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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company. Specification for LDO/HFO PLC System 1. SCOPE This technical specification covers the Design, Engineering, Manufacturing, System integration, Assembly, testing at vendor works, inspection by purchaser, packing and transportation to site with necessary documentation like data sheets, statutory approvals, O&M manuals etc., as required and supervision of Erection, commissioning till final handover of PLC system to End user. 2. Proven Track Record 2.1 The system (with all its sub-systems) as being offered / supplied should have been installed and operating satisfactorily in a similar Unit application of hydrocarbon industry like Refinery, Petrochemical or Gas Processing Plant for <u>at least 4000 hours</u> (as collaborated by user certificate). 2.2 The system should be supplied, engineered, integrated, tested etc. from a factory from where the system / sub-systems as offered / supplied have already been supplied, engineered, integrated, tested etc. and meet the criteria 2.1 above. 2.3 All the activities including engineering should be carried out by the agency which have carried out the similar activity in the past and meets the criteria 2.1 above. 2.4 The system should be supplied by the manufacturer in the fully engineered condition or should be supplied by the manufacturer's representative / subsidiary who have proper infrastructural facilities and meets the criteria 2.1 above. 2.5 In any case, the manufacturer whose system is being offered / supplied should have a local representation / subsidiary which have the proper infrastructural facilities like engineering, installation, maintenance, testing, spare part support, system fault diagnosis and other related logistic support. Systems, which don't have the local base, should be avoided. 3. INSTRUCTIONS TO BIDDERS 3.1 Bidders are advised to contact BHEL for essential technical queries in writing within one week of issue of Enquiry. In the event of any conflict between these specifications, data sheets, related standards, codes etc. the vendor shall refer the matter to the purchaser for clarifications before bid submission and the decision of Purchaser shall be final & binding on Bidder, without any cost & delivery implications. In the event of conflict, most stringent requirements shall be followed in general. 3.2 Offers with incomplete information will not be considered for evaluation, and are likely to be rejected outright without any further interaction with the Bidder. 3.3 Any technical features [over & above BHEL enquiry specification requirements] proposed by Bidder will not be given preference for the purpose of evaluation. 3.4 Bidder shall submit the "Duly filled & Signed copy of Check list" compulsorily along with technical offer without which offer is liable for rejection without any further interaction with the Bidder 4. Codes & Standards – Refer Annexure-[E] of this specification					
Ref. Doc	Revision :00 Refer Record of Revisions	Prepared:  Vineet Kumar	Approved:  ANAND	Date: 05.05.2021	

(Bidder's Signature and stamp with date)

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	DEVIATION FORMAT Enquiry No.: Item: Name of Bidder: Offer Ref. No.: <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Clause no. & Spec. no.</th> <th>Description as per Specification</th> <th>Deviation taken</th> <th>Nature of Deviation</th> <th>Remarks</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> NOTES: - Technical offer of the bidder will be evaluated only on the basis of Deviation Schedule. Deviation Schedule constitutes this sheet (with these Notes) duly signed and stamped. - Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned / taken elsewhere or in any other format will be ignored. - Additional sheets in the same format can be attached by the vendor, if necessary. - Nature of Deviations shall only be of Design / Manufacturing constraints and non-availability of items / components / makes in market. - No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviations are accepted by BHEL during technical scrutiny then also there will be no price implication. Hence, in no case there will be consideration of Price implications. - Reasons for the deviations shall be specified in the Remarks column. - If there are no deviations from the specifications, bidder still has to submit the signed copy of this format by writing "NO Deviations" on this format. - If the "Deviation Schedule" is not submitted along with the offer, the bidder's offer is likely to be rejected without any further interaction with the bidder. Only the accepted deviations in conjunction with the original tender shall constitute the contract document for the award of job to the bidder SIGNATURE OF THE BIDDER_____ NAME_____ DESIGNATION_____ DATE_____ COMPANY SEAL			Sl. No.	Clause no. & Spec. no.	Description as per Specification	Deviation taken	Nature of Deviation	Remarks																								
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6. List of Annexures (To followed along with this specification)

Document No.	Document Name
Annexure – [A]	Bill of material
Annexure – [B]	IO Count
Annexure – [C]	Price Bid format
Annexure – [D]	PLC Configuration Diagram
Annexure – [E]	Technical Specification for PLC System
Annexure – [F]	Master Document Schedule
Annexure – [G]	Vendor List

7. Scope Matrix for Supply, Engg and Installation & commissioning

S.No.	Description	Engineering by	Supply by	Erection by	Supervision of Erection by	Commissioning by	Remarks
[A]	LDO/HFO PLC including, operation station, Engineering station, software, etc. based on IO count	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2,4)	Bidder + BHEL (Note-2)	Note-(5)

Notes:

- 1) Termination accessories and termination of all types of cables at bidder supplied items/panels shall be in Bidder scope.
- 2) BHEL will provide the necessary man power required for commissioning. However, system commissioning shall be done by bidder only.
- 3) Engineering of Panels, model selections, configuration of software, etc are part of Bidder scope.
- 4) Any special activities involved in erection like FO cable splicing, termination, etc. shall be by bidder including special tools & tackles.
- 5) PLC I/O List, Signal grouping, Logic diagrams & inputs for graphics shall be provided by BHEL after P.O. placement.

8. Technical SPECIFICATIONS

S. No.	System	:	Technical specifications
[A]	PLC System for LDO/HFO PUMP HOUSE		
1	Bill of material	:	Refer Annexure-[A] of this specification for <u>Main Supply</u>
2	PLC configuration	:	Refer Annexure-[D] of this specification
3	I/O Count + sizing criteria	:	Refer Annexure-[B] of this specification
4	System Loading	:	Loading of controller shall not exceed 50% with installed spares;
5	System Redundancy	:	Controller - 1:1; Communication / Network cords – 1:1; Power supply – 1:1; I/O cards – 1:1; All the control processors offered for the Standalone PLC of LDO/HFO pump house shall be in dual redundant configuration with redundancy in memory, power supply, communication interface etc. The system shall be designed to ensure that failure of any single control processor or communication processor in the system shall not cause the operator to loose control of visual communication with the process. Redundant control processors shall be in separate racks to maximize availability. The failure shall be annunciated on the operator station. The system offered shall be expandable, flexible and upgradable and shall be able to be configured for wide range of process application and easily field changeable with the help of user-friendly software. Redundant hardware like memory, power supply, communication interface etc. shall be in separate racks. Controllers shall be one-to-one redundant. i.e. redundant controller shall not support more than one controller for redundant functions. Data Highway connecting all Controllers, Operator Stations, Printers, remote I/O system shall be dual redundant data cable, so that failure of one shall be taken over by the other automatically and the failure shall be communicated/annunciated.
6	Engineering Station	:	Configuration change of logic and application program in standalone PLC shall be possible through engineering station (laptop). All required hardware and software shall be considered and offered by the bidder.
7	Work stations' Control desk	:	CRCA Sheet consoles (Desktop type) for mounting the monitors and printer (A4) consoles along with operator chairs The console shall have provision for mounting the PC's in closed enclosure with lock and key arrangement, surge protected power sockets, cooling fans provision for mounting key boards, mouse in guide mounted trays shall be considered. Refer Annexure-[E] of this specification

8	Operating Station, Engineering Station & Printers	1) The Operating Station shall present the necessary plant information in a manner, which can be easily understood and absorbed by the Operator. 2) These displays shall be in the form of plant overviews, area overviews, group and sub group overviews, drive level displays, alarm list, sequences of event list with time stamping, mimic diagrams, hardware status displays, logs, bar charts, trends curves, etc. 3) All the Operating Stations (HMI) and Engineering Stations shall be of desktop mounted workstations and one number of portable Laptop (EWS & Documentation). All the Operating Stations & Engineering Stations shall be of open architecture with universal hardware and software platform with plug and play feature and shall be suitable for continuous operation in industrial environment. 4) The Operating Stations envisaged standalone PLC system (LDO/HFO pump house) Plant) shall be complete with processor, memory, power supply, bulk memory units, high resolution color monitor, key-board, mouse, communication interface modules, printer etc. along with necessary software modules. Dual screen (side-by-side) shall be provided with operation by single mouse and keyboard having full screen mode and multi window mode. Selection of screens shall not be required. Multi-window environment shall also be provided. Operating Stations shall acquire process data by an event driven method (on demand by the operator to avoid unnecessary loading in the network). All the operating commands / actions shall be stored, logged and protected with password identity. Modifications/alterations on such stored commands/actions shall not be permitted. Such commands / actions shall be printed out only on demand with password. 5) Each Engineering station, Operating Workstation, printer server shall have the following minimum design features and shall be identical and interchangeable: ◆ CPU Processor shall be latest configuration. ◆ Minimum 8 GB RAM and shall be expandable. ◆ Minimum 500 GB internal Hard Disc. ◆ High resolution 24" LED Flat panel, TFT active matrix type colour monitor with minimum pixel resolution of 1080 x 1920, 32 bit colour support with mounting arm provisions / tilt swivel bases of reputed makes. ◆ Minimum six(6) USB Ports & HDMI ports ◆ Serial, Parallel, USB, Network interface ports for connecting the data highway, printers etc. One spare serial and parallel port shall be provided additionally. ◆ Consoles for mounting the monitors, key-board, mouse and the electronic unit of the Operating stations. ◆ Optical Mouse with enable/disable provision. Fixed pad types finger move only mouse shall be offered. ◆ Latest DVD-RW for data back-up and installation. ◆ Dust and drip proof QWERTY keyboard for operating and other functions. ◆ Dynamic graphic capability with control through dynamic graphics. ◆ Minimum 8 levels of software security feature shall be provided. 6) Colour Laser Jet Printer (Multifunction) – A4, 600 x 600 DPI, Duplex printing – 1 no. shall be offered for connection to the console for data logging, Report generation, SOE & Alarm printing. Covers shall be provided for all printers with locking facilities. 7) Printers shall be provided with required printer stands/tables with required number of power supply points. 8) Consumables such as printer papers, cartridges, etc. shall be provided along with the printers. Sufficient quantity of consumables shall be supplied for operating the system up to guarantee period and hand over the excess after commissioning. 9) The engineering station offered shall have provision for performing the following minimum engineering functions. ◆ Database configuration. ◆ Automatic downloading of the configurations to respective control stations. ◆ Configuration of various control functions, displays ◆ Configuration of alarm settings, values, changing PID values. ◆ Disk initialization. ◆ Calling of detailed self-diagnostic displays for maintenance aid. ◆ Documentation software for system engineering
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a)	Installation location	:	LDO/HFO pump house; Indoor in air-conditioned room
b)	Panel color	:	To be intimated during detail engineering
c)	Panel Cable entry	:	From Bottom
d)	Removable gland plate at bottom	:	Required

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10. POWER SUPPLY

10.1 Following power supplies shall be provided by purchaser at single point of PLC PDB.

a) UPS supply for control supply: 230 V AC ± 10%, 1-phase, 50 Hz – 1 No’s of redundant feeder.

b) Normal power supply [non-UPS] for panel lighting & utility supply: 240V AC ± 10%, 1-phase, 50 Hz - 1 No non-redundant feeder

10.2 Further conditioning & distribution within package shall be in vendor scope.

10.3 Vendor shall provide standalone PDB with necessary protections & metering for powering equipments under their scope. Power distribution scheme shall be approved by purchaser.

10.4 Vendor shall supply accessories (like cable glands, plugs, etc.) required for termination of purchasers’ as well as vendor power cables.

10.5 Spare feeders of 5A-2 nos, 16A- 2 nos 230V AC from PLC PDB (for purchaser use) – 4 No’s.

10.6 Vendor shall furnish above feeders capacity during bidding stage as well as detail calculations during order execution.

All internal distributions shall be designed such that a single power fault in any instrument branch system shall not cause a trip of the entire system. Each consumer shall be provided with separate switch & isolation fuse

11. EARTHING

12.1 Earth points of all panels shall be looped together and shall be terminated at ONE copper Earth bus (Start point – minimum size 50mm (W) x 6mm thick) located at control room floor. Copper earth bus shall be part of bidder supply. From Earth bus to Earth pit, cable supply shall be by BHEL.

12.2 BHEL shall provide the following:

a) Electrical earth connection for panel earthing – 1 No (redundant) near the PLC panel

b) Electronics earth connection at bidder supplied Copper bus for system earthing - 1 No (redundant) near PLC panel

12.3 All hardware with in package required for earthing & connectivity up to BHEL’s earth points shall be in vendor scope.

12.4 Scheme for recommended earthing system/earth pit shall be furnished by vendor during order execution.

12. Bidder’s Scope of SERVICES

13.1 Supervision of erection & commissioning, performance guarantee testing & trial run and final handing over to end customer for the supplied systems.

13.2 Number of man days and number of visits as specified in the “Annexure-[A] of this specification” shall be considered. However, either or both of the number of man days or no of visits may increase / decrease based on the actual site requirement.

13.3 Bidder to mobilize concerned competent person for supervision of Erection & commissioning activities within a period of 7 days of receipt of intimation in this regard from BHEL.

13.4 Following shall be the scope of work for services:

a) Services charges shall include the travel to & fro travel from vendors work to site, lodging, boarding & local travel. Vendors shall arrange their own lodging, boarding & traveling.

b) Vendors shall arrange their own Test equipment’s, commissioning tools, manpower etc as required.

13.5 Above services shall be ordered by BHEL Site at the time of commissioning. However, vendor shall submit the price offer for services as per “Annexure-[A] of this specification” and same shall be considered for L1 evaluation.

13. Erection & Commissioning SPARES

15.1 All commissioning spares as required during erection and commissioning of all the systems are included in bidder’s scope & shall be supplied along with the main supply/package.

15.2 Bidder to ensure that all the spares are procured from the original equipment manufacturers (as per their recommendation) and shall make them available at site well before the start of commissioning activities.

15.3 Refer Annexure-[E] of this specification for detail list of spares.

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14. TRAINING

16.1

Bidder shall arrange training for Owner’s personnel. Different type of courses shall be offered for operation / process engineers and operators, instrument maintenance engineers and technician.

16.2

Travel and living expenses of the owner’s personnel shall be borne by the Owner. Apart from the hardware and software maintenance training and site training, bidder shall also offer operation training basically meant for operating personnel.

16.3

The various facilities available in the system for operation, actions required during emergencies and identifying the various diagnostic messages shall be the main contents of the operation training.

16.4

The Tenderer shall train the operational personnel in the operation of the system including preparation of logs and reports using the system. The personnel shall also be trained in building/modifying graphics, displays and logs.

16.5

The maintenance personnel shall be trained for trouble shooting any defects arising in the system. They shall also be trained to perform the diagnostic test for fault finding and shall be able to configure/modify the control system using the engineers work station.

16.6

The duration & location of the training shall be as per “Annexure-[A] of this specification”.

15. DOCUMENTATION

17.1

Information to be included with offer

Vendor shall make the offer in detail, with respect to every item of the Purchaser’s specifications. Any offer not conforming to this shall be summarily rejected.

a)

Duly filled & Signed copy of Check list

b)

Deviation list, if any (as per “No deviation format” given in this specification). If there are no deviations, bidders shall submit “Deviation format” by mentioning deviations “Nil”.

c)

Unpriced price schedule (To be submitted compulsorily without fail)

d)

Bill of materials

17.2

Documentation after P.O. Placement

a)

Submission of documents as per “Master documents schedule” (which will be finalized in Kick-off meeting after award of the contract) within 2 weeks of placement of LOI (for approval by BHEL and / or BHEL’s customer in 4 sets)

b)

All vendor documents of PLC and its sub-items shall be submitted to NTPC for approval during order execution. Any comment furnished by NTPC / BHEL shall be taken care by vendor during ordering execution.

c)

Further BHEL will provide comments on vendor submitted document within 25 working days for revision & resubmission. Vendor shall follow up with BHEL for non-receipt of comments/approvals.

d)

Revised drawings / Documents shall be submitted by Bidder in 07 days of receipt of comments / observations from BHEL. BHEL shall revert within 25 days on receipt of these revised documents / drawings from vendor for approvals.

e)

All the approvals required for manufacturing shall be completed with 2months from P.O to meet the P.O delivery schedule. Accordingly, vendor shall ensure the submission of approval category documents (which are required for manufacturing) and obtain their approvals.

f)

Vendor shall obtain final approvals on all technical + quality aspect documents before inspection dates.

g)

It is vendor’s responsibility to obtain approvals from BHEL as earliest as possible to meet PO delivery schedules. Accordingly, vendor to plan and execute the supplies in time.

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17.3

Documents to be submitted during final shop testing and before equipment dispatch. **(Note: submission of these documents are commercially linked)** - all in 16 sets (2 sets to be included with item dispatch and balance to BHEL purchase department).

a)

Complete O& M manual.

b)

Approved Engg documents

c)

As-Shipped documents

d)

As-Built documents

e)

Guarantee and all test certificates for review and acceptance by BHEL and / or BHEL’s Customer

3 sets of CD-ROM – containing **O&M manual and Engineering documents** (1 set to be included with item dispatch and balance to BHEL purchase department).

16. MARKING, PACKING AND DESPATCH

18.1

All items shall be marked (stamped/etched) in accordance with the applicable code/standard/specification. In addition, the item code, if available, shall also be marked.

18.2

For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.

18.3

Part number/Dispatch link-up of all the equipment’s/items supplied and also their co-relation with system/drawing/approved BOQ.

18.4

Paint or ink for marking shall not contain any harmful metal or metal salts which can cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.

18.5

The equipment shall be transported to site by the vendor in fully assembled condition. However, in case some components are liable to be damaged during transit, the same shall be dismantled and supplied separately, to be reassembled at site the vendor. Assembly of the item supplied loose at site and repairing of any item damaged during transport shall be in the vendor’s scope. The vendor shall send each consignment to site with a detailed packing list.

18.6

All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to the finish. Crates/cases shall have skid bottom for handling.

18.7

Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

18.8

The equipment/items may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

18.9

The following minimum packing procedures shall be followed: -

a)

All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kinds.

b)

All items shall be protected from rust, corrosion, and mechanical damage during transportation and handling.

c)

Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.

d)

All electrical, instrumentation etc., shall be properly packed to prevent damage during transport, storage, handling at site.

e)

All the items which the Bidders considered liable to be damaged during shipment or storage, shall be packaged for separate shipment. If instruments are removed from the panel, they and their connection shall be suitably tagged to ensure simple re installation at the job site. Each instrument shall be sealed in plastic bags containing moisture absorbing desiccants.

f)

It shall be bidder’s sole responsibility to protect all the material during period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and including delays in transit.

g)

Commissioning spares, Tools & tackles to be packed separately & suitably tagged.

18.10

Loose vendor items sent by vendor to sites shall be quantified/numbered/tagged and not merely mentioned as ONE lot of loose items.

18.11

A packing list covering items having shelf life are to be intimated to site. Also, shelf-life items shall be packed separately in black color painted box for easy identification at site.

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		17. TESTING, INSTALLATION, COMMISSIOING & ACCEPTANCE – As per Annexure-[E] of this specification.	
		19.1 Final Inspection including document verification as per approved QAP shall be carried out by CUSTOMER /CONSULTANT/ CUSTOMER’s Third Inspection Agency & BHEL/BHEL’s Third Party Inspection Agency at vendor works.	
		19.2 Inspection & Factory Acceptance Test at Vendor works – by BHEL + VENDOR + NALCO as per approved FAT procedure.	
		19.3 Site Acceptance Test at site - by BHEL + VENDOR + NALCO as per approved SAT procedure.	
		19.4 Representative of OEM shall also require to be present during Factory acceptance testing of PLC.	
		18. WARRANTY	
		The warranty shall be as per GCC / SCC of NIT.	
		19. SUB VENDOR LIST	
		Bidder to supply the all items from manufacturers as given in Annexure-[G] of this specification.	
		Note: <i>If any component is not appearing in above the list, makes of the same shall be proposed by bidder during order execution for NALCO/MN Dastur’s approval. Sub-vendors selected by the bidder to ensure adequate Proven Track Record as per industry practice.</i>	
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