaces (Either serial, Ethernet or Digital Input Modules) may be considered for this purpose as per RPOP system requirements. Necessary digital input channels required for acquiring rack health parameters are not accounted in IO channel count provided in RPOP section.
- All external interfaces from the racks to the instrumentation interfaces should be with MIL Circular Connectors. Wherever terminal blocks are to be used within a rack, these should be with WAGO terminals of clamp and cage type. Wiring inside the rack should be neat with necessary markings / ferrules provided for easy maintenance.
- OEM certification (PO copy, BOM and deliverables verified by OEM/ OEM authorized system integrators) for all the third party items shall be provided.

Table 3:Rack details

S.No	Component (Make)	Specification
1.	PLC Panel enclosure (Rittal)	1200 mm (W) x 400 mm (D) x 2000mm (H) with 100 mm plinth suitable for matching with existing base frame (as per RIO interface board rack configuration mentioned in the existing system section)
2.	Anti Vibration pads	Should be available between two plinths
3.	Panel internal wiring cables (Lapp)	Will be finalized during detailed engineering
4.	Cooling fan for panels with necessary filters (Rittal)	2 fans per panel of 8 inch size
5.	Fan failure detection and regulation units (Reputed Brand)	2 units (with remote monitoring of fan running status and temperature sensor)
6.	Top cover with additional perforation sheet	As per panel specification
7.	MIL Connector fixing bracket	Will be finalized during detailed engineering
8.	Sub rack with swing arm assembly for keeping TMR interface boards	Will be finalized during detailed engineering
9.	Terminal blocks inside panel (Wago make with cage clamp)	Will be finalized during detailed engineering

S.No	Component (Make)	Specification
10.	Mounting plate for fixing the hardware components	Will be finalized during detailed engineering
11.	24V DC Power supply (DIN rail) holding clamps	Will be finalized during detailed engineering
12.	MCBs for individual isolation of rack power supply, DC power supply and illumination for panel and fan for each UPS (Siemens/ Schneider)	Will be finalized during detailed engineering
13.	Necessary Surge Protection Devices	Will be finalized during detailed engineering
14.	Panel illumination	LED light per panel
15.	Power socket with MCB	Will be finalized during detailed engineering

15 Remote Power ON/OFF and Panel Environment Monitoring System

All the Remote IO systems available at the remote locations (RL-1 to RL-5) should be installed in necessary rack mounted enclosures. All the PLC racks, IO racks and instrumentation racks shall be powered using dual redundant power supply outlets. Each of the independent power outlets should be controllable (Switching ON / OFF) remotely from the Control Centre using mini PLC/controller. A Separate Network (independent of control and operator network) based system to be provided for meeting this requirement.

- Mini PLC / controllers for PLC/Instrumentation racks for both UPS1 and UPS2 chains shall be provided
- Mini PLC / Controllers should communicate with its own SCADA System through Modbus / Ethernet IP etc. protocols
- Motorized MCBs may be considered to get trip status remotely
- MCBs ON/OFF commands for remote operation shall be through SCADA
- MCBs (ON/OFF/Trip) status, DC power supplies status, Fan failure and high temperature detection unit status etc., shall be extended to the controllers
- Temperature and RH sensors in each remote location (RL-1 to RL-5) to be provided and interfaced with RPOP system

- At each remote location (RL-1 to RL-5) Voltage and Current measurements for each phase to be extended to RPOP system. Three voltages (RYB) and three currents at each remote location shall be extended to RPOP system.
- Hard wired Bypass option (disabling remote operation of MCBs) during critical activities shall be provided to avoid unintended operation
- Power cables from RPOP power JB to RPOP racks and to PLC /IS racks is in the scope of the supplier, suitable cable (copper,3 core, 4 Sqmm, armored) length shall be provided in BOM. Suitable cable glands to be supplied and installed.
- Suitable MCBs in RPOP power JB are in the scope of supplier. Quantity shall be provided in BOM.

System	Controllers	Location and Systems
RPOP (Remote Power-ON/OFF and Panel health monitoring)	Controllers /mini PLC for UPS1 and UPS2	PLC and Instrumentation racks at RL1, RL2, RL3, RL4, RL5

Mini PLC/Controllers along with two SCADA systems and software to be supplied for the following Control System and Instrumentation System racks

Location	Control system Racks	Instrumentation Racks	Total Racks
RL1	11	7	18
RL2	4	5	9
RL3	4	5	9
RL4	3	3	6
RL5	5	5	10

I/Os in Each Control Systems rack consists of

Commands:

1. MCB ON/OFF for PLC IO Rack Power for UPS1/UPS2 -2 no.
2. MCB ON/OFF for DC Power for UPS1/UPS2 -2 no.
3. MCB ON/OFF for Fan, Light and other Auxiliary Power for UPS1/UPS2 -2 no.

Status:

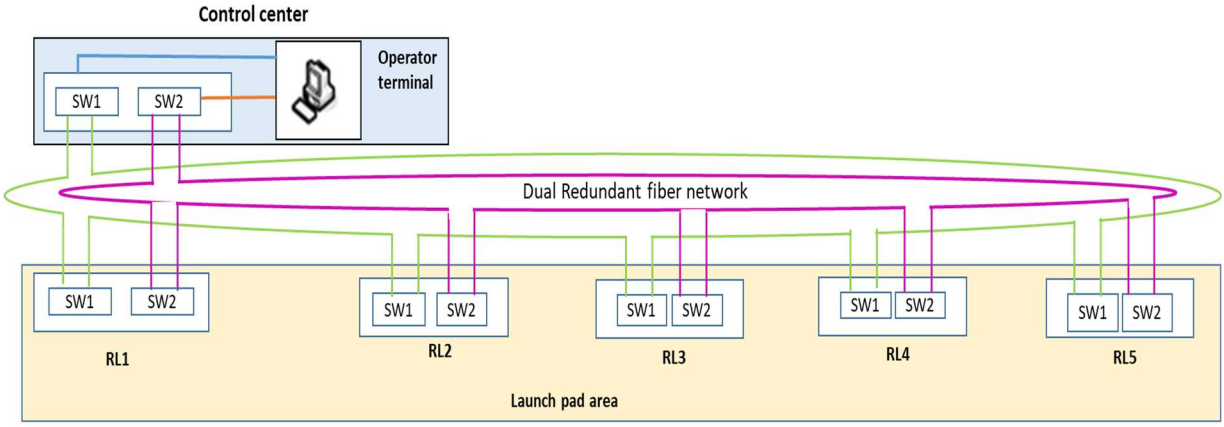
4. I/O rack power supply status for UPS1/UPS2 -2 no.
5. DC Power supply ON/OFF status for UPS1/UPS2 -2 no.
6. Fan Failure Units (2) status -4 no.
7. Ethernet Switch ON/OFF status -2 no.
8. SPD health status -2 no.
9. Analog parameters such as Temperature, RH, Current and Voltage

I/Os in Each Instrumentation rack consists of

1. MCB ON/OFF for IS IO Rack Power for UPS1/UPS2 -4 no.
2. I/O rack power supply status for UPS1/UPS2 -2 no.
3. DC Power supply ON/OFF status for UPS1/UPS2 -4 no.

Configuration of RPOP Network

1	DIN-rail mountable Industrial Ethernet switch with 100 Mbps or better copper ports and 1 Gbps SFP ports for SCADA network with redundant power supply.	6 Copper ports or more 2 FO ports or more (1 Gbps)	2	Belden, Antaira, Allied Telesis or equivalent



Note: Temperature (5) & RH(5) transmitters and Current (20 A ac) transmitters (30) and Voltage (~230 V) measurements (30) should be supplied by the supplier/bidder.

16 Manual safe system (PLC)

- An Independent standalone PLC system with IOs shall be provided for safing the process systems and storages in case of main Process Automation System failure.
- This system shall be configured with star topology to connect its SCADA systems at Control Center using two separate network links as shown in Figure 8
- Separate SCADA server/client license along with system shall be provided. It should not be interfaced with the other Process Automation System Network/SCADA Network

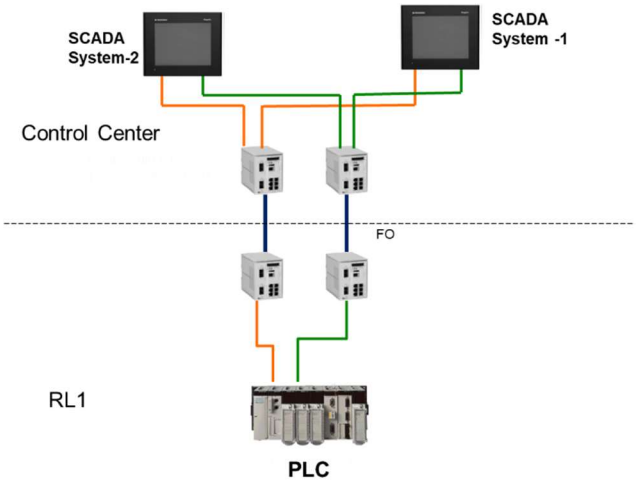


Figure 8 Manual safe system configuration

IO and Network requirements

		Number of Channels			Ethernet switches
Location	Controller with built in I/O's	AI	DO	DI	With 2 FX and 4 Tx
RL-1	1	16	41	41	2
Control Center	0	0	0	0	2

The specifications of Ethernet switches are given below

Name	Number of ports	Quantity	Make
Industrial Ethernet switch with 100 Mbps or better	4 Copper and 2 Fiber SFP module (1 Gbps)	4	Antaira, Allied Telesis, Belden or equivalent or better

Copper ports and with redundant power supply			

17 HART monitoring system for Mass Flow meters

Mass Flow Meters are installed in liquid propellant filling lines to measure the flow rate and total quantity filled. Emerson make Micro motion flow meters supporting HART protocol for configuration and diagnostics is used for this purpose. An independent system with a provision of communicating with the flow meters using HART protocol to display the configuration and diagnostics parameters to the user at the control room along with the necessary DTM (Device Type Manager) software allowing the communication between the PC and the field device using FDT (Field Device Tool) environment is to be supplied. RPOP system and its network can be used for this purpose. The number of flow meters to be interfaced with HART systems are mentioned below

S.No	Location	Channel Requirement (Flow meters)
1.	RL1	4
2.	RL5	16
3.	RL3	5
4.	RL2	3

18 Environmental Conditions

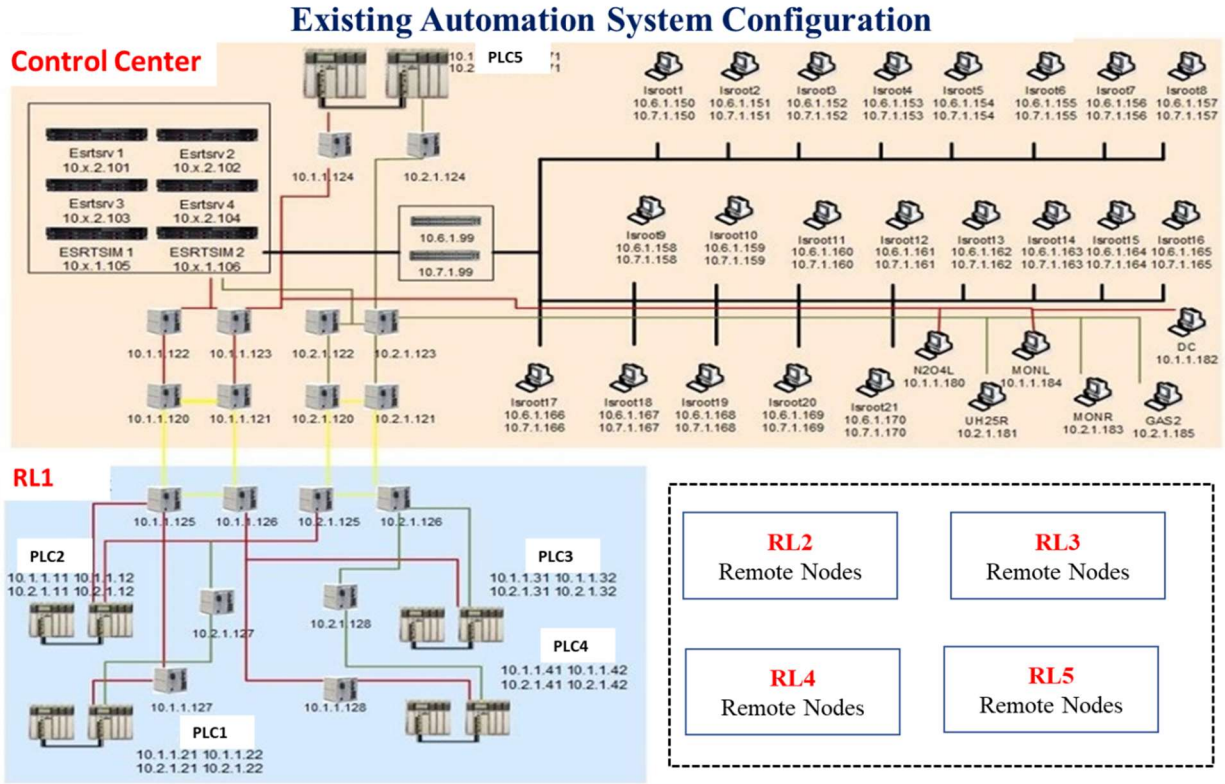
All the PLC Systems should be able to perform flawlessly under the following environmental conditions.

Temperature	0˚C to 50˚C
Humidity	50% RH to 95% RH non-condensing
AC Supply	230V ± 10%, 50Hz ± 5%
Vibration	As per IEC61131 – 2 standards
Shock	15 g peak, 11 msec
Environment Protection	Corrosion protection (G3 standard), Conformal coating at OEM factory for PLC systems shall be ensured

19 Existing System Configuration

Process Automation Systems are being used for launch servicing and are realized with Programmable Logic Controller (PLC) based Triple Modular Redundant (TMR) Control Systems and Client-Server based SCADA systems. The Automation system consists of three subsystems i.e. PLC System, Data Concentrator and SCADA System. Existing propellant filling control system for Earth Storable propellant filling consists of four controllers with respective IOs, Server-Client based SCADA system, Network System and Data Concentrator.

The following diagrams gives the configuration of Existing Automation system to be replaced:



19.1 SCADA System

This system consists of client server-based SCADA on windows 2019. The servers are redundant and Master server posts commands to the field and Slave server synchronizes and ready to take over any time. There are 24 operator clients which are

reconfigurable to connect to display any mimic. The SCADA system supports all basic features like-Real Time Database, alarm, real time trending, redundant network support, audit trails, concurrent engineering etc.

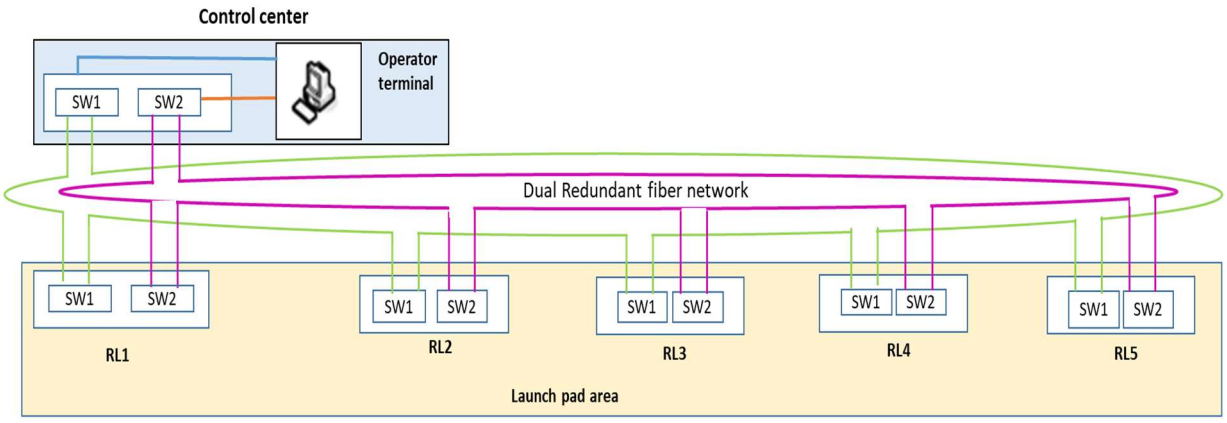
19.2 PLC System

PLC system consists of 4 PLCs and each PLC consists of Hot standby CPUs and TMR based IO layers. Programming terminal is windows 10 based system which is connected to PLC network exclusively for downloading and online monitoring of variables. Active CPU communicates data from all IO layers, execute the application software and post the commands to field. Each CPU has two Ethernet network connectivity to SCADA.TMR IO layers are connected to CPUs via dual redundant bus network (S908 Co-axial cable) and each IO layer is having communication module. These IO layers are interfaced with field via interface boards.

19.3 Data Concentrator (PLC5)

Data Concentrator is Hot-Standby CPU for connecting to external interfaces like checkout for acquiring Telemetry data. In this system Standby CPU sends the two telemetry frames received by its own interfaces within one scan cycle to main CPU. Main CPU receives 4 telemetry frames every cycle and selects the best for processing. Each CPU has two Ethernet link connectivity to SCADA.

19.4 Remote Power On Panel (RPOP) configuration



19.5 Network

Network connectivity between SCADA Server and Client is via TCP/IP using copper cable (Cat.5). Network connectivity between PLC and SCADA server is via TCP/IP using Single Mode Fiber Optic cable. Network connectivity between main CPU and IO layer is via UDP using copper cable (cat.5) for local IO layer and Multi-mode Fibre optic cable for remote IO layers.

19.6 Interface with field I/Os

All interfaces from field instruments are terminated at instrumentation junction boxes (IJBs). All field cables are terminated and signal conditioners are mounted in the junction boxes. Instrumentation Power supplies are used for commanding EP valves and excitation to Signal conditioners.

The existing interface details for various I/Os are as given below:

The inputs (analog and digital) that are available from the field as single input without redundancy are triplicated at the IO rack and fed to the TMR input cards. Such inputs are referred as Panel triplicated inputs. The inputs (analog and digital) that are available in TMR mode from the field are fed to the respective input cards directly. These inputs are referred as field triplicated inputs

19.7 Existing Rack Configuration:

19.7.1 CPU Rack:

The CPU rack consists of Hot Stand by CPUs, Ethernet Switches (Multimode), 24V DC Power Supplies (2 Nos), MCBs and Terminal blocks

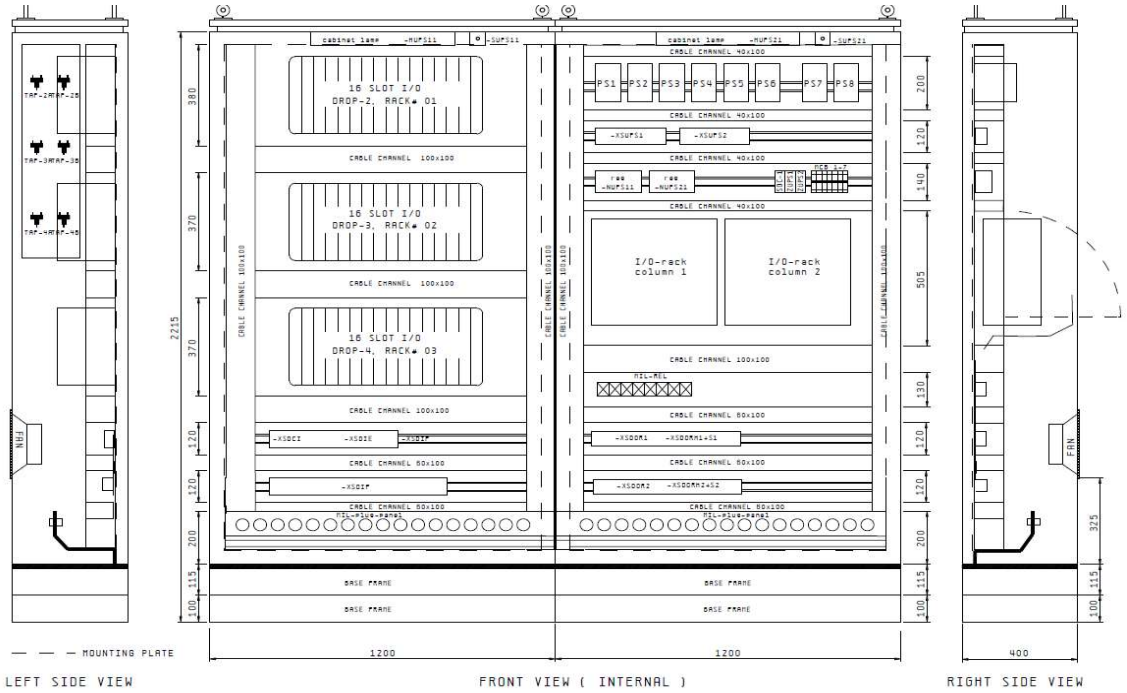
19.7.2 IO Racks:

IO racks consist of TMR IO node and modules, 24V DC Power Supplies (8 Nos), Interface boards, MIL connectors, prefab cables for connecting interface boards and IO modules and also interface boards to MIL connectors, Group Authorization relays (Leech make are being retained), MCBs and Terminal blocks. In case of Remote IO Rack, one IO rack is having Ethernet switches for connecting to CPU layer.

Existing PLC rack

RIO rack TMR interface boards rack

Existing RIO rack



Schematic of RIO & TMR Interface boards rack

19.7.3 MIL connectors

The interface boards for panel triplication and the IO cards for the field triplicated inputs are connected to the Instrumentation junction box using MIL connectors. The MIL connector consists of mating and receptacle part. Receptacle is connected between I/O module to field connector in the I/O rack which should be supplied as part of the system and mating is connected between field connector to instrumentation junction box which is supplied by the department for the existing instrumentation interfaces in order not to disturb existing field wiring. Both receptacle and mating connectors shall be supplied for the new requirements.

20 Tentative Bill of Material

20.1 Process Automation System

Below table is given for your reference based on existing system configuration. However, the actual BOM shall be provided by the bidder based on offered system configuration.

S. No	Item description	Quantity
Main Process Automation System		
1.	Hot Standby Controllers (set of Main & Standby Controllers)	5
2.	32ch Digital I/P modules	408
3.	8 ch Analog I/P modules	237
4.	5 ch Pulse I/P modules	30
5.	32ch Digital O/P modules	144
6.	4 ch Analog O/P modules	24
7.	Modbus Serial module	12
8.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply	176
9.	Controller backplanes	10
10.	IO rack backplanes	63
11.	Rack Power Supply modules	146
12.	RIO Communication modules	126
13.	PLC to SCADA Communication Module	20
14.	Interface Module for DO (2oo3 H/W Voter) with JSS certified or equivalent OEN make min 6 contacts relays (OEN Relay Part No: 67EP-24-6Cx-PC-NIT or equivalent or better)	192 boards 4608 relays
15.	Interface Module for panel triplicate DI	21
16.	Interface Module for panel triplicate AO with JSS certified OEN make relays part no mentioned above	16 boards 288 relays
17.	Interface Module for panel triplicate AI	37
18.	Interface Module for panel triplicate PI	10
19.	Prefab cables	1 lot
20.	Receptacle part of MIL Connectors (refer MIL connector table) as per existing system number given	1 lot

S. No	Item description	Quantity
21.	Receptacle and Mating part of MIL Connectors (refer MIL connector table) 5 numbers for each type mentioned in the existing system	1 lot
22.	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 1 Gbps /10 Gbps or better fiber ports for PLC (RL1) to Control Center connectivity 16 Copper and 8 Fiber ports	2
23.	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 1 Gbps /10 Gbps or better fiber ports for PLC to SCADA connectivity at RL1 6 Copper and 2 Fiber	8
24.	IDE for PLC – S/W Licenses	10
25.	Panel enclosures for housing PLC and necessary interface elements	46
26.	Serial Communication modules (Data Concentrator)	4
27.	Ethernet Communication modules (Data Concentrator)	4
28.	Servers	6
29.	SCADA Clients workstation PCs with out monitors	25
30.	NTP Time Servers	2
31.	Network management tool	1
32.	Portable Programming stations with necessary operator & programming license(laptop)	1
33.	SCADA Client S/W Licenses	25
34.	Web Client S/W Licenses	25
35.	SCADA Server S/W Licenses	6
36.	Antivirus software (Symantec end point protection or equivalent or better)	100 clients (2 groups)
Manual Safing System		
37.	Controller with back plane, communication modules, rack power supplies and associated accessories	1Lot
38.	32ch Digital I/P modules	4
39.	8 ch Analog I/P modules	3
40.	32ch Digital O/P modules	2
41.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply	2
42.	PLC IDE Software license	1

S. No	Item description	Quantity
43.	Industrial Ethernet switch with 100 Mbps or better Copper ports and with redundant power supply; 4 Copper and 2 Fiber SFP module (1 Gbps) Manual safe system	4
44.	SCADA Server/Client (Runtime, Engineering) licenses suitable for the PLC I/O scope	2
45.	Work station for SCADA systems without monitors	2
Remote Power Monitoring System (RPOP)		
46.	Mini PLC/Controllers with Suitable Digital, Analog I/O, communication modules, rack power supplies and associated accessories (Controllers at each location from RL1 to RL5 for both UPS1 and UPS2))	1 Lot
47.	Mini PLC IDE / Controller IDE Software license	1
48.	SCADA Server/Client (Runtime, Engineering) licenses suitable for the PLC I/O scope	2
49.	Work station for SCADA systems without monitors	2
50.	Industrial grade Ethernet switches for RPOP systems, 2 SFP ports, 8 Copper ports of 1Gbps at Control center	2
51.	Digital I/P modules (as per OEM configuration)	1 Lot
52.	Digital O/P modules (as per OEM configuration)	1 Lot
53.	Analog Input modules (as per OEM configuration)	1 Lot
54.	24V DC 10A Power supply modules for Operation of relays and for Internal mini PLC/Controller supply	12
55.	Motorized MCB (as per PLC/IS rack requirements)	1 Lot
56.	Power cable of Copper 4 sq mm 3 core armored (RPOP rack/JB to PLC/IS racks) as per requirement	1 lot
57.	Suitable 4 Pole MCBs for RPOP JB input power from UPS DB (2 at each location) as per requirements	1 Lot
Installation and Commissioning		
58.	Supply of 100 human days of PLC and SCADA expert developers for application development support	1 Lot
59.	Supply of Safety hardline panel which consists of BOM as per section 10.7 and installation and commission of safety panel	1 Lot
60.	Installation and Commissioning of all the systems and mentioned and as per the scope mentioned in the tender specifications document.	1 Lot

Note: Any items which are not explicitly mentioned in the Diagram and essential for fulfilling

the functional requirements of the project are in the scope the supplier.

20.2 **Spares**

S. No	Item description	Quantity
1.	Hot Standby Controllers (set of Main & Standby Controllers)	1
2.	32 ch Digital I/P modules along with prefab cables	15
3.	8 ch Analog I/P modules along with prefab cables	8
4.	5 ch Pulse I/P modules along with prefab cables	2
5.	32 ch Digital O/P modules along with prefab cables	7
6.	4 ch Analog O/P modules along with prefab cables	2
7.	Modbus Serial module	2
8.	Serial Communication modules (Data Concentrator)	2
9.	Ethernet Communication modules (Data Concentrator)	2
10.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply	5
11.	Controller backplanes	2
12.	IO rack backplanes	3
13.	Rack Power Supply modules	7
14.	RIO Communication modules	6
15.	PLC SCADA Communication Module	2
16.	Interface Module for DO (2oo3 H/W Voter) with JSS certified or equivalent OEN make min 6 contacts relays (OEN Relay Part No: 67EP-24-6Cx-PC-NIT or equivalent or better)	5 boards 120 relays
17.	Interface Module for panel triplicate DI	2
18.	Interface Module for panel triplicate AO with JSS certified OEN make relays	2 boards 13 relays
19.	Interface Module for panel triplicate AI	2
20.	Interface Module for panel triplicate PI	2
21.	Prefab cables (as per module list)	1 lot
22.	Receptacle part of MIL Connectors (refer MIL connector table) two numbers for each type mentioned in existing system	1 lot
23.	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 10 Gbps or better fiber ports for PLC to Control Center connectivity at Control center: 16 Copper and 8 Fiber	1
24.	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 10 Gbps or better fiber ports for PLC to Control Center connectivity at RL1 location: 6 Copper and 2 Fiber ports	2

S. No	Item description	Quantity
25.	Industrial Ethernet switch with 100 Mbps or better Copper ports and with redundant power supply ; 4 Copper and 2 Fiber SFP module (10 Gbps or 1 Gbps) Manual safe system	2
26.	Industrial Ethernet switch with 1 Gbps or better Copper ports and with redundant power supply; 8 Copper and 2 Fiber SFP module (10 Gbps or 1 Gbps) SCADA connection to remote locations (RL1-RL5)	2
27.	Panel enclosures for housing PLC and necessary interface elements	2
28.	Serial Communication modules (Data Concentrator)	2
29.	Ethernet Communication modules (Data Concentrator)	2
30.	SCADA Clients PCs	2
31.	Thin Clients for Web Clients	2
32.	**Manual Safing System**	
33.	Controller with back plane	1
34.	32ch Digital I/P modules	2
35.	8 ch Analog I/P modules	2
36.	32ch Digital O/P modules	2
37.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply	2
38.	**RPOP System**	
39.	Min PLC/Controllers	2
40.	Remote I/Os	2
41.	Distributive controllers (If configured)	2
42.	Industrial grade Ethernet switches for RPOP systems, 4 SFP ports, 16 Copper ports of 1Gbps	2
43.	Digital I/P modules if configured	2
44.	Digital O/P modules if configured	2
45.	24V DC 10A Power supply modules for Operation of relays and for Internal mini PLC/Controller supply	2
46.	Motorized MCB	10
47.	4 Pole MCBs for RPOP JB input power from UPS DB	2

Annexure-1

Bid Qualification Criteria for
PLC based Process Automation Systems

Bidders who are qualifying/meeting following Technical and Financial capabilities are eligible to participate in the bid for Supply, erection and commissioning of PLC based Process Automation Systems at First Launch Pad. Bidder shall furnish all the details with documentary proof and submit the same along with quotation. Bids of the parties which are not meeting the following criteria will not be considered for evaluation and will be rejected without seeking any further clarifications. Bidder shall furnish the details of their resources for department to assess their capability.

Sl.No.	Criteria / Requirement	To be confirmed by the bidder
Technical Qualification Requirements The bidder should meet the following technical qualifying requirements and shall submit relevant certificates/data to establish his credentials along with the technical bid.		
1.	Bidder shall be Original PLC manufacturers / authorized system integrators of PLC manufacturers with the experience for executing similar projects in India and in operation for the last five years from the date of tender enquiry	
2.	Bidder should have at least ten years' experience as on 31/07/2025 in the field of Design, Supply of Hardware & Software, Erection & Commissioning of Process Automation Systems and the bidder should have installed & commissioned at least one system using PLCs with minimum 3000 I/Os & respective SCADA systems & associated Instrumentation interfaces during last ten years. Documentary proof for the same shall be provided along with bid.	
3.	Bidder should provide details of offered PLC systems (same make and model) commissioned in India in the recent past by OEM or authorized system integrator. Site visit for evaluation of bidder/system installed shall be arranged if required by department. Documentary proof of project completion certificate must be provided	
4.	The Bidder shall have dedicated Design/ Engineering, software development and erection/commissioning teams.	

5.	Bidder in case of system integrators must have executed projects with reputed PLC makes and should have been authorized by PLC OEM of same make for minimum of five years continuously till March 2025 and necessary document shall be provided.	
6.	The bidder should have an establishment in India in providing services and maintenance support along with all type of spares for the offered PLC system. Documentary proof of the establishment, service setup and other resources required for prompt service to be furnished by the bidder along with the offer.	
7.	The PLC offered should have a proven performance track record of continuous trouble-free operation for at least for the last one year preceding from the date of technical bid opening. Bidder shall furnish the necessary details as mentioned in document	
8.	The bidder must support the offered system for a period of minimum 15 years for hardware and software from the date of commissioning and must provide assurance for NON-comprehensive AMC. If the bidder is not OEM, then he must submit a copy of agreement with the OEM of the offered system to meet the above criteria.	
9.	Offered PLC CPU must be cyber security certified by third party and compliance to the standard such as IEC62443 or equivalent	
10.	All PLC and SCADA system elements must be certified by third party international standard	
Financial Qualification Requirements: The bidder should also meet the following financial qualification requirements:		
1.	Bidder should have executed at least one purchase order value of Rs 6 crores or two purchase orders of each of Rs 3 crores or three purchase orders each of Rs 2 crores of similar automation project in any PSU's/Central Govt establishment/reputed private firms in the last five years (before 31/07/2025).	
2.	The Bidder should have annual turnover of minimum Rs.15 crores per year for last 5 financial years ending with March 2025.	
3.	Bidder should possess a current Solvency Certificate from commercial bank for an amount of not less than Rs. 200 Lakhs as detailed in bid qualification criteria. Date of Solvency certificate should be on or after 01-01-2025.	
4.	IT/ TDS certificate and Balance Sheet shall be submitted for last 3 years ending 31-03-2025.	

1. **Important notes:**

1.2 In the above technical qualification, bidder shall clearly indicate the list of sub vendors in case of outsourcing if any. The same shall be evaluated and approved by purchaser.

1.3 Bidder shall furnish all the above details fully and explicitly. The party shall enclose the documents in support of the details provided in the bidder qualification.

1.4 Please note that the "BID" without above mentioned documents/information in support of the eligibility criteria will be summarily rejected.

2. **Bid Selection Procedure and Process of Pre-Qualification**

Step -1: Technical Bids will be opened and scrutinized for meeting all technical specification and supply conditions

Step -2: Short listing based on documents submitted, satisfying all the eligibility criteria given above by the Party or individual along with their Bid / application. (Non-submission of any document as given in above list within stipulated time leads to rejection of Bid)

Step–3: Subsequently Bidder's competency, their technical achievements and financial status will be evaluated suitable for this project. Feedbacks from Bidder's clients will be verified.

Step - 4: If required, visit will be made to their factory/ Party by technical team (ISRO or third party) for accessing the capability of manufacturer.

Step - 5: Visit to sites, wherever required by technical team (ISRO or Third party)

ISRO-SHAR reserves right to verify the information/data furnished by Bidder. If the same is found as fault or with any deviation the bid will be rejected.
Only those Bidders who are found suitable & meeting all above qualification Criteria/requirements will be finally qualified for opening the Price Bids for evaluation.

Annexure-2

General Compliance Statement Form

Sl. No	Description	compliance Yes/No
1.	Bidder must quote all the items specified in the tender enquiry.	
2.	Bidder must fill and enclose all Annexure as per the tender document (Annexure 1 to 7)	
3.	Ensure all items/sub systems are considered as per Tender document for each Automation System	
4.	Bidder shall sign and stamp each page of the document as a token of their acceptance & submit along with their offer.	
5.	BOM of each automation system must be provided separately as per Annexure 5 as part of technical bid	
6.	BOM of spares shall be provided by the bidder as per Annexure 6 as part of technical bid	
7.	Much care has been taken in arriving the list of components, however if any item which is not mentioned explicitly but essentially required for the completion of system is in the scope of the Bidder	
8.	Department reserves the right to remove some of the items / services in the tender from the scope of supply	
9.	Bidder shall arrange training of department engineers at site by OEM trainers for PLC & SCADA system including programming	
10.	During the warranty period, the bidder has to perform periodical maintenance and unlimited breakdown calls and replacement of failed/ malfunctioning components without any additional cost by employing a trained resident engineer as per scope indicated in clause 6.4	
11.	Cost quoted shall be firm and fixed	
12.	Bidder must supply the details of international standard third party certifications of the items supplied	
13.	Language of correspondence will be in English for all forms of communication	
14.	During the erection, testing and commissioning of equipment at site in Sriharikota, the supplier has to make his own arrangements for boarding, lodging and transportation of his men and materials	
15.	Bid shall remain valid for acceptance for a period of six months from the due date of submission of the Bid	
16.	The PLC based automations system and related accessories shall be guaranteed against any manufacturing defects for a period of	

Sl. No	Description	compliance Yes/No
	24 months from the date of supply or 18 months from date of commissioning whichever is earlier	
17.	Bidder shall submit the detailed engineering drawings within 4 weeks of receipt of the firm Purchase Order	
18.	Overall delivery of all supply items must be within 28 weeks from the date of Purchase Order release	
19.	Removal of existing old Process Automation Systems at Control Centre and Remote Locations by retaining the existing instrumentation interfaces	
20.	All Hardware and Software shall be STATE-OF-THE-ART at the time of delivery	
21.	Supply of hardware related to Controllers with necessary accessories (interfacing circuitry, cables, fiber optic devices, relays etc.,) built-in at factory in fully pre-wired and tested cabinets as per specifications, maintenance spares and associated systems and sub-systems etc provided in the tender document	
22.	Supply, installation and commissioning of SCADA components such as Servers, network components, operator stations, control desks and housing racks as required	
23.	Supply of the necessary Operating system, Application software development tools / environments, standard libraries for process control applications, software packages and supporting tools for the Controller, SCADA and interface components	
24.	Communication between the SCADA system and the PLC based control system shall be through local dual redundant Ethernet LAN. Required interfaces in the dual redundant Ethernet LAN is to be considered for such communication	
25.	Supply of receptacle part of MIL connectors within the PLC panel	
26.	Supply of necessary interface boards for the IO Modules to interface with the existing Instrumentation system as per IO requirement	
27.	Installation of the system at site and integration with existing instrumentation system (including MIL connector terminations etc.,), testing and commissioning of the system as per approved test procedures	
28.	Laying and termination of power / control and data cables as per the requirement	
29.	Necessary test jigs/PLC simulator for sub system level testing of pre-wired panel during FAT and SAT for all the types of IO channels must be provided by the supplier	

Sl. No	Description	compliance Yes/No
30.	Smart Link based power distribution system for powering all remote IO panels and monitoring panel environment parameters to be part of automation system	
31.	Offered PLC Controllers must be Cyber security certified by third party (IEC 62443)	
32.	All prices must be entered in the price bid of e-procurement page only. Any price component specified in the document or annexure will not be considered and bid is liable for rejection	

Annexure-3

Technical Specification Compliance

Sl. No.	Feature	Specification	Party's compliance Yes/No
		PLC System	
1.	Controller redundancy	Dual Redundant/Hot Standby The redundancy Controller shall take over from the main controller instantaneously in case of failure of main controller.	
2.	Controller Synchronization	Event or Cyclic	
3.	Controller Switch over time from main to redundant	Less than a scan cycle and should be bump less	
4.	Controller to IO Rack distance	Minimum 2 Km	
5.	No. of IO Nodes/ Drops per Controller	IO requirement must be configured without exceeding 30 IO nodes	
6.	Deterministic scan Time (with system software, voting logic and application software of 250K lines of code) including fault tolerance	Less than 100ms	
7.	Turnaround time of the system (Reaction time from input reading to output posting)	Not more than two scan cycles	
8.	Controller rack backplane	Redundancy in backplanes for main and redundant controllers with dual redundant power supply and communication modules (independent for IO Network and Control Network)	
9.	Inter-PLC communication	TCP/UDP communication – Full duplex	
10.	Number of PLCs that can be configured for inter-PLC communication	Minimum 8	
11.	Diagnostic levels	Information should be available at System level, Module level and Group/Channel level	

Sl. No.	Feature	Specification	Party's compliance Yes/No
12.	Operating system for PLC Programming software or IDE	Should be supported by latest Windows or Linux based OS	
13.	PLC simulator feature	Programming IDE should have simulation feature. User must be able to test the application software with SCADA without the PLC hardware.	
14.	Run time programming requirements	Program modification done in Main controller should automatically get updated in stand-by controller	
15.	IO redundancy	TMR configurable (Input voting-by software, output voting – by Hardware)	
16.	Backplane Power supply for each IO nodes/drops	Dual Redundant	
17.	Minimum No. of IO channels per IO drop	416 digital IO or 112 Analog IO	
18.	Hot swap ability	IO modules and Power supply modules	
19.	Posting of predefined values in case of PLC failure or communication failure between PLC and IO rack	Configurable by user at Channel level	
20.	Conformal Coating for all PLC system modules	As per ISA G3 and Conformal coated at OEM factory	
21.	Cyber security for PLC	Compliance to the IEC – 62443 standards	
22.	Third party certifications	TUV or CE or equivalent	
Controllers			
23.	IO capacity per controller	Minimum 5000 Digital IOs and 1000 Analog IOs	
24.	Memory Size-RAM	Minimum 16MB for application program	
25.	Maximum Application Size	30% memory margin should be available for an executable code of 250K lines of code	
26.	RTC resolution	1ms	

Sl. No.	Feature	Specification	Party's compliance Yes/No
27.	Scan Cycle	Must be user configurable or cyclic	
28.	Real time Operating System	Must support multitasking with different scan rates	
29.	Watch dog timer	Must be user configurable	
30.	Programming languages supported	IEC 61131 languages (must support structured text)	
31.	Built in communication ports	USB or Ethernet for monitoring/debug port	
32.	PLC CPU to IO node - Network connectivity	Dual Ring or Star topology or better Must be able to support dual redundant IO network with 100 Mbps or higher speed. Each IO node should have dual communication modules and connectivity to PLC CPU	
33.	PLC CPU to SCADA servers – network connectivity	Must be able to support dual redundant network to avoid single point failure for each PLC CPU	
34.	Communication Protocol for SCADA to PLC	Minimum 100Mbps must be supported	
35.	Time Synchronization	NTP support must be available for time synchronization	
36.	Diagnostic features	Detailed error log should be provided	
37.	Online Program Modification	Provision must be available to change the logic and download to PLC without disturbance to the operations	
38.	Memory Protection	Provision must be available to avoid inadvertent downloading of logic to PLC	
39.	Remote restart feature	User must be able to give cold restart through programming IDE	
40.	OPC compatibility	Shall be supported	
41.	Retaining program context in case of power failure	Must be available	
42.	Timers / Counters supported	Minimum 255	

Sl. No.	Feature	Specification	Party's compliance Yes/No
DO card Specifications			
43.	Number of outputs	Minimum 32	
44.	Sink/Source Output	Source type	
45.	Output switching	Solid-state	
46.	Switching voltage	24V nominal	
47.	Number of outputs that can be triggered simultaneously	All outputs	
48.	Minimum Current Per Channel	0.1A	
49.	Isolation ➢ Between channel and backplane ➢ Between group to group	 500V DC 500V DC	
50.	Switching delays	Less than 1.2ms	
51.	Internal protective circuit	Overload protection must be available	
52.	Front Panel display	Must indicate the module health status and command status for all channels	
53.	No Inter channel interference	Essential	
54.	Diagnostics ➢ Module level ➢ Group or Channel level	 ➢ Essential ➢ Essential	
DI Card Specifications			
55.	Number of Inputs	Minimum 32	
56.	Number of inputs that can be triggered simultaneously	All inputs	
57.	Sink/Source mode	Sink	
58.	Isolation ➢ Between channel and backplane	 500V DC 500V DC	

Sl. No.	Feature	Specification	Party's compliance Yes/No
	➢ Between group to group		
59.	Input voltage	24V nominal	
60.	Switching threshold ➢ Low Range (0) ➢ High Range (1)	 ➢ <5 VDC ➢ >11 or >15 VDC	
61.	Input Resistance	Min 2.4 K Ohms	
62.	Input Switching delay from '0 to '1'	1 to 10ms	
63.	Front Panel display	Must indicate the health status and ON/OFF status for all channels	
64.	No Inter channel interference	Essential	
65.	Diagnostics ➢ Module level ➢ Group or Channel level	 ➢ Essential ➢ Essential	
AI Card Specifications			
66.	Input type	Current – differential type	
67.	No of channels	8/16	
68.	ADC Resolution	16 bit or better	
69.	Input Measuring ranges	0-20mA/4-20mA	
70.	Input Impedance	50 - 275 Ohms	
71.	Accuracy	0.2% or better at 25°C	
72.	CPU read time	Less than 25ms	
73.	Update Time for all channels	Less than 25ms	
74.	Input Filter	Essential	
75.	Diagnostics ➢ Module level ➢ Channel level	 ➢ Essential ➢ Essential	

Sl. No.	Feature	Specification	Party's compliance Yes/No
76.	Isolation Between channel and backplane	500V DC	
77.	CMRR between channels	70dB or better	
78.	Front Panel display	module health status shall be displayed	
79.	No Inter channel interference	Essential	
AO Card Specifications			
80.	Output type	Current – differential type	
81.	No of channels	4/8	
82.	DAC Resolution	16-bit or better	
83.	Output range	4-20mA	
84.	Accuracy	0.25% or better at 25°C	
85.	Load Resistance	Minimum 500 ohms or as to meet TMR Configuration – refer to interface diagram* as shown in Figure 5 and Figure 8	
86.	Update Time	10 ms without ramp or better	
87.	Diagnostics ➢ Module level ➢ Channel level	 ➢ Essential ➢ Essential	
88.	Isolation Voltage between channel and backplane	500V DC	
89.	Front Panel display	module health status shall be displayed	
90.	No Inter channel interference	Essential	
PI Card Specifications			
91.	No of channels	4 or more	
92.	Counter Inputs (Voltage)	24V nominal	

Sl. No.	Feature	Specification	Party's compliance Yes/No
93.	Counter Operating Modes	Totalizer mode/Rate mode	
94.	Counter Resolution	32 bit	
95.	Counter Frequency Range	10 KHz and above	
96.	Switching threshold ➢ Low Range (0) ➢ High Range(1)	 ➢ <5 VDC ➢ >11 V or >15 VDC	
97.	Field to Channel Isolation	500V DC	
98.	Internal protective circuit	Essential	
99.	Indications and Diagnostics ➢ Module level ➢ Channel level	 ➢ Essential ➢ Essential	
100.	Front Panel display	module health status shall be displayed	
101.	No Inter channel interference	Essential	
Programming Interfaces			
102.	Programming languages Support	IEC61131-3 compliant programming languages. Structured Text for user application task development is mandatory	
103.	Integrated development environment (IDE) for program development	Must be User-friendly. The user should be able to configure the controllers and IO cards as per the functional requirements, develop, compile, and download the application task	
104.	Online debugging and real time monitoring	The IDE should provide features for monitoring the watch variables in real-time, and debugging of application software	
105.	Online modification of application logic	The user should be able to modify the configuration or change the logic without disturbance to the operations	
106.	PLC simulator	The user must be able to simulate and test the application logic without the	

Sl. No.	Feature	Specification	Party's compliance Yes/No
		PLC hardware. SCADA communication should be possible while testing in simulator mode	
107.	All the device drivers, libraries for PID control and communication interface handling	Must be available for all the system modules and also the third-party communication devices such as timing interfaces and serial interfaces	
108.	Provision for programming and downloading over network interface	Essential	
Data Concentrator			
109.	Controller deterministic scan time	Less 100 ms	
110.	Serial interface specification	RS422 with 1 KB data at 115.2 Kbps	
111.	Ethernet interface specification	TCP/IP or UDP/IP at 100 Mbps	
112.	Communication with SCADA	The data concentrator should have provision to communicate with the SCADA runtime servers for data display, logging and archival and accepting supervisory control commands	
113.	Communication with other PLC Systems	The data concentrator should be able to process the data from the communication interfaces and provide the processed data to the Controllers for performing their control activities at least at the Cycle Time of Main controllers on the Control Network	
114.	Programming interfaces	Necessary programming interfaces for Configuration and data acquisition of the communication interfaces should be provided	
SCADA System			
115.	SCADA system	Client – Server architecture. Response time of SCADA system must be 1 second or lesser	
116.	CPU to SCADA communication - Control network	Dual Redundant	

Sl. No.	Feature	Specification	Party's compliance Yes/No
117.	SCADA server to client's communication redundancy – Operator network	Dual Redundant	
118.	SCADA server configuration with redundancy	Should be configurable as runtime, trend, alarm and Report	
119.	Switchover from main to redundant server	less than 5 sec	
120.	SCADA Engineering Server	Development and deploying the project in runtime servers without disturbance to the operations	
121.	Number of SCADA Tags	Unlimited tags (w.r.t software license)	
122.	Operating system for SCADA software	Should be compatible with latest Windows or Linux based Operating system	
123.	Third party certifications	International standard Certifications	
124.	Time synchronisation	NTP based time synchronization is mandatory for all elements in the SCADA System	
125.	Scripting feature	User scripts can be stored in procedures for multiple reuse and centralized maintenance Script function must perform basic arithmetic, logic and control tasks and display and manipulate data in graphics pages. Editor must be provided for writing, editing and de bugging of the generated scripts	
126.	SCADA Security	Each graphic page must have visibility association based on user privilege. Assign security rights for the user interfaces	
127.	Version Management	Provide facility to maintain versions of the software being developed	
128.	Trend Configuration	Log trend data either periodically with resolution of 1s or lesser or based on the change of data with a minimum tolerance of 0.005	

Sl. No.	Feature	Specification	Party's compliance Yes/No
129.	SCADA Runtime System capabilities	The capability to refresh the display data at 1 second or lesser interval with maximum 32000 tags per PLC and the user commands to be transmitted to the Controllers within 2 seconds of user command	
130.	SCADA Data logging	Logging a minimum of 10000 variables as trends and minimum 10000 variables as alarms Data Storage should occur in both servers simultaneously to maintain continuity in data in case of failures	
131.	Trend, Alarm, Event and Report Viewing	The Runtime system should allow querying for online / recorded events / alarms / trends when the system is running without having affect to the data acquisition of the real-time parameters and the ongoing process through a suitable interface (Web Query or an equivalent one). These data should be generated as reports (text based or graphical) with user customizable formats	
132.	SCADA performance requirement	Reading a minimum of 2500 Analog tags per PLC within a given SCADA scan cycle time Simultaneous reading of minimum of 10000 Analog tags from all PLCs within a given scan cycle time	
133.	Network Management and Monitoring tools	Tools for performance analysis of the network without adding any delays to the process control application related communication jobs	
134.	System health monitoring	Centralised Server and client health monitoring like, CPU performance, disk space, memory usage and status of internal activities should be available	
SCADA System hardware			

Sl. No.	Feature	Specification	Party's compliance Yes/No
135.	SCADA Server	Processor: Intel Xeon Gold dual processor with 24 Core or more per processor having hyper-threading feature and support for Virtualization, L3 cache 36 MB or better RAM: ECC DDR5 128 GB Storage: 2 x 2 TB SSD for OS(Mirrored), 4 x 4TB SSD RAID Support: RAID 0,1,5 & 6 Make: HP/DELL	
136.	Operator Stations	Processor: Intel Core i7 13thGen or better, L3 cache: 30 MB or better, 16 cores or better. 5.2 Ghz or better RAM: 16 GB or better Storage: 1TB SSD or better	
137.	SCADA Network Switches	CISCO Make 48 Port 1 Gbps Ethernet switch with dual redundant power supply	
138.	Mobile Programming station	Processor: Intel Core i7 13thGen or better, L3 cache: 30 MB or better, 16 cores or better. 5.2 Ghz or better RAM: 16 GB or better Storage: 1TB SSD or better	

Annexure-4

Deviation Table

Sl. No.	Tender Specification	Deviations (if any)	Reason for Deviations

Annexure-5

BOM for Automation System

S. No	Item description	Quantity	Make and Model Number
Main Process Automation System			
1.	Hot Standby Controllers (set of Main & Standby Controllers)		
2.	32ch Digital I/P modules		
3.	8 ch Analog I/P modules		
4.	5 ch Pulse I/P modules		
5.	32ch Digital O/P modules		
6.	4 ch Analog O/P modules		
7.	Modbus Serial module		
8.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply		
9.	Controller backplanes		
10	IO rack backplanes		
11	Rack Power Supply modules		
12	RIO Communication modules		
13	PLC to SCADA Communication Module		
14	Interface Module for DO (2oo3 H/W Voter) with JSS certified or equivalent OEN make min 6 contacts relays (OEN Relay Part No: 67EP-24-6Cx-PC-NIT or equivalent or better)		
15	Interface Module for panel triplicate DI		
16	Interface Module for panel triplicate AO with JSS certified OEN make relays part no mentioned above		
17	Interface Module for panel triplicate AI		
18	Interface Module for panel triplicate PI		
19	Prefab cables		
20	Receptacle part of MIL Connectors (refer MIL connector table) as per existing system number given		
21	Receptacle and Mating part of MIL Connectors (refer MIL connector table) 5 numbers for each type mentioned in the existing system		
22	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 1 Gbps /10 Gbps or better fiber ports for PLC (RL1) to Control Center connectivity 16 Copper and 8 Fiber ports		
23	Industrial Ethernet switch with		

	100 Mbps or better speed Copper ports 1 Gbps /10 Gbps or better fiber ports for PLC to SCADA connectivity at RL1 6 Copper and 2 Fiber		
24	IDE for PLC – S/W Licenses		
25	Panel enclosures for housing PLC and necessary interface elements		
26	Serial Communication modules (Data Concentrator)		
27	Ethernet Communication modules (Data Concentrator)		
28	Servers		
29	SCADA Clients workstation PCs with out monitors		
30	Network management tool		
31	Portable Programming stations with necessary operator & programming license(laptop)		
32	SCADA Client S/W Licenses		
33	Web Client S/W Licenses		
34	SCADA Server S/W Licenses		
35	Antivirus software (Symantec end point protection or equivalent or better)		
Manual Safing System			
36	Controller with back plane, communication modules, rack power supplies and associated accessories		
37	32ch Digital I/P modules		
38	8 ch Analog I/P modules		
39	32ch Digital O/P modules		
40	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply		
41	PLC IDE Software license		
42	Industrial Ethernet switch with 100 Mbps or better Copper ports and with redundant power supply; 4 Copper and 2 Fiber SFP module (1 Gbps) Manual safe system		
43	SCADA Server/Client (Runtime, Engineering) licenses suitable for the PLC I/O scope		
44	Work station for SCADA systems without monitors		
Remote Power Monitoring System (RPOP)			
45	Mini PLC/Controllers with Suitable Digital, Analog I/O, communication modules, rack power supplies and associated accessories (Controllers at each location from RL1 to RL5 for both UPS1 and UPS2))		
46	Mini PLC IDE / Controller IDE Software license		
47	SCADA Server/Client (Runtime, Engineering) licenses suitable for the PLC I/O scope		
48	Work station for SCADA systems without monitors		

49	Industrial grade Ethernet switches for RPOP systems, 2 SFP ports, 8 Copper ports of 1Gbps at Control center		
50	Digital I/P modules (as per OEM configuration)		
51	Digital O/P modules (as per OEM configuration)		
52	Analog Input modules (as per OEM configuration)		
53	24V DC 10A Power supply modules for Operation of relays and for Internal mini PLC/Controller supply		
54	Motorized MCB (as per PLC/IS rack requirements)		
55	Power cable of Copper 4 sq mm 3 core armored (RPOP rack/JB to PLC/IS racks) as per requirement		
56	Suitable 4 Pole MCBs for RPOP JB input power from UPS DB (2 at each location) as per requirements		
Installation and Commissioning			
57	Supply of 100 human days of PLC and SCADA expert developers for application development support		
58	Installation and Commissioning of all the systems and mentioned and as per the scope mentioned in the tender specifications document.		

Annexure-6

Tentative BOM for Spares for Automation Systems

S. No	Item description	Quantity	Make and Model Number
1.	Hot Standby Controllers (set of Main & Standby Controllers)		
2.	32 ch Digital I/P modules along with prefab cables		
3.	8 ch Analog I/P modules along with prefab cables		
4.	5 ch Pulse I/P modules along with prefab cables		
5.	32 ch Digital O/P modules along with prefab cables		
6.	4 ch Analog O/P modules along with prefab cables		
7.	Modbus Serial module		
8.	Serial Communication modules (Data Concentrator)		
9.	Ethernet Communication modules (Data Concentrator)		
10.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply		
11.	Controller backplanes		
12.	IO rack backplanes		
13.	Rack Power Supply modules		
14.	RIO Communication modules		
15.	PLC SCADA Communication Module		
16.	Interface Module for DO (2oo3 H/W Voter) with JSS certified or equivalent OEN make min 6 contacts relays (OEN Relay Part No: 67EP-24-6Cx-PC-NIT or equivalent or better)		
17.	Interface Module for panel triplicate DI		
18.	Interface Module for panel triplicate AO with JSS certified OEN make relays		
19.	Interface Module for panel triplicate AI		
20.	Interface Module for panel triplicate PI		
21.	Prefab cables (as per module list)		
22.	Receptacle part of MIL Connectors (refer MIL connector table) two numbers for each type mentioned in existing system		
23.	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 10 Gbps or better fiber ports for PLC to Control Center connectivity at Control center: 16 Copper and 8 Fiber		
24.	Industrial Ethernet switch with 100 Mbps or better speed Copper ports 10 Gbps or better fiber ports for PLC to Control Center connectivity at RL1 location: 6 Copper and 2 Fiber ports		

S. No	Item description	Quantity	Make and Model Number
25.	Industrial Ethernet switch with 100 Mbps or better Copper ports and with redundant power supply ; 4 Copper and 2 Fiber SFP module (10 Gbps or 1 Gbps) Manual safe system		
26.	Industrial Ethernet switch with 1 Gbps or better Copper ports and with redundant power supply; 8 Copper and 2 Fiber SFP module (10 Gbps or 1 Gbps) SCADA connection to remote locations (RL1-RL5)		
27.	Panel enclosures for housing PLC and necessary interface elements		
28.	Serial Communication modules (Data Concentrator)		
29.	Ethernet Communication modules (Data Concentrator)		
30.	SCADA Clients PCs		
31.	Thin Clients for Web Clients		
	Manual Safing System		
32.	Controller with back plane		
33.	32ch Digital I/P modules		
34.	8 ch Analog I/P modules		
35.	32ch Digital O/P modules		
36.	24V DC 10A Power supply modules for Operation of relays and for Internal PLC supply		
	RPOP System		
37.	Min PLC/Controllers		
38.	Remote I/Os		
39.	Distributive controllers (If configured)		
40.	Industrial grade Ethernet switches for RPOP systems, 4 SFP ports, 16 Copper ports of 1Gbps		
41.	Digital I/P modules if configured		
42.	Digital O/P modules if configured		
43.	24V DC 10A Power supply modules for Operation of relays and for Internal mini PLC/Controller supply		
44.	Motorized MCB		
45.	4 Pole MCBs for RPOP JB input power from UPS DB		

Annexure-7

BIDDER'S CHECKLIST

S.No	Items	Check
1.	Sign and stamp each page of proposal and the same is scanned and uploaded in e-procurement portal	
2.	Sign and stamp each page of Annexures from 1-7 and the same is scanned and uploaded in e-procurement portal	
3.	Documentary proof of previous project experience	
4.	Documentary proof of the establishment, service setup and other resources required for prompt service	
5.	Documentary proof of proven performance track record of continuous trouble-free operation of PLC for last 1 year	
6.	In case of system integrators documentary proof of executed project with reputed PLC makes and associated with the OEM as authorized System Integrator for minimum period of five years	
7.	Documentary proof of annual turnover for last 3 financial years	
8.	Latest solvency certificate from any commercial bank as detailed in bid qualification criteria for an amount of not less than Rs. 200 Lakhs. Date of Solvency certificate should be on or after 01-01-2025.	
9.	IT/ TDS certificate and Balance Sheet for last 3 years ending 31-03-2025	
10.	Proposed system architecture and data sheets of all items as per technical specifications	
11.	Documentary proof of cyber security certificate by third party for offered PLC CPU	
12.	Documentary proof of offered system with same make and model systems commissioned in the last 7 years in India.	
13.	Documentary proof of international standard test certifications for the offered PLC & SCADA elements	

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(SEAL & SIGNATURE OF THE TENDERER)

Annexure - 8

Price Bid Format

S.No	Item description	Cost (Rs)
1.	Supply of items for PLC based Process Automation Systems as per the specifications mentioned in the tender specifications document	
2.	Spares	
3.	Installation and Commissioning of PLC based Process Automation Systems as per the specifications mentioned in the tender specifications document	
4.	Non-Comprehensive AMC as per the scope mentioned in the tender specifications document	
4.1	First year Non-Comprehensive AMC	
4.2	Second year Non-Comprehensive AMC	
4.3	Third year Non-Comprehensive AMC	
5.	Packing and Forwarding Charges	
6.	Taxes extra	
7.	Grand Total	