DEENDAYAL PORT AUTHORITY

An ISO 9001 : 2008 & ISO 14001 : 2004 Certified Port

Office of Chief Mechanical Engineer,
First Floor, Annex Building, A.O. Building, Gandhidham, Kutch 370210
Email: cme@deendayalport.gov.in

No. 5TPDGreenAmmoniaPlant Date: 10.06.2026

BUDGETARY ENQUIRY

for

"DESIGN, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF 5 TPD GREEN AMMONIA PLANT IN DPA ON EPC MODE"

1. Introduction

Deendayal Port Authority (DPA) intends to establish a 5 TPD modular Green Ammonia Plant within DPA premises for promoting green fuel infrastructure and sustainable industrial development.

The proposed Green Ammonia Plant shall utilize Green Hydrogen supplied at battery limit and shall include complete ammonia synthesis facilities, nitrogen generation system, ammonia storage facilities, utility systems, electrical & instrumentation systems, safety systems, automation systems and associated plant infrastructure.

The project shall be executed on EPC / LSTK basis including design, engineering, procurement, supply, installation, testing, commissioning, performance guarantee test run and operation & maintenance support.

The proposed plant shall broadly include:

1. Ammonia Synthesis Unit
2. Nitrogen Generation Unit
3. Pressurized Ammonia Storage Facility
4. Piping & Mechanical Systems
5. Fire Detection & Fire Fighting System
6. Utility Systems
7. Electrical Distribution System
8. Pre-fabricated Control Room & Substation
9. Safety Monitoring & Surveillance System
10. Instrumentation, PLC/DCS & SCADA System
11. Integrated Plant Automation System

2. Purpose of Budgetary Enquiry

This budgetary enquiry is issued solely for the purpose of obtaining indicative cost estimates for planning and budgeting. This document shall NOT be treated as a

Tender or Request for Proposal (RFP). Submission of budgetary offers does not confer any right for award of work. Deendayal Port Authority (DPA) reserves the right to initiate a separate tendering process in future. No contractual obligation shall arise from this enquiry.

3. Scope of Work:

The work shall be executed on EPC / LSTK basis and shall include, but not be limited to:

- Basic & Detailed Engineering
- Process Design Integration & Licensor Coordination
- Procurement & Supply of Plant & Equipment
- Design, Supply & Installation of Ammonia Synthesis Unit
- Nitrogen Generation Unit
- Pressurized Ammonia Storage Facility
- Utility Systems including Cooling Water, Air System etc.
- Mechanical Equipment, Piping & Structural Works
- Electrical Distribution System & Substation
- Instrumentation, PLC/DCS & SCADA System
- Fire Fighting & Safety System
- Testing, Pre-commissioning & Commissioning
- Performance Guarantee Test Run
    - Training & Documentation
- Operation & Maintenance Support for One Year

4. Estimated Quantities (Summary)

Sl. No.	Description	Qty
1	Design, Engineering, Procurement, Supply, Installation, Testing, Commissioning and Performance Guarantee of complete 5 TPD Green Ammonia Plant including Ammonia Synthesis Unit, Nitrogen Generation Unit, Pressurized Ammonia Storage System, Utility Systems, Electrical Systems, Instrumentation & Automation System, Fire Fighting System, PLC/DCS/SCADA System, Mechanical & Piping Works and all associated accessories on EPC / LSTK basis complete in all respects with one year O & M including warranty obligations.	**LS**

5. Technical Standards

All equipment and systems shall conform to latest applicable Indian and International standards including but not limited to:

- ASME / API Standards
- IEC / IEEE Standards
- OISD Guidelines
- PESO Regulations

- IS Standards
- NFPA Standards
- IEC 61439 / IEC 62271
- Applicable Environmental & Safety Regulations

The complete plant shall comply with applicable statutory, environmental and safety

6. Submission of Budgetary Offer

Interested firms are requested to submit their budgetary quotation including:

- Detailed cost break-up
- Technical assumptions and deviations (if any)

7. Submission Deadline:

On or before: 01.07.2026

8. Mode of Submission:

Email: cme@deendayalport.gov.in

Hard copy: Office of Chief Mechanical Engineer, DPA

9. Time period:

Project completion period shall be 15 Months.

10. General Notes

- Prices shall be reasonable and competitive inclusive all taxes, duties and incidentals, excluding GST.
- GST applicability shall be clearly mentioned
- Any assumptions/conditions shall be clearly stated
- DPA may seek clarifications, if required

11. Contact for Clarification

Office of Chief Mechanical Engineer
Deendayal Port Authority
Email: cme@deendayalport.gov.in

Enclosures:

- Detailed Scope of Work (Annexure-I)
- Detailed Price Schedule and Price Break up (Annexure-II)

Sd/-
Chief Mechanical Engineer
Deendayal Port Authority

Annexure I

Detailed Scope of work

Deendayal Port Authority (DPA) is envisaging to set up a Green Ammonia plant with Green Hydrogen being supplied from renewable energy which will be set up by others. The Ammonia plant capacity is envisaged as 5 TPD. This document pertains to the requirement of the 5 TPD Green Ammonia plant.

Ammonia Synthesis Unit

- Pressurised Ammonia Storage Facility of required Capacity
- Nitrogen Generation Unit (PSA/CRYOGENIC Nitrogen with vaporisation / ASU)
- Utility Package including Cooling Tower with associated items, Instrument & Plant Air etc.
- Cylinder Cascade Storage and Dispatch Area
- Other facilities such as Pre-Fabricated Control Room Substation and Testing Lab, Firefighting, Water storage system, Pipe Rack, Cable Rack.

Product Requirement

Ammonia, NH_3		
Description	**UOM**	**Values**
Capacity	TPD	5 TPD
Purity	% wt	≥ 99.5
water	% wt	≤ 0.5
Oil	ppmw	Max. 5

Raw Material:

Hydrogen (H_2) will be provided at Battery Limit.		
Description	**UOM**	**Values**
Pressure	$kg/cm^2.g$	25-30
Temperature	°C	Ambient (30–40°C)
Purity	% wt	≥ 99.99

The above utility and raw material parameters are indicative only and the firms shall satisfy themselves about quality of raw materials and to ensure end objectives of the project..

See Raw Water (For Utilities) pumped through Fire Fighting System at Oil Jetty No.1 to 4 :

66 KV Electrical power will be supplied by DPA at plant B/L to cater to all the load of Green Ammonia Plant.

Nitrogen Generation Unit shall be designed, engineered and supplied by the selected EPC Contractor and shall form an integral part of the EPC / LSTK scope of the Green Ammonia Plant.

The scope of EPC Contractor shall include Basic Engineering, Detailed Engineering, procurement, manufacturing, inspection, supply, transportation, construction, erection, testing, pre-commissioning, commissioning, PGTR, training and documentation required for successful completion and operation of the plant.

For supply of the Ammonia Synthesis Unit, the LSTK Firm needs to produce evidence of exclusive arrangement with the Licensing Partner.

The EPC Contractor shall coordinate with DPA, technology licensor and other associated agencies during engineering, construction and commissioning stages for successful execution of the project.

Civil works based on approved drawings and engineering inputs submitted by EPC Contractor shall be executed by DPA. EPC Contractor shall provide all necessary engineering inputs, drawings and technical support required for execution of such works.

Any item, equipment, component, system or service required for safe, reliable and integrated operation of the complete Green Ammonia Plant shall be deemed to be included in the scope of EPC Contractor whether specifically mentioned or not in this document.

1. THE SCOPE OF WORK/DELIVERABLES OF LSTK CONTRACTOR

1. Complete Engineering, Procurement, Supply, Installation Supervision, Testing, Pre-commissioning, Commissioning, Performance Guarantee Test Run (PGTR), plant handover and integration of the complete modular Green Ammonia Plant shall be within the scope of the LSTK Contractor.
2. Optimization of plant layout, CAPEX and OPEX based on proven licensor technology, lifecycle cost considerations, operability, maintainability and site conditions shall be within the scope of the LSTK Contractor.
3. Integration and detailed engineering review of all process packages and associated systems for complete plant operation shall be within the scope of the LSTK Contractor. Availability of all necessary calculations and engineering documents from the Technology Licensor shall be ensured by the contractor.
4. Effluent generated from the Green Ammonia Plant shall be collected in suitable effluent pit/tank. Design, engineering and construction of effluent handling facilities shall be provided by the contractor and disposal as per norms of GoI shall be under the scope of the Contractor. Suitable handling systems including transfer pumps, piping, valves and associated accessories required for handling of effluent shall be within the scope of the contractor. Separate sewage tank shall be provided by the contractor and its disposal shall be taken care of by the Contractor.
5. Supply, installation and commissioning of CCTV surveillance system with night vision capability covering complete plant area for remote monitoring from

Control Room shall be within the scope of the contractor. The system shall include display arrangement with LED monitor, minimum 30 days recording backup, date and time stamping facility and dual connectivity provision for remote monitoring. The system shall be expandable for future addition of cameras and storage capacity.

6. Basic and Detailed Engineering for all systems and facilities falling within the scope of the Modular Green Ammonia Plant shall be within the scope of the LSTK Contractor.

7. Integration of process units, utility systems, loading/unloading facilities and feed receiving systems shall be within the scope of the LSTK Contractor.

8. Inspection, expediting, follow-up, pre-commissioning, commissioning, startup assistance and conduct of Performance Guarantee Tests at site shall be within the scope of the LSTK Contractor.

9. The LSTK Contractor shall carry out plant design considering operability, maintainability, safety, reliability and availability requirements during plant operation.

10. Preparation of plant tag numbering philosophy and colour coding philosophy shall be within the scope of the contractor.

11. Carrying out site survey and verification of site data prior to commencement of detailed engineering to ensure robust and fail-safe design shall be within the scope of the contractor.

12. Preparation of vendor list in consultation with and approval of DPA shall be within the scope of the contractor.

13. Preparation and submission of documents required for obtaining approvals from State / Central Government Authorities and statutory bodies as per applicable safety, environmental, OISD and statutory requirements shall be within the scope of the contractor. Scope shall include HAZOP, LOPA, SIL Study, QRA Report and Hazardous Area Classification. Statutory fees payable to Government Authorities shall be borne by DPA.

14. Comprehensive operation and maintenance support for the plant for a period of one year after successful completion of Performance Guarantee Test Run (PGTR) shall be within the scope of the contractor.

15. Any item, system, equipment, component or service required for safe, reliable and integrated operation of the complete Green Ammonia Plant shall be deemed to be included in the scope of the EPC Contractor whether specifically mentioned or not.

2. DISCIPLINE WISE SCOPE OF WORK DETAIL (INCLUDING BUT NOT LIMITED TO)

2.1 PROCESS ENGINEERING

LSTK Contractor shall perform, review, validate and complete all process design and engineering activities required for successful implementation and operation of the Modular Green Ammonia Plant. The scope shall include preparation of all necessary engineering documents, calculations, studies, drawings and technical inputs required for engineering, procurement, construction, commissioning and operation of the plant.

The scope of Process Engineering shall include, but not be limited to, the following:

1. Preparation of Process Datasheets (PDS), Mechanical Datasheets (MDS), Instrument Datasheets, Valve Datasheets, electrical system calculations and drawings including SLDs, cable layouts, interlock logic diagrams and fault tree analysis.
2. Preparation and validation of all detailed process engineering calculations.
3. Preparation of overall plant layout in accordance with latest applicable standards, statutory requirements and safety guidelines.
4. Preparation and updating of PFDs, P&IDs and associated engineering documents including incorporation of additions, deletions and modifications, wherever required.
5. Preparation of interconnection details and hook-up arrangements with Outside Battery Limit facilities considering site-specific layout requirements.
6. Preparation and updating of Safety Interlock Philosophy, Trip Settings, Cause & Effect Matrix and Process Control Philosophy.
7. Preparation of interconnection diagrams and tie-in lists for process units, utility systems and offsite facilities.
8. Preparation and updating of Instrument Index incorporating all new and engineered instruments.
9. Preparation and updating of utility consumption summary and effluent summary based on Process Licensor data.
10. Preparation of design pressure and design temperature diagrams including hydraulic calculations, pressure profile diagrams, line sizing and pressure drop calculations.
11. Preparation and updating of Operating Manuals in line with Process Licensor guidelines and plant operational requirements.
12. Review and incorporation of all licensor inputs into detailed Operation Manuals for safe, reliable and smooth operation of the plant.
13. Preparation of Material Selection Diagram (MSD), emergency and shutdown philosophy, vent & drain philosophy, surge analysis and startup/shutdown philosophy.
14. Preparation and submission of Material Safety Data Sheets (MSDS) for all chemicals, catalysts and hazardous materials used in the plant.

15. Preparation of documents covering catalyst summary, chemical consumption, utility consumption and list of laboratory equipment.
16. Preparation of RFQs, technical specifications, technical bid evaluations and engineering inputs for procurement and service contracts.
17. Preparation of Hazardous Area Classification as per applicable Indian Standards and conduct of HAZOP study during appropriate stages of engineering. All recommendations arising out of HAZOP and safety studies shall be incorporated during engineering, procurement, construction and commissioning stages. Final compliance report shall be submitted by the contractor.
18. Deployment of Field Engineering Team at site as required for design verification, design modifications and engineering support during project execution.
19. Preparation of flare load summary and associated studies including process studies, hydraulic studies, depressurization studies, flare network studies, flare radiation studies and dispersion analysis, wherever applicable.
20. Preparation of residual Basic Engineering for areas where Basic Engineering Package (BEP) is not available from Technology Licensor or OEM.
21. Preparation of pre-commissioning and commissioning procedures including flushing procedures, air blowing, steam blowing, water run, proof testing procedures, material take-off and material specifications required for commissioning activities.
22. Evaluation of requirement of chemical cleaning for equipment and systems, preparation of specifications and engagement of specialized agencies for carrying out chemical cleaning activities, wherever required, shall be within the scope of contractor.

2.2 MECHANICAL EQUIPMENT & PIPING ENGINEERING

The scope of Mechanical Equipment and Piping Engineering shall include complete design, engineering, review, analysis, detailing and preparation of engineering documents required for successful execution, commissioning and operation of the Green Ammonia Plant. The scope shall include, but not be limited to, the following:

1. Preparation of Mechanical Design Basis, Piping Design Basis, PMS, VMS and associated engineering documents and obtaining approval from DPA.
2. Preparation of design basis and technical specifications for all new equipment considering optimization requirements, applicable standards, operational requirements and procurement needs.
3. Evaluation of vendor offers, technical bid analysis, technical recommendations, review and approval of vendor drawings/documents including QAP review for various packages.

4. Mechanical design and engineering of vessels, columns, heat exchangers, chillers, pumps, compressors, turbines, black start DG sets, firefighting systems, ammonia storage tanks and associated mechanical equipment.
5. Preparation of design criteria and technical specifications for chemical dosing systems, chemical storage systems, chlorination systems, hoists and material handling equipment.
6. Preparation of technical specifications, scope documents, Bill of Materials (BOM) and Bill of Quantities (BOQ) for systems and modules involving mechanical equipment and piping systems.
7. Preparation and furnishing of design criteria, calculations, applicable codes and standards, engineering assumptions and technical computations for equipment selection and design.
8. Carrying out piping stress analysis, flexibility analysis, system integrity analysis and configuration review wherever required.
9. Preparation of piping general arrangement drawings, piping material specifications, valve material specifications, piping specialty specifications, PDMS modelling, isometric drawings as per IBR requirements and detailed piping layouts including fittings, valves, loops and supports.
10. Preparation of overall plant layout in accordance with latest applicable standards and guidelines including OISD-118 and conducting 30%, 60% and 90% model review stages.
11. Preparation and submission of all necessary "Good for Construction (GFC)" piping drawings required for site execution.
12. Preparation of detailed plot plans showing equipment coordinates, elevations, structural requirements, pipeline routing, cable routing and complete detailed engineering of the integrated system.
13. Preparation of Material Take-Off (MTO) for fasteners, gaskets, supports and associated piping/equipment items.
14. Preparation of MTO for foundation bolts, anchor bolts and equipment mounting bolts for structures and foundations.
15. Preparation of technical specifications for insulation, painting, wrapping, coating and steam tracing systems. Design and engineering of ammonia storage tank piping, pipe supports, pipe racks, pipe corridors, anchors, expansion loops and hangers including special supports shall be within the scope of contractor.
16. Preparation of detailed specifications for painting, wrapping, coating and packing requirements for all equipment, piping systems and structures.
17. Carrying out field engineering, site verification and collection of site data for preparation of Approved for Construction (AFC) drawings and resolution of site engineering issues.

18. Preparation of fabrication drawings for all mechanical equipment and piping systems.
19. Preparation of technical specifications and design details for special tools and tackles required for operation and maintenance of the plant.
20. Redrawing and modification of drawings, preparation of design calculations as per IBR requirements and providing technical assistance for obtaining approvals/certifications from IBR authorities for boilers and associated systems.
21. Preparation of procedures for Preliminary Acceptance Test (PAC), Final Acceptance Test (FAC) and Performance Guarantee Test (PG).
22. Preparation and submission of documents required for obtaining approvals from State / Central Government Authorities and statutory bodies in accordance with applicable safety, environmental, OISD and statutory requirements.
23. Preparation of recommended spare parts list for commissioning and minimum two years operation, wherever required, over and above OEM recommendations.

The scope shall further include the following:

a. Preparation of piping layouts and general arrangement drawings including building layouts and review/update of P&IDs considering operation and maintenance requirements.
b. Preparation of three-dimensional engineering models and associated drawings.
c. Stress analysis and engineering review of critical piping systems.
d. Preparation of specifications for insulation, painting and coating systems.
e. Review and approval of vendor and contractor drawings/documents.
f. Preparation of equipment layouts and general arrangement drawings for complete plant facilities.
g. Preparation and submission of documents required for statutory approvals from applicable authorities as per prevailing safety, environmental and statutory regulations.

2.3 STRUCTURAL ENGINEERING

The scope of Structural Engineering shall include complete design, engineering, detailing, review and preparation of drawings and engineering documents required for execution of structural and architectural works associated with the Green Ammonia Plant. The scope shall include, but not be limited to, the following:

1. Preparation and updating of design basis for structural and architectural works and obtaining approval from DPA.
2. Preparation of "Good for Construction (GFC)" drawings for equipment foundations, buildings and structures required for complete operation of the plant, excluding areas covered under vendor package scope.

3. Preparation and updating of technical specifications, BOQ and engineering documents for civil, structural and architectural works.
4. Preparation of design and construction drawings for structural steel works and architectural works.
5. Preparation of detailed engineering and design for site security systems including fencing, gates, barriers, guarding arrangements, gate house, parking facilities and associated infrastructure.
6. Preparation of site development drawings including roads, drainage systems, storm water disposal systems, underground sewage systems and industrial/domestic waste disposal systems. Site grading and datum level planning shall be carried out to minimize cutting and filling requirements.
7. Preparation of detailed design, fabrication drawings and erection drawings for structures, pipe racks, pipe bridges, sleepers, utility corridors, gas/liquid pipelines and raw water systems.
8. Design and engineering of foundations, supporting structures, operating platforms and technological structures including preparation of Civil Architectural Drawings (CAD), Civil Concrete Drawings (CCD) and Civil Structural Drawings (CSD).
9. Preparation and integration of 3D engineering models for civil, structural, piping and cable systems using suitable engineering software/platforms. Clash-free integrated models shall be developed within the contractor's scope.
10. Preparation of drawings for underground piping systems and underground facilities related to sewage, drainage and process waste collection systems.
11. Preparation of Material Take-Off (MTO) for structural steel and architectural items.
12. Preparation of specifications and engineering details for survey works and associated investigations.
13. Design and engineering of site development works including site grading, storm water systems, roads, pavements, boundary walls, fencing, sewerage systems, waste disposal systems and effluent treatment/disposal systems.
14. Design and engineering of all underground and above-ground piping support systems and associated civil infrastructure.
15. Preparation of water supply, sewage, waste disposal and effluent treatment drawings for plant facilities and buildings.
16. Review of basic design data and technical documents of turnkey package systems and providing technical recommendations wherever required.
17. Design and engineering of all types of steel structures, pipe racks and associated structural systems.
18. Preparation of specifications for soil investigation works and review of geotechnical investigation reports.

19. Preparation of basic engineering data and design inputs required for design and approval of Pre-Engineered Building (PEB) structures.

Civil execution works based on approved drawings and engineering inputs submitted by the contractor shall be executed by DPA. The contractor shall coordinate closely with DPA and shall provide all necessary engineering inputs, drawings, technical clarifications, modifications, supervision support and coordination required for successful execution of such works.

2.4 ELECTRICAL ENGINEERING

The scope of Electrical Engineering shall include complete electrical system design, engineering, studies, drawings, specifications and associated engineering activities required for safe, reliable and efficient operation of the Green Ammonia Plant. The scope shall include, but not be limited to, the following:

1. Preparation of Lightning Protection and Earthing Study for complete plant facilities including ammonia storage and associated systems.
2. Preparation of Protection Coordination Study for complete electrical distribution system.
3. Preparation of Single Line Diagrams (SLDs) for power distribution, lighting system, control power distribution and instrumentation power systems.
4. Preparation and finalization of electrical load calculations for complete plant facilities.
5. Electrical equipment sizing, selection and preparation of technical specifications for transformers, MV/LV switchgear, MCCs, VFDs, motors, UPS systems and associated electrical equipment.
6. Design and engineering of electrical power receiving and distribution system from grid interface/substation up to process units and utility systems.
7. Design and engineering of electrical control, protection and monitoring systems.
8. Preparation of electrical cable sizing calculations, technical specifications and cable schedules.
9. Preparation of cable routing drawings and layouts for HV, MV, LV, control and fibre optic cables.
10. Preparation of cable BOQ and computerized cable routing outputs.
11. Preparation of cable tray, cable rack and support layout drawings along with BOQ.
12. Preparation of power and control cable schedules, termination details and wiring diagrams.
13. Preparation of interconnection diagrams between process packages and electrical systems including compressors, pumps, chillers, utility systems, ammonia storage systems, nitrogen systems and associated equipment.

14. Preparation of schematic diagrams for interlocks and protection systems.
15. Design and layout of electrical systems associated with instrumentation including power supply systems, grounding arrangements, junction box locations and associated systems.
16. Preparation of illumination design calculations and lighting layout drawings for plant areas, buildings and outdoor facilities.
17. Preparation of technical specifications, sizing calculations and BOQ for lighting fixtures and associated accessories.
18. Design and engineering of Fire Alarm and Smoke Detection Systems for plant facilities and buildings.
19. Design and engineering of Public Address (PA) System for plant communication and emergency announcements.
20. Design and engineering of earthing and lightning protection systems for substations, control rooms, ammonia storage facilities, loading gantry and associated plant systems.
21. Preparation of equipment layout drawings for switchyard facilities, wherever applicable.
22. Preparation of equipment layout drawings for indoor and outdoor substations.
23. Preparation of general arrangement drawings for MV/LV rooms and electrical facilities.
24. Preparation of Inspection and Test Plans (ITPs), Factory Acceptance Test (FAT) procedures and Site Acceptance Test (SAT) procedures for electrical systems and equipment.
25. Preparation of Material Take-Off (MTO) for cables, switchgears, VFDs, motors and associated electrical systems excluding electrolyzer-specific electrical distribution systems.
26. Preparation and submission of documents required for obtaining approvals from CEA, Electrical Inspectorate, SEB, PESO and other applicable statutory authorities.
27. Design, engineering and integration of Prefabricated Substation and Control Room facilities shall be within the scope of the contractor.

2.5 INSTRUMENTATION & CONTROL ENGINEERING

The scope of Instrumentation & Control Engineering shall include complete design, engineering, system architecture development, detailed engineering, drawings, specifications, studies and associated activities required for safe, reliable and automated operation of the Green Ammonia Plant. The scope shall include, but not be limited to, the following:

1. Preparation of Instrumentation Design Basis and system architecture for Instrumentation & Control Systems including DCS, PLC, Advanced Process Control Systems and associated automation systems. Preparation of engineering drawings and documents including hook-up drawings, level sketches, instrument location layouts, drive interface schemes, FDAS layouts, PA system layouts, EPABX configuration drawings and SAMA diagrams for control loops and interlocks shall be within the scope of contractor.
2. Design calculations and sizing of control valves, safety valves, pressure relief valves, flow elements and associated instrumentation systems along with submission of engineering reports.
3. Preparation of Inspection and Test Plans (ITP), FAT and SAT procedures for instrumentation systems and preparation of interlock schematic diagrams.
4. Preparation of datasheets and technical specifications for all instrumentation components including control valves, safety valves, DP transmitters, recorders, controllers, signalling systems, interlocking systems, trip systems, level gauges, pressure gauges, thermometers, gas detectors, analysers and associated instrumentation items.
5. Preparation of Instrument Input/Output (I/O) List, Junction Box grouping, JB Schedule, Air Manifold Schedule (AMS), Control Room layouts, Control System configuration, field instrument datasheets, interlock and permissive logic sheets and list of calibration instruments for calibration laboratory.
6. Preparation of cable tray layouts, cable schedules, interconnection cable schedules, cable drum schedules, interlock logic diagrams, complex loop diagrams, instrument power distribution diagrams, grounding diagrams, air supply distribution diagrams, surge protection requirements, instrument alarm set point lists and field instrument name plate lists.
7. Preparation of detailed specifications and enquiry documents for DCS, PLC, ESD, Fire & Gas Systems (F&G) and associated third-party control systems.
8. Preparation of instrument schedules and complete BOQ/BOM for instrumentation systems including gauges, switches, transmitters, controllers, control valves, regulators, air filters, multicore cables, tubing, fittings, supports and associated accessories.
9. Preparation of instrumentation drawings including instrument index, loop schematics, functional schematics, instrument layout plans and associated engineering drawings.
10. Preparation of MCC-DCS interface wiring diagrams in coordination with Electrical Engineering systems.
11. Preparation of instrument plot plans, tubing layouts, cable tray layouts, electrical wiring layouts, air supply distribution systems, hook-up diagrams, loop diagrams,

shutdown system diagrams and power distribution arrangements from control room up to field instrumentation systems.

12. Preparation of datasheets, BOQ and engineering documents for control cables, junction boxes, cable trays and associated instrumentation systems.
13. Preparation and finalization of Centralized Control Room and Remote Instrument Building layouts and obtaining approval from DPA / Owner.
14. Preparation of construction drawings related to field instrumentation including JB layouts, instrument location layouts, cable routing layouts, cable duct drawings, trench layouts, branch tray layouts, air supply layouts, instrument installation drawings, analyser room layouts and gas monitoring system layouts.
15. Review and approval of vendor documents related to DCS/PLC systems including I/O assignment details, termination details, logic diagrams and loop diagrams.
16. Preparation and approval of graphics for DCS/PLC systems displaying static and dynamic process information as per operational requirements.
17. Preparation of As-Built drawings based on marked-up drawings and site modifications carried out during execution.
18. Preparation of annunciation schedules, window allocation details and Sequence of Events (SOE) recorder schedules.
19. Integration of DCS systems between Hydrogen System, Green Ammonia Plant and Balance of Plant (BOP) systems shall be within the scope of the LSTK Contractor.

2.6 HSE & FIRE FIGHTING

The scope of HSE & Fire Fighting Engineering shall include complete safety engineering, fire protection engineering, hazard analysis, emergency planning, environmental engineering and associated studies required for safe design, construction, commissioning and operation of the Green Ammonia Plant. The scope shall include, but not be limited to, the following:

1. Preparation of HSE Philosophy to be followed during construction, commissioning and operation phases of the plant.
2. Preparation of Active and Passive Fire Protection Philosophy including fireproofing requirements along with submission of all necessary fire protection calculations.
3. Preparation of Noise and Vibration Control Philosophy and Cryogenic Spill Protection Philosophy, wherever applicable.
4. Preparation of QRA Report, HAZID Report and Hazardous Area Classification Report as per applicable standards and statutory requirements.
5. Carrying out Flare and Vent Dispersion Analysis and Radiation Analysis, wherever applicable.

6. Preparation of Fire Water Demand Report and Fire Zone Layout Drawings for complete plant facilities.
7. Preparation of Active Fire Fighting Calculation Reports including hydraulic analysis under steady state and dynamic surge conditions.
8. Preparation of datasheets and technical specifications for Fire Protection Equipment and associated systems.
9. Preparation of Fire Protection System Layout Drawings, Fire Fighting P&IDs and Process Flow Diagrams related to fire protection systems.
10. Preparation of Fireproofing Calculation Reports, Fire Zone Layout Drawings, technical specifications and associated datasheets.
11. Preparation of layout drawings and technical specifications for Safety Equipment, Emergency Equipment and Safety Signages.
12. Preparation of Escape Route Layout Drawings and Emergency Equipment Layout Drawings for complete plant facilities.
13. Preparation of Noise Control and Vibration Control requirements and associated engineering recommendations, wherever applicable.
14. Preparation of Waste Estimation Summary and Waste Storage Plan, wherever applicable.
15. Preparation of Water Use and Wastewater Management Plan for complete plant facilities.
16. Preparation of Air Emission Estimation Report, Liquid Effluent Estimation Report and Air Emission Management Plan.
17. Preparation of Emergency Response Plan and Emergency Preparedness Plan for plant operation and emergency situations.
18. Provision of assembly points and preparation of emergency evacuation plans considering prevailing wind direction and wind rose diagram.
19. Preparation of Pre-Start-up Safety Review (PSSR) Procedures, Reports and associated Action Plans shall be within the scope of the contractor.

3. PROCUREMENT:

Complete procurement activities for the Green Ammonia Plant shall be within the scope of the LSTK Contractor. The scope shall include procurement planning, vendor evaluation, technical bid analysis, expediting, coordination and associated procurement engineering activities required for successful execution of the project.

The scope of Procurement shall include, but not be limited to, the following:

1. Preparation of technical specifications, RFQs, procurement documents and technical bid analysis for all equipment, systems and associated packages shall be

within the scope of the LSTK Contractor. Technical recommendations shall be submitted to DPA for review and approval.

2. Issuance of RFQs, receipt of bids, technical evaluation, clarification with vendors and Technical Bid Analysis (TBA) for all packages and systems shall be within the scope of the LSTK Contractor.
3. Only approved and technically qualified vendors shall be considered for commercial evaluation and procurement activities.
4. Any technical deviation from approved specifications, standards or scope requirements shall require prior approval from DPA before implementation.

4. INSPECTION, AND EXPEDITING

Complete Inspection and Expediting activities for the Green Ammonia Plant shall be within the scope of the LSTK Contractor. The scope shall include quality assurance, inspection coordination, expediting, monitoring and associated QA/QC activities required for successful execution of the project.

The scope of Inspection & Expediting shall include, but not be limited to, the following:

1. Preparation and implementation of Quality Assurance Plan (QAP) for all equipment, systems and project activities shall be within the scope of the LSTK Contractor.
2. All materials, equipment and systems shall be subjected to inspection by approved Third Party Inspection Agencies (TPIA). The list of inspection agencies shall be submitted to DPA for approval prior to commencement of inspection activities.
3. Deployment of qualified QA/QC personnel during engineering, procurement, manufacturing, construction and commissioning stages shall be within the scope of the LSTK Contractor.
4. Contractor shall establish and implement a comprehensive inspection and quality control system with proper documentation, inspection records, test certificates and supporting evidences for all project activities.
5. Inspection reports, test certificates and approved quality documents shall be submitted to DPA in digital format within seven (7) days from issuance/publication of the respective reports.
6. The scope of Inspection Activities shall include complete inspection, testing, verification and quality monitoring of materials, equipment and systems during manufacturing, assembly, supply and site execution stages. The scope shall include, but not be limited to, the following:
7. Carrying out stage-wise inspection and Pre-Dispatch Inspection (PDI), wherever required, at manufacturer’s works shall be within the scope of the contractor.

8. Inspection and verification of materials, equipment and systems as per approved packing list, specifications and procurement documents shall be within the scope of the contractor.
9. Verification of raw material certificates, mill test certificates, foundry inspection reports and inspection of critical components during manufacturing and final assembly stages shall be within the scope of the contractor.
10. Checking of dimensions during final assembly and witnessing of unit tests, performance tests and shop tests for equipment and systems shall be within the scope of the contractor.
11. Inspection of critical materials and equipment procured from indigenous vendors including progressive inspection, non-destructive testing (NDT) and dimensional checks at vendor works shall be within the scope of the contractor.
12. Carrying out inspection activities at works of suppliers, sub-suppliers, contractors and sub-contractors shall be within the scope of the contractor.
13. Inspection of field welding activities for assembly of equipment supplied in multiple sections/pieces by vendors or contractors shall be within the scope of the contractor.
14. Witnessing and verification of hydro tests, pressure tests, leak tests and associated testing activities for equipment, piping and systems shall be within the scope of the contractor.

<u>The Expediting will mainly include as below:</u>

The scope of Expediting shall include complete monitoring, coordination and follow-up activities related to procurement, manufacturing, inspection and delivery of materials/equipment required for successful execution of the project. The scope shall include, but not be limited to, the following:

1. Submission of consolidated expediting reports indicating procurement status, manufacturing progress, inspection status and delivery schedules on fortnightly basis shall be within the scope of the contractor.
2. Follow-up with vendors for submission of compliance certificates, quality documents, test certificates and approved final vendor drawings shall be within the scope of the contractor.
3. Deployment of expeditors at works of vendors, sub-vendors, contractors and sub-contractors for critical and major equipment/items, wherever required and mutually agreed, shall be within the scope of the contractor.
4. Expediting and continuous follow-up with vendors for timely manufacturing, inspection, dispatch and delivery of materials/equipment after placement of purchase orders shall be within the scope of the contractor.
5. Preparation and implementation of integrated Quality Assurance Program (QAP) for the complete project in accordance with recognized international

standards and approval requirements of DPA shall be within the scope of the contractor. Inspection, quality checks and release clearance of materials/equipment at vendor works prior to dispatch to site shall also be within the scope of the contractor.

5. CONSTRUCTION:

The scope of Construction Management & Site Execution shall include complete planning, coordination, supervision, quality control, safety management, testing, commissioning support and construction management activities required for successful execution and completion of the Modular Green Ammonia Plant. The scope shall include, but not be limited to, the following:

1. Deployment of Project Management Team headed by Construction Manager along with experienced construction personnel and Planning Engineer for planning, supervision, monitoring and execution of project activities shall be within the scope of the LSTK Contractor. Construction Manager shall coordinate and manage all correspondence with contractors and sub-contractors.
2. Deployment of experienced Planning Engineer at site for preparation and monitoring of detailed project schedules, progress monitoring reports and MIS reports on daily, weekly and monthly basis using suitable project management software shall be within the scope of the contractor. MIS reports shall include project status, critical issues, slippages, deviations and corrective measures.
3. Preparation and implementation of site procedures for issue and control of drawings, documents, instructions and construction records shall be within the scope of the contractor.
4. Establishment and implementation of Site Quality Assurance Plans, field quality control procedures and inspection procedures shall be within the scope of the contractor.
5. Preparation and implementation of quality control documents, erection checklists, pre-commissioning checklists, commissioning protocols and quality records for site activities shall be within the scope of the contractor.
6. Witnessing, verification and certification of quality tests, inspection checkpoints, pour cards, reinforcement schedules, piping fit-up checks, welding approvals, equipment alignments, structural works, chemical cleaning and steam blowing activities shall be within the scope of the contractor.
7. Conducting daily, weekly and monthly review meetings and preparation of construction progress reports covering construction status, schedule deviations, critical issues and corrective actions shall be within the scope of the contractor.
8. Supervision and coordination of erection activities for mechanical, electrical, instrumentation and control systems to ensure compliance with approved specifications and drawings shall be within the scope of the contractor.

9. Mobilization and deployment of construction equipment including cranes, lifting equipment, forklifts, dumpers and associated machinery as per project requirement shall be within the scope of the contractor.
10. Review and deployment of adequate tools, tackles, consumables and special equipment required for site activities shall be within the scope of the contractor.
11. Resolution of technical field issues and engineering problems encountered during construction and commissioning stages shall be within the scope of the contractor.
12. Identification and implementation of corrective actions for works not conforming to approved drawings, specifications and quality requirements shall be within the scope of the contractor.
13. Preparation of procedures and documents related to testing, commissioning, performance testing, operation, maintenance and training activities shall be within the scope of the contractor.
14. Monitoring and implementation of quality checks in accordance with approved Quality Plans and project procedures shall be within the scope of the contractor.
15. Measurement and certification of executed works shall be within the scope of the contractor.
16. Material reconciliation, inventory monitoring and compilation of measurement records including free issue materials supplied by DPA, if any, shall be within the scope of the contractor.
17. Preparation and monitoring of material package lists shall be within the scope of the contractor.
18. Monitoring and enforcement of health, safety, statutory compliance and permit requirements for sub-contractors and associated agencies shall be within the scope of the contractor.
19. Overall project planning, engineering review and construction coordination activities shall be within the scope of the contractor.
20. Preparation of Constructability Study and establishment of Construction Strategy for project execution shall be within the scope of the contractor.
21. Preparation of heavy lifting schemes and planning of temporary facilities including site offices, warehouses, rest areas, access roads and fencing arrangements shall be within the scope of the contractor.
22. Establishment and implementation of site safety procedures shall be within the scope of the contractor.
23. Preparation and submission of documents required for obtaining statutory approvals related to construction and site execution shall be within the scope of the contractor.

24. Establishment of material control systems, warehousing procedures and inventory management systems shall be within the scope of the contractor.

25. Establishment and implementation of work permit systems for contractors and sub-contractors shall be within the scope of the contractor.

26. Establishment of construction planning, monitoring, control procedures and reporting systems shall be within the scope of the contractor.

27. Preparation of method statements for site execution activities shall be within the scope of the contractor.

28. Establishment of induction and training systems for labour, supervisors and staff deployed at site shall be within the scope of the contractor.

29. Preparation of plant and mechanical completion checklists shall be within the scope of the contractor.

30. Preparation and finalization of pre-commissioning test schedules shall be within the scope of the contractor.

31. Preparation of vendor mobilization schedules for commissioning support activities shall be within the scope of the contractor.

32. Close-out activities related to sub-contracts, vendors and contractors shall be within the scope of the contractor.

33. Preparation and submission of site close-out reports and completion documentation shall be within the scope of the contractor.

34. Development and implementation of best HSE practices for safe and incident-free project execution shall be within the scope of the contractor.

Civil construction execution works based on approved drawings and engineering inputs submitted by the contractor shall be executed by DPA through Civil Department

6. COMMISSIONING & START UP

Commissioning, start-up and Performance Guarantee Test Run (PGTR) of the Green Ammonia Plant shall be within the scope of the LSTK Contractor. The scope shall include complete planning, coordination, supervision, testing, troubleshooting and associated activities required for successful commissioning and stable operation of the plant.

The scope of Commissioning & Start-up shall include, but not be limited to, the following:

1. Preparation of commissioning, testing and operational procedures for plant systems and equipment, wherever required, shall be within the scope of the contractor.

2. Review and verification of testing procedures and protocols submitted by contractors and vendors and monitoring/supervision of pre-commissioning tests as per approved procedures shall be within the scope of the contractor.

3. Troubleshooting and rectification support during commissioning and start-up activities until achievement of acceptable and guaranteed performance parameters shall be within the scope of the contractor.

4. Carrying out pre-commissioning checks for mechanical, piping, electrical, instrumentation and control systems and certification of readiness for commissioning shall be within the scope of the contractor.

5. Preparation of pre-commissioning BOQ including consumables, chemicals, utilities and spare parts required for commissioning activities and procurement of the same shall be within the scope of the contractor.

6. Coordination with contractors, package vendors and OEMs for trial runs and commissioning of individual equipment and systems shall be within the scope of the contractor.

7. Preparation of detailed procedures and schedules for pre-commissioning activities including flushing, blowing, chemical cleaning, pressure testing, calibration of instruments, loop checking and associated activities as per Process Licensor and Package Vendor requirements shall be within the scope of the contractor. All pre-commissioning and commissioning activities shall be carried out in accordance with approved procedures, schedules and Process Licensor guidelines.

8. Coordination and compliance support for internal and external safety audits during pre-commissioning and commissioning stages shall be within the scope of the contractor.

9. Coordination for handing over and taking over of equipment, systems, tools, accessories and spare parts from contractors, sub-contractors and vendors shall be within the scope of the contractor.

10. Preparation and finalization of detailed Commissioning Plan and commissioning schedules and obtaining approval from DPA / Owner and Process Licensor shall be within the scope of the contractor.

7. INTEGRATED OPERATION AND PERFORMANCE GUARANTEE & SUPERVISION SERVICES:

The contractor shall ensure that commissioning, start-up and operation of the Green Ammonia Plant are carried out in a systematic and sequential manner to achieve safe, reliable and stable plant operation. Performance testing and acceptance activities shall be carried out in accordance with approved procedures and Process Licensor recommendations.

The scope under this section shall include, but not be limited to, the following:

1. Preparation of schedule for procurement and supply of utilities, raw materials, consumables, chemicals, catalysts and associated services required for commissioning, start-up and operation of the plant shall be within the scope of the contractor.
2. Preparation of detailed commissioning plan covering no-load trial run, sequential trial runs, hot commissioning, integrated system testing and Performance Guarantee Test Run (PGTR) for all equipment and systems shall be within the scope of the contractor.
3. Preparation of shutdown programs and coordination procedures for facilities not falling within the scope of the contractor, wherever required, shall be within the scope of the contractor. Necessary shutdown protocols and coordination procedures with all concerned agencies shall be prepared well in advance.
4. Overall planning, coordination and execution of testing, trial runs, commissioning activities, issue of commissioning certificates and successful completion of Performance Acceptance Test / Provisional Acceptance Certificate (PAC) jointly with DPA shall be within the scope of the contractor.
5. Comprehensive operation and maintenance support for the complete Green Ammonia Plant for a period of one (1) year after successful completion of Performance Guarantee Test Run (PGTR) shall be within the scope of the contractor.

Annexure-II: Price Schedule and Detailed Price Break up

Sl.No	Description	Qty	Amount
1	Design, Engineering, Procurement, Supply, Installation, Testing, Commissioning and Performance Guarantee of complete 5 TPD Green Ammonia Plant including Ammonia Synthesis Unit, Nitrogen Generation Unit, Pressurized Ammonia Storage System, Utility Systems, Electrical Systems, Instrumentation & Automation System, Fire Fighting System, PLC/DCS/SCADA System, Mechanical & Piping Works and all associated accessories on EPC / LSTK basis complete in all respects with one year O & M including warranty obligations.	**LS**	

Detailed Price Break up

Sl. No	Description	Qty	Amount
1	DSITC of Ammonia Synthesis Unit	LS	
2	DSITC of Nitrogen Generation Unit	LS	
3	DSITC of Pressurized Ammonia Storage Facility	LS	
4	DSITC of Piping & Mechanical Systems	LS	
5	DSITC of Fire Detection & Fire Fighting System	LS	
6	DSITC of Utility Systems	LS	
7	DSITC of Electrical Distribution System	LS	
8	DSITC of Pre-fabricated Control Room & Substation	LS	
9	DSITC of Safety Monitoring & Surveillance System	LS	
10	DSITC of Instrumentation, PLC/DCS & SCADA System	LS	
11	Commissioning of modular green ammonia plant through Integrated Plant Automation System	LS	

Note:

a. Rates quoted shall be inclusive of complete engineering, procurement, supply, testing, commissioning, PGTR and one-year O&M including warranty period of 1 year.

b. GST shall be paid extra as applicable.

c. Any item or service required for safe, reliable and integrated operation of the complete Green Ammonia Plant shall be deemed to be included in the quoted rates whether specifically mentioned or not.

d. Civil construction execution works shall be carried out by DPA based on approved drawings and engineering inputs submitted by the contractor.