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TECHNICAL SPECIFICATION FOR PRE-BID TIE UP

WITH

"Package supplier for *Hydrogen Separation, Purification, Compression & storage System"*

for proposed 1 TPD Green Hydrogen Plant from Plasma Enhanced Gasification of MSW-RDF/ Agri-Waste at NETRA

Revisions:	Prepared by :	Checked by :	Approved by :	Date :
	-Sd- Iftekhar	-Sd- Amit Kumar Sinha	-Sd- K Srinivas	27.05.2024

Refer to record of revisions



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1.0 INTRODUCTION

NETRA, NTPC Ltd is setting a 1 TPD (Nominal) Green Hydrogen plant based on 'Plasma induced Radiant Energy based Gasification System' (GH2-PREGS) with Municipal Solid Waste-Refuse Derived Fuel or Agriculture Waste as feed at NTPC NETRA, Greater Noida.

This 1 TPD GH2-PREGS plant, primarily, comprises of following 5 blocks:

- i) Block-1: 25 TPD Plasma induced Radiant Energy based Gasification Block (including arrangement for two years, storage, transportation and preparation of feed)
- ii) Block-2: Syngas Conditioning/Cleaning Block
- iii) Block-3: Hydrogen Separation Block
- iv) Block-4: Hydrogen Compression & Storage Block and
- v) Block-5: Power Block.

One (1) TPD GH2-PREGS plant shall be set up at NETRA, which is located in the district of Gautam Budh Nagar, Uttar

Pradesh. Nearest airport is Delhi at a distance of approx. 50 KMs. The nearest railway station is Ghaziabad, Which is at distance of about 25 km. Also, site is approachable by road from National Highway 24 (NH 24).

Plant Capacity & Design Considerations:

S.No.	Description	Value
1.	Input	25 TPD MSW-RDF/Agri-Waste (NCV greater than 2800 kcal/kg) (Design margin: > 25%)
2.	Output	1 TPD (nominal) Hydrogen with Purity \geq 99.99 %
3.	Power	33 kV, 3 phase
Design Considerations		
4.	Gasification Technology	Plasma induced Radiant Energy based Gasification
5.	Hydrogen Separation Technology	Membrane separation/VPsA/PSA or combination of above
6.	Hydrogen Compression	200 bar
7.	Hydrogen Storage	2 tones



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2.0 INTENT OF SPECIFICATION:

BHEL is in the process of identifying "Package supplier for Hydrogen Separation, Purification, Compression & storage System" to enter in to a Tie-up Agreement, which shall be part of BHEL's bid to NTPC against GEPNIT Tender Ref No. 2024_NTPC_86564_1 dated 03rd May 2024 (Bidding Document No. CS-0011-9409-9). BHEL will place an order on selected "Package supplier for Hydrogen Separation, Purification, Compression & storage System", in case BHEL adjudged as successful EPC Bidder and awarded the "Project" by NTPC. This "AGREEMENT" will be valid up to till the end of defect liability period of the contract or the completion of O&M period or completion period of BHEL for the plant as per contractual agreement with M/s NTPC, whichever is later. The intent of this specification is to elaborate the scope of Package supplier for Hydrogen Separation, Purification, Compression & storage System for MSW-RDF to Syngas who are willing to enter into Pre-Bid Tie-up/MOU with BHEL for Block 3 and Block 4 (refer clause 1.0 (Introduction) above and clause 11.1 Detailed Scope of Supply/Work.). Hence Package supplier for Hydrogen Separation, Purification, Compression & storage System for MSW-RDF to Syngas who are willing to enter into Pre-Bid Tie-up/MOU with BHEL for Block3 and Block 4 as per the specification would be referred as Hydrogen Package supplier (HPS).

The Prospective Package supplier (HPS) will undertake that the offered system/package shall conform to all technical specification requirements set forth in the tender attached and further agrees to abide by with the execution schedule.

In the event, BHEL is declared as successful EPC Bidder and awarded the "Project", the HPS shall be responsible for design, engineering, supply, erection, testing, training, pre-commissioning, commissioning, trial runs, functional test after commissioning and performance guarantee test run and Two Years O&M. continuous operation, guaranteeing and handing over, all on turnkey basis as required & complete in all respect and demonstration of guarantees, calibration, spares & maintenance tools etc. for Hydrogen Package (i.e. Hydrogen Separation, Purification, Compression & storage System) of the said project.

BHEL is looking for a prospective Hydrogen Package supplier (HPS) qualified as per the requirements specified in this Technical Specification, who has to Design, Engineer, Manufacture, Assemble, Inspect, Test and Deliver properly packed and painted system with all accessories and Erect, Commission, Operate & Maintain for 2-Years and depute Manpower for O&M Period as specified in the NTPC's Tender Specification and BHEL's Enquiry Documents

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3.0 SPECIAL NOTES TO BIDDERS:

LEGEND

BHEL	Bharat Heavy Electricals Limited
PE&SD	Project Engineering & Systems Division, Hyderabad, unit of BHEL
BQC	Bidder Qualification Criteria
PO	Purchase Order
LOI	Letter of Intent
Contractor	EPC Contractor, BHEL
HPS / Bidder	Qualified Hydrogen Package Supplier
'Contractor' mentioned anywhere in NTPC's Tender Document in context of Hydrogen package / Equipment shall be treated as 'HPS'	

- a) This specification shall be read in conjunction with its enclosures and Techno-commercial Specifications, Amendments, corrigenda, Pre-Bid Replies, clarifications etc. issued by NTPC regarding the subject tender.


The same are available at [NTPC Limited eProcurement Portal \(eprocurentpc.nic.in\)](http://eprocurentpc.nic.in)

GEPNIC Tender Ref No. 2024_NTPC_86564_1 dated 03rd May 2024

For the ease of Bidder, important NTPC's Technical documents are enclosed along with this enquiry, only for ready reference, but Bidder is responsible for accessing the above link to download and comply with all the requirements of the NTPC's Tender.

In case of any discrepancy arising between this specification & its enclosures, the most stringent of all shall be followed and shall over-ride others. Further, if a requirement in this specification or its enclosures, calls for decision of BHEL, it shall be bidder's sole responsibility to clearly bring out the same distinctively in his technical tender offer, to enable BHEL to furnish their decision. If such a requirement is not duly addressed by bidder during tender stage and same comes out during order execution stage, it shall be binding on the bidder to comply with the decision furnished by BHEL then, without any cost, delivery, or any other commercial implications.

- i). Bidders shall comply with various requirements of this specification. Bidders can bring out only those deviations, which are impractical to meet, for BHEL review.
 - ii). Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.
- b) Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/ applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification.

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- c) The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipment. These shall be executed on the basis of proven design principle and in accordance with the latest state of the art in such a manner that the purpose to be served by the equipment is fulfilled in every respect and a maximum of operational dependability and efficiency are assured. Standardization of equipment, materials etc. shall be employed in the design. Care shall be taken to ensure safe operation as well as simplicity of assembling and dismantling of all parts of the plant.
- d) Bidder shall quote strictly as per the scope of supply and requirements of this specification. Unsolicited or Alternate offers from the bidders will not be entertained.
- e) Incase Bidder is unable to offer due to any specific requirement of specification; Bidder shall bring out the same in their regret letter. Otherwise, it will be considered that non-participation by the bidder is attributable to reasons other than any specification requirements.
- f) Any 'Bidder from a country which shares a land border with India', as specified in the Bidding Documents, will be eligible to bid in this tender only if bidder is registered with the Competent Authority as mentioned in the Bidding Documents.
- g) Further, any bidder (including bidder from India) having specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India, will be eligible to bid only if the bidder is registered with the same competent authority.
- h) However, the said requirement of registration will not apply to bidders from those countries (even if sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects.
- i) BHEL reserves the right to reject any or all bids or cancel/withdraw the Invitation for Bids (IFB) without assigning any reason whatsoever and in such case no bidder/intending bidder shall have any claim arising out of such action.
- j) ***No deviations (technical / commercial) to the requirements as stated in NTPC's Tender Documents, BHEL's Enquiry Documents (Tech Spec, GCC, SCC, Price Bid Format, MOUs etc) will be accepted. Any deviations / alternatives indicated as part of Bidder's Offer in any form will not be considered.***

4.0 BIDDER QUALIFICATION CRITERIA

4.1 Technical Criteria

4.1.1 The Vendor should have Designed, Engineered & Supplied at least 01 Hydrogen Separation Plant using Membrane / PSA Technology of Capacity minimum 500Nm³/hr from Coke Oven Gas / Syngas or any Hydrocarbon Gases to any reputed Company in India in the seven (07) years from the date of floating of enquiry.

4.1.2 All the goods and services or works offered by Technology Owner shall contain minimum 50% of local content for the subject tender.

[Local Content means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the goods, services or works procured (excluding net domestic indirect taxes) minus the value of imported content in the goods, services or works (including all customs duties) as a proportion of the total value, in percent.



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4.2 Financial Criteria

4.2.1 The average annual turnover of the Bidder in the preceding three (3) financial years as on the date of techno-commercial bid opening, should not be less than INR 6 crores or in equivalent foreign currency.

4.2.2 Bidder should have operating/cash profit at least in one year in last three years.

4.2.3 Audited financial statement have to be submitted for all the three years as indicated against clause 4.2.1 above. If financial statements are not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by chartered accountant. Published Annual Report available in the public domain shall also be acceptable.

4.2.4 In case audited Financial statements have not been submitted any of three years as indicated above, then the applicable audited statements submitted by bidders against the requisite three years, will be averaged for three years i.e. total divided by three.

4.3 GPS shall not be under Holiday List/ Negative List/ Suspension List/ Banning List of NTPC / BHEL.

4.4 Bidder should have operating/cash profit at least in one year last three years.

5.0 DOCUMENTATION FOR BIDDER QUALIFICATION CRITERIA:


- a) Dispatch Document/ Packing List/ Inspection Release Note / Commissioning Protocol /Customer Satisfaction Report from the purchaser for documentary evidence against 4.1.1.
- b) Brochure of Product

6.0 TERMS OF CONTRACT

- a) HPS shall extensively use latest design software including 3D Modeling with PDS/PDMS software.
- b) BHEL may depute its Engineers to office/factory of HPS to expedite design, supplies of the HPS
- c) After start of construction, HPS shall position at work site a field engineering team essentially consisting of General Civil, Piping & Structures initially and followed by Electrical and Instrumentation, who have been involved in carrying out the design at the design office in order to closely coordinate with site construction group to resolve any issues related to design/ construction and provide additional drawings/ documents as required.
- d) HPS shall note and comply to the applicable clauses in GCC/SCC of BHEL's NIT and NTPC's Tender Specification.

7.0 BID EVALUATION CRITERIA

- a. The bidders are expected to meet the Bidder Qualification Criteria as detailed earlier in this specification (ref cl 4.0). The same shall be evaluated during technical bid scrutiny. The offers made by the bidders not meeting the BQC are liable for rejection.
- b. The bid evaluation shall be on lowest value arrived among all the quoted bidders as per the data filled by bidders in Price Bid Format. Quotations submitted in partial will be summarily rejected. BHEL will not entertain any other expenses/ assumptions written separately elsewhere other than those specified in the price bid format.
- c. The Price Factors shall be binding on the Bidders. **No deviation shall be permitted.**
- d. Successful Bidder shall be awarded the LOI for Pre-Bid Tie-up. Subsequently PO for Hydrogen Package will be awarded to Successful bidder if BHEL bags the order as EPC contractor.

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- e. HPS shall note and comply to the applicable clauses in GCC/SCC of BHEL's NIT and NTPC's Tender Specification.

8.0 DELIVERABLES TO BE SUBMITTED DURING PRE-BID AND POST BID STAGE

- For deliverables in the scope of HPS in Post-Order Stage, refer NTPC's Tender Specification.
- In general, it is expected that the HPS shall maintain high standards of engineering, quality in deliverables submitted and accuracy in documentation submitted meeting the intended contractual requirements.
- The detailed list of deliverables during the Pre-bid stage and during detailed engineering to be submitted along with offer
- The deliverables of HPS shall be submitted to BHEL only, unless instructed otherwise.
- BHEL will review the deliverables and furnish its observations, comments, if any to HPS for their incorporation and resubmission to BHEL.
- HPS shall clarify, with all supporting details on any queries raised by BHEL on their deliverables

However, following are the tentative list of documents to be submitted by HPS during Pre-Bid and Post bid

During Pre-Bid Stage:

- Electrical Load List (Normal, Emergency, DC, UPS etc.)
- Overall Process Flow Diagram /P&IDs
- Utility requirements (Aux Cooling water IA, SA etc.) as per format in clause no. 23.f
- Technical write up
- Control/ Operation/ Design Philosophy
- Functional guarantees
- Data sheets
- Special Tool and tackle
- Commissioning /start up spares
- Mile stone schedule
- Any other data related to Package as required by BHEL

Note: Bidder to furnish the signed, stamped copy of BHEL's Enquiry Documents (Technical Specification, important NTPC Tender Extract enclosures, GCC, SCC, Un-Priced Price Bid Format, MOU formats etc.) as part of Technical Offer.

During Post-Bid Stage:

Documents to be submitted by HPS after receipt of order:

Sl. No	DRG/DOC. NAME	Date of Submission
MECHANICAL		
M.01	P&ID	1 week from PO
M.02	System write-up (Including Control Philosophy)	1 week from PO
M.03	Performance data	4 weeks from PO



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M.04	Design Basis and Sizing Criteria of Package including Process Calculations	1 week from PO
M.05	List of Utilities along with quantity	2 weeks from PO
M.06	Auxiliary power consumption	4 weeks from PO
M.07	Equipment Layout	2 weeks from PO
M.08	Equipment list and load details	2 weeks from PO
M.09	Pipe Schedule	2 weeks from PO
M.10	Valve Schedule and valve specification	2 weeks from PO
M.11	List of Terminal Points	2 weeks from PO
M.12	Data sheets	2 weeks from PO
M.16	Piping layouts	4 weeks from PO
M.17	Forces and moments of piping at terminal point for steam & feed water lines	4 weeks from PO
M.18	All documents required for Customer submission as per NTPC specification for the items pertaining to package.	6-8 weeks from PO
M.19	Any other document pertaining to package as desired by BHEL	6-8 weeks from PO
ELECTRICAL		
E.01	Electrical Load List with normal power (HT/LT), emergency power (HT/LT), DC Power, UPS power, Power for lighting requirement etc.,	2 weeks from PO
E.02	Various layouts like Earthing layout, Lightning protection layout, cable tray layout, Illumination layout etc., pertaining to package	6 weeks from PO
E.03	All documents required for Customer submission as per EIL specification for the items pertaining to package	6-8 weeks from PO
E.04	Cable schedules for cables pertaining to package	6-8 weeks from PO
E.05	Any other document pertaining to package as desired by BHEL	6-8 weeks from PO
INSTRUMENTATION		
I.01	Instrument Index with BOQ, range, set points etc.,	2 weeks from PO
I.02	Instrument Hook up drawings	4 weeks from PO
I.03	Technical data sheet of Instruments	3 weeks from PO
I.04	JB Grouping	3 weeks from PO
I.05	Cable schedule	6 weeks from PO
I.06	DCS I/O List	5 weeks from PO
I.07	DCS Loop Diagram	5 weeks from PO
I.08	PLC I/O List	5 weeks from PO



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I.09	PLC Logic Diagram	5 weeks from PO
I.10	All documents required for customer submission as per NTPC specification for the items pertaining to package	6-8 weeks from PO
I.11	Any other document pertaining to package as desired by BHEL	6-8 weeks from PO
CIVIL		
C.01	Civil input drawings for all buildings	4 weeks from PO
C.02	Civil input drawings for all including Tanks, pits and chambers etc.	4 weeks from PO
C.03	Foundation details of all equipment	4 weeks from PO
C.04	Foundation details of structures & pipe racks within package area	4 weeks from PO
C.05	All documents required for Customer submission as per NTPC specification for the items pertaining to package	6-8 weeks from PO
C.06	Any other document pertaining to Gasifier as desired by BHEL	6-8 weeks from PO
MISCELLANEOUS		
MIS.01	Commissioning spares	5 weeks from PO
MIS.02	Recommended spares/Mandatory Spares	5 weeks from PO
MIS.03	Consumable list (Chemicals, oil, grease etc.)	5 weeks from PO
MIS.04	O&M manual	5 weeks from PO
MIS.05	Performance Test Procedure	5 weeks from PO

Note: The date of first submission is indicated above. Bidder shall submit all subsequent revision within 5 working days of comments by BHEL. BHEL shall give approval/comments on the submitted documents within 10 working days.

The above list is minimum Documents required. Final list shall be prepared by bidder and submitted to BHEL during detailed engineering stage for BHEL approval.



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9.0 DELIVERY SCHEDULE:

Sl. No.	Activity/Mile Stone	PERIOD IN MONTHS FROM LOI	
		Start	End
1	Engineering Drawing & Documents	0	3
2	Placement of Purchase Order for 'Bought Out' items	2	6
3	Site Mobilization	1	3
4	Civil Works	2	7
5	Supply of Plant & Machinery	3	7
6	Erection	4	10
7	Commissioning	9	12

10.0 OTHER INSTRUCTIONS

- g) Since speedy completion of project is essential for a tight project schedule, it shall be responsibility of HPS to ensure timely delivery of all milestones.
- h) HPS shall familiarize fully with the standard/ procedures/ practice of BHEL/OWNER, to avoid any dispute at later date and after order placement.
- i) BHEL shall not pay any amount, other than the fee specifically agreed, towards any cost incurred by HPS by way of salaries to their employees (income and taxes), insurance of any nature, benefits/ bonus to the employees, etc. BHEL's liability is limited to the amount contracted for the services to be rendered under the scope of work defined.
- j) HPS shall not commit any expenditure on behalf of BHEL without BHEL's consent in writing, during the execution of the work defined in the scope.
- k) HPS shall bear all expenses/ fee penalties if it infringes on patents/ licenses of any persons/ organizations or in case of suits, court proceedings, damage claims etc., due to any reason whatsoever.
- l) HPS shall ensure that it possesses the latest revisions of various national and international standards, codes of practices, statutory & environmental regulations etc. as applicable, for execution of the work. BHEL shall not provide any such documents to HPS. Engineers of HPS assigned for this project shall have familiarity on relevant documents as mentioned above for their use and applications.
- m) HPS shall maintain at their own cost the personal accidents policy, life insurance and / or any such insurance required in respect of their personnel deputed to outstation visits for the given contract.
- n) BHEL reserves the right to terminate or suspend the contract or withdraw part of the scope of the work at any stage of its execution, if it is found that HPS has not met its obligation for the performance / progress is not up to the expected standards and overall work is likely to suffer. In such an event, BHEL shall give 15 days' notice in writing. In such case all costs incurred accordingly by BHEL to complete any work forming part of the contract shall be recovered from



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HPS. In case of such premature termination of contract, BHEL reserves the right to claim damages from HPS including the initiation of judicial proceedings.

- o) HPS shall keep all information/data/drawings etc. related to the work as confidential information and shall not divulge or use the information indirectly or directly in any way detrimental to the interest of BHEL. All drawings, documents, manuals, design calculations including all originals prepared or obtained during the work shall remain the property of BHEL and shall be handed over to BHEL on demand.
- p) HPS shall comply with the laws and regulations of the country, the state and territories concerned, during the progress of the work.
- q) HPS shall submit progress report on the status of the work entrusted to them periodically and as mutually agreed upon.
- r) HPS shall ensure optimal & economic design while executing the work, but without sacrificing the customer specification requirements/ Statutory regulations/ code provisions/ safety aspects.

11.0 TECHNICAL SPECIFICATION OF HYDROGEN PACKAGE

Hydrogen Quality @ outlet of Hydrogen Package	From Syngas quality as specified in Clause 6. PFD of NTPC Specification and other relevant clauses of NTPC at inlet of H ₂ recovery block (i.e. indicatively 2000 Nm ³ /hr @ 1.6 barg) to H ₂ gas at 90% recovery with 99.99 % purity.
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Please refer the Technical Specification from NTPC for detailed technical specification and compliance for relevant area.

11.1. Brief Scope Of Supply/Work

Scope of supply/ works shall be as per technical specification and attached enclosures. Bidder may include in his scope, any additional requirements/equipment, if so warranted by him, in order to meet the guarantees as specified in this specification.

The scope of this project includes following:

- a) Setup of Hydrogen package (i.e. Hydrogen Separation, Purification, Compression and Storage System comprising of Syngas Compressor, Membrane and/or molecular sieve based H₂ Separation & purification, Hydrogen compressor, Storage and Hydrogen Cylinder Filling etc.)
- b) Two (2) years O&M of Hydrogen package (including spares, consumables etc.) after successful commissioning,

The scope of work shall include Project Management; Residual Process Design & Detailed Engineering; Procurement; Fabrication; Inspection; Supply; Manufacture; Transportation of all equipment/materials to the work site& Storage at site; assembly, erection & installation; Construction and Erection of Structural, Mechanical, Electrical, Instrumentation & Piping works; Painting; Testing; Pre-commissioning, commissioning; Training of NTPC's personnel; Functional test,



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Performance guarantee test run in presence of NTPC's; Guaranteeing and handing over of the Hydrogen Package to the Client on lump sum turnkey basis as per design basis, equipment list, standards, P&IDs, data sheets, drawings, etc., all complete within Bidder's specified battery limits including supply of spares, chemicals & consumables. The bidder shall be required to obtain all statutory approvals for completion of his scope of work. Bidders shall quote price for **Two (2) years** O&M contract duration including required chemicals, consumables supply. *Refer NTPC technical specification for detailed scope of supply for relevant area.*

Brief Electrical Scope pertaining to vendor Block


- LT MCC
- LT power cables
- Control cables
- Cable lugs & Glands
- Cable trays & Supports
- Earthing & Lighting protection
- Illumination
- Local Push button station
- VFD if applicable as per process requirement

Brief Instrumentation Scope pertaining to vendor Block

- Complete Field Instruments Package (PG, PT, TG, LG, TT, TE, FE, FT, LT, LS, DPT, DPG, Rotameter etc.)
- Instrument mounting, hook up material for Vendor supplied instruments.
- Gas Analyzers,
- Laboratory instruments
- Completer Signal Cables including special cables like FO cable, serial interface cable & Network cable and Junction Boxes.
- Package PLC's for Vendor Block (as applicable) including interfacing with Central Integration PLC of GH2-PREGS
- OWS & EWS for Vendor Block
- Cable lugs & Glands
- Cable trays & Supports
- Special tools & tackles (as applicable).

Brief Scope of civil works/ services:

- The HPS shall furnish complete design, drawings and Engg. Documentation work related to total scope of the Civil, Structural & Architectural areas. The following services are envisaged in the scope.
- Preparation of list of drawings and drawing submission schedule.
- A consolidated Design Basis has to be prepared to give a detailed idea for the total engineering work involved.
- Design basis for the individual structures has to be submitted to BHEL/ NTPC and got approved before taking up the complete analysis & design of the respective structures.
- Preparation of Analysis & Design documents and drawings for various buildings, equipment foundations, structures and services listed as per the scope

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- Preparation of detailed BOQ for all structures to include all items of construction based on RFC drawings and to be updated based on As Built Drg. However, all relevant construction drawings shall contain a table indicating BOQ's for PCC, RCC and Reinforcement Steel.
- The scope of this work includes complete Architectural, Civil and structural design and drawing services as per 'Scope of Civil Works'. The list is only indicative for the Engineering Subcontractor. It is not intended to limit the Engineering work to these equipment/building/facilities. Engineering Subcontractor to carry out Civil Engineering as necessary.
- Soil investigation report indicating relevant recommendations for design of foundations will be furnished by BHEL before taking up the design work. However, soil report furnished by customer shall be made available during the tendering. HPS to decide the type of foundation to be used for the different structures. Design of piles (capacity of piles, structural design, etc.), if piles are required, shall be in scope of HPS.
- Seismic analysis shall be as per IS 1893. Design response spectra given in the code or site-specific seismic data as applicable shall be used.
- Incorporation of civil interface details in respective civil drawings using vendor drawings. BHEL shall furnish vendor drawings to HPS for their review in this regard.
- Preparation of as built drawings.

NOTES:-

- Design calculations, Architectural, R.C.C and structural drawings for each structure should be submitted in one lot for approval by customer/customer Subcontractor.
- HPS shall submit detailed working sheets along with abstract of quantities for structure wise BOQ.
- HPS is expected to give a most economical design for the civil structures, however, without compromising on customer specifications, code and statutory requirements etc. BHEL will furnish HPS the structure wise BOQ prepared by BHEL at bidding stage. HPS is expected to carry out the engineering based on the customer specifications, code and statutory requirements and BHEL standard practices for the project. HPS shall monitor the actual BOQ for various structures as per RFC drawings and compare the same with BHEL's BOQ and inform BHEL whenever the actual quantities exceed preliminary estimated quantities or where it becomes necessary to operate additional items. For the purpose HPS shall submit a comparative statement every time engineering for a particular structure is completed.
- HPS shall take care that the items, specifications and details shown in the drawings are strictly in accordance with customer specifications and BHEL schedule of items. If there is any variation between the two, the same must be referred to BHEL for opinion

11.2. Process

Process documents enclosed are the basic documents and are to be followed for execution of job leading to successful commissioning and performance guarantee test run of the Plant. During the course of execution, updating/modification to the process documents that would become necessary is to be carried out with the approval of NTPC/BHEL. The resultant work arising out of this will also form the part of scope from detailed engineering to handing over of the plant with no



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cost implication to NTPC/BHEL. The tender specifies the scheme (refer to the PFDs/SFDs and P&IDs attached in relevant sections in tender documents) & Bidder's scope of supply in subsequent sections of this document as minimum requirements. Bidder may include in his scope any additional requirements, if so warranted to meet process guarantees and for smooth safe and trouble-free operation of the plants. All equipment described in these specifications; datasheets & equipment list; as shown in the P&IDs& PFDs; as mentioned elsewhere in the tender document or as necessary for completeness but not listed above shall also be deemed to have been included in Contractor's scope. All works required to meet requirements given in design/process/operation requirements defined elsewhere in the bid document shall also be deemed to have been included in Contractor's scope.

11.3. Engineering

The design basis, data sheets, drawings, standards, specification, codes to be followed for different types of works are brought out in the various engineering sections forming part of the tender document. Bidder shall carry out residual process design & detail engineering works for the plant and submit various drawings and documents for approval of NTPC/BHEL before these are released for construction.

11.4. Supply Of Consumables, Lubricants, And Chemicals

Supply of consumables, lubricants, and Chemicals (if any) required for 100% pre commissioning, Commissioning, functional test, PG Test and Two (2) years O&M period is in Bidder's scope.

11.5. Man Power For Erection, Commissioning And Operation And Maintenance.

Required man-power to be deputed to site, for Erection, Commissioning, O&M by HPS contractor in line with NTPC/BHEL technical specification.


11.6. Construction

Foundations including all erection of structural works including materials (for Hydrogen Package) are in HPS scope.

12.0 QUALITY ASSURANCE

HPS have to submit the inspection test plans by taking care of specification requirements, applicable national, international standards and procedures. The same will be reviewed during detailing stage. Further, in house testing of each component shall be carried out at vendor's works / their sub vendor's works and test certificate shall be furnished during final inspection. However, vendor shall be responsible for supply of material as per specification and demonstrate the performance of these components /integrated system, if required.

The Owner / Purchaser reserves the right to inspect the equipment at the point of manufacture and witness factory and other such tests as may be necessary to ensure conformance to the specification.

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13.0 STATUTORY CLEARANCES

All the applicable safety codes, national laws and local regulations shall be followed by the successful bidder for the design, engineering, fabrication, erection, commissioning & handing over of the Plant / Equipment and necessary approvals shall be obtained from the concerned statutory authorities by the Bidder. Statutory bodies from which approvals may have to be taken include State Pollution Control Board, Chief Inspector of Boilers / IBR, PESO, Factory Inspectorate, Labour Authorities, Electrical Inspectorate and Chief Controller of Explosive, Directorate General of Mines and Safety requirements, etc. The Bidder shall ascertain requirement of approvals as applicable in such plants and initiation of action as required shall be in Bidder's scope.

14.0 VENDOR LIST

For most of the systems/equipment, the approved vendor list of NTPC is enclosed in the bid document, which shall be adhered to. While for other items, not listed in the approved vendor list, the suppliers who would be involved for design, engineering and supply of equipment and materials are to be proposed by the Bidder (for NTPC approval) during detailed engineering with the documentary evidence of having supplied similar equipment, systems and/or materials for similar applications with proven track record. Any change for new contractor/supplier after award of contract for supply will not be permitted. It will be necessary to purchase certain items as a system and not as individual equipment. These have to be identified and furnished during detailed engineering for approval of the NTPC/BHEL.

15.0 WASTE DISPOSAL

All wastes generated like surplus earth after use/surplus construction materials to be disposed-off from time to time by the Bidder to the disposal locations as directed by the Engineer-in-Charge.

16.0 DESCRIPENCIES / VARIATIONS IN SPECIFICATIONS / STANDARDS

Bidders may bring out variations, deviations, if any, in related data sheets, equipment list, drawings, specifications, standards, codes, scope and any other contractual clauses before submission of bids and seek clarifications. In case of any contradiction on specification brought out at the post award stage of job, decision of BHEL/NTPC shall be final & binding upon the Bidder without any time & cost implication.

17.0 SPARES & TOOLS

- ERECTION & COMMISSIONING SPARES**

Bidder shall ensure adequate supply of all spares as required by him for successful erection & commission of the plants till handing over to the client. The lump sum price quoted shall be deemed to be inclusive of cost of such spares.



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- **MANDATORY SPARES**

Bidder's scope regarding supply of mandatory spares shall be as per the specifications attached in the tender.

- **TWO YEARS RECOMMENDED SPARES**

Two year normal operation spares required are to be identified by the bidder and shall be in the bidder's scope during the Two Years Operation and Maintenance Contract. These Spares as identified by the Bidder.

- **STORAGE OF SPARES**

All spare parts supplied by the bidder shall be properly wrapped, packaged and stored by the Bidder so that they will be preserved in original and new condition under the normal conditions of storage to be anticipated in India and shall be properly tagged and coded so that later identification as to intended equipment usage will be facilitated. They shall be packed separately clearly marked as 'spare parts'. Packing lists shall be furnished so that the parts can be handled without uncrating if desired.

- **SPECIAL TOOLS AND TACKLES**

Bidder shall ensure supply of all special tools and tackles for commissioning of the entire plants till handing over. The lump sum price quoted shall be deemed to be inclusive of cost of such tools and tackles.

18.0 MECHANICAL COMPLETION / PRE-COMMISSIONING / COMMISSIONING

- **Mechanical Completion**

Mechanical completion of the Plant shall mean that all installations works of the Plant have been completed and hydrotested in accordance with approved construction drawings, approved specifications, applicable codes, accepted International good engineering practices and all the activities have been completed in a comprehensive manner by the Bidder.


- **Pre-Commissioning**

Pre-commissioning activities are defined as those activities which are required to be performed after completion / installation, inspection, hydro-testing, etc. of the Plant to make it ready for commissioning.

- **Commissioning**

The Plant shall be considered "Ready for Commissioning" when all the facilities have been completed along with their auxiliaries and support facilities in every respect including charging of lubes, chemicals, filters media, preparation of solution, etc. as recommended by NTPC in standard format with all exceptions, if any, resolved.

Commissioning of the Plant shall mean taking the feed in the system, passing it through normal route and establishing the process control parameters. The Plant shall be considered to be commissioned successfully with instrumentation / control system, process, utilities & support system have been on uninterrupted stable operation for not less than 72 hours while producing syn gas with desired quality. Whether the 72 hours operation has been successful or not shall be decided by NTPC based on observations recorded during 72 hours. The countdown for 72 hours

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operation shall start on after the system has been on stable operation with all controls and safety systems in normal operation for a period of not less than 48 hours.

19.0 TOLERANCES

The guaranteed figures are subject to the following tolerances for acceptance of the plant.

- Capacity measurement as per NTPC specification.
- Quality measurement as per accuracies guaranteed by the instrument supplier.

In case of any variation over the tolerances given above, Bidder shall rectify the plant at his own cost within a time mutually agreed upon by the Contractor and NTPC to bring the plant performance in line with the guaranteed figures.

20.0 PERFORMANCE AND GUARANTEES

- After the system has been stabilized by the Bidder during trial runs and functional tests and plant is successfully commissioned as per the contract, the Bidder shall conduct a performance guarantee test run for the package. The procedure for performance testing shall be submitted by the Bidder to the BHEL/NTPC for review & approval. The duration for the performance guarantee test run shall be 24 hours continuous operation of the plant. During the performance guarantee test runs, the following guarantee parameters shall also be fulfilled (within the tolerances as specified) at design conditions as specified above.

Hydrogen Quality @ outlet of Hydrogen Package	From Syngas quality as specified in Clause 6. PFD of NTPC Specification and other relevant clauses of NTPC at inlet of H ₂ recovery block (indicatively i.e. 2000 Nm ³ /hr. @ 1.6 barg) to H ₂ gas at 90% recovery with 99.99 % purity.
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- Any loss of consumable/material during pre-commissioning, trial runs, commissioning, etc. prior to handing over of plant to NTPC shall be made up by the bidder to the quantities specified in the design calculations as initial charge without any extra time & cost to NTPC.
- If on testing, any material or equipment or the unit does not meet the design, rated or guaranteed performance related there to, the Bidder shall forthwith, within the scope of work of Bidder and at no additional cost to NTPC, undertake such additional tests and / or operations as are necessary to identify the cause of such failure. Such tests and / or operations shall be conducted in conjunction with NTPC, if the plant as a whole fails to meet the guarantees.
- If as a result of such tests and / or operations it is determined that the design, rated and / or guaranteed outputs or capacities have not been met because of defect in any material(s) (including machines and equipment) supplied by the Bidder, the bidder shall forthwith in consultation with the Engineer-in charge take steps necessary to cause the defect to be identified and rectified, either by replacement of the defected material, machine or equipment or part thereof or by repair or replacement thereof at sole cost and expenses of Bidder.
- In the event that certain of the guaranteed performance have not been met, the bidder shall make suitable additions, deletions or modifications, if required after obtaining approval of NTPC to the process and the Plant to ensure the guaranteed results.



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- i). HPS shall provide a list of laboratory test procedures and frequencies thereof required for validating Performance Guarantees.
- ii). HPS to prove the Functional Guarantee as per NTPC Specification (clause 3.1 and clause 3.2 of technical specification of NTPC). HPS to demonstrate parameters as specified above.
- iii). HPS's liabilities on account of not meeting the above said Performance Guarantees (because of Engineering related issues), shall be limited to 5% (5 percent) of the Supply value between BHEL and HPS, payment of which is reserved against issue of Commissioning and Performance Test Certificate by OWNER.
- iv). HPS shall note and comply to the applicable clauses in GCC/SCC of BHEL' s NIT and NTPC's Tender Specification.



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21.0 PROJECT MANAGEMENT

Effective project management within time frame is also a part of the Bidder's scope. The system of organization & control; feedback & corrective measures; communication & project execution scheme to be submitted.

Planning, scheduling and monitoring is essential for timely completion of the project and effective project management system to be adopted as enumerated.

22.0 BATTERY LIMIT CONDITIONS

Please refer Annexure-2 for battery limit conditions.

23.0 FORMAT FOR CHEMICAL AND UTILITY CONSUMPTION FIGURES

All Utilities & Chemicals Consumption shall be listed by HPS which is envisaged to be used in Plant for Normal Operation as well as for start-up / shutdown requirements.

Maximum Consumption Figures for Utilities

Description of Utility	Unit	Hourly Rate (Max.)	Maximum Consumption Figure/ day (1 Day = 24 Hours)
Power	kW		
Service Water	m ³ /hr		
Drinking Water	m ³ /hr		
Plant Air	Nm ³ /hr		
Instrument Air	Nm ³ /hr		
Nitrogen	Nm ³ /hr		
MP BFW	Kg/hr		
MP Steam	Kg/hr		
LP Steam	Kg/hr		
Cooling Water	m ³ /hr		
Fire water	m ³ /hr		
Any Other			

Maximum Consumption Figures for Chemicals



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24.0 LIST OF ENCLOSURES

Sl. No.	Document No.	Document Title
1.	Annexure-1	SCOPE MATRIX BETWEEN BHEL & "HYDROGEN PACKAGE SUPPLIER (HPS)"
2.	Annexure-2	Terminal Points
3.	Annexure-3	Technical Specification from NTPC
4.	Annexure-4	MoU Format (Between BHEL & Bidder)
5.	Annexure-5	Price Bid format
6.	Annexure-6	Checklist

*In case any Enclosure missing/required date not available bidder to communicate to BHEL and obtain confirmation/required data.

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