
	<p align="center">NOTICE INVITING TENDER (TENDER NO: 18112023)</p>	<p>REVISION: 00</p>
<p>AVAADA GROUP</p>	<p>ELECTROLYZER SYSTEM FOR GREEN HYDROGEN PRODUCTION</p>	

NOTICE INVITING TENDER (NIT)
FOR
SUPPLY OF ELECTROLYZER SYSTEM FOR THE PRODUCTION OF
GREEN AMMONIA AND GREEN METHANOL

(INTERNATIONAL COMPETITIVE BIDDING)




AVAADA GREENH2 PRIVATE LIMITED
 Registered Office: C-11, Sector-65, Gautam Buddha Nagar, Noida, UP-201301
www.avaada.com


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1.0 INTRODUCTION

ABOUT AVAADA

Avaada Group, a leading integrated green energy solutions provider, has expertise in the renewable energy landscape and capabilities across green hydrogen, green ammonia, and green methanol production. Seamlessly intertwining a commitment to sustainable production with a meticulously backward-integrated model, Avaada Group propels towards a future that is not merely sustainable but remarkably self-sufficient. In essence, Avaada Group is a 'sand to molecule' platform, converting silicon to solar modules and utilizing Solar, Wind, and Water Battery technologies for power generation to create green molecules.

1.1 VISIONARY IN SUSTAINABILITY

Avaada Group, synonymous with 'promise,' is driven by an unwavering belief in a sustainable future, embedding this vision into every aspect of an energy ecosystem that goes beyond sustainability to embrace remarkable self-sufficiency. The envisioned world is one where energy is not only utilized but also judiciously generated, conserved, and circulated within an endless loop of efficiency and sustainability.

1.2 INDIGENOUS TECHNOLOGICAL INTEGRATION


Avaada Group takes pride in being an innovator in the renewable energy sector, producing premier solar panels and establishing a unique position within the domain. The company's proprietary solar technologies symbolize technical prowess and are fundamental to its self-reliant energy pursuits.

1.3 LEADING THE CHARGE IN GREEN AMMONIA & GREEN METHANOL

Avaada Group transcends traditional frameworks, orchestrating sustainable production of Green Ammonia and Green Methanol. Utilizing internally generated clean energy, the company establishes a positive cycle, ensuring production methodologies are optimally energy-efficient and minimally impactful on the environment.

1.4 A HOLISTIC ENERGY ECOSYSTEM

Avaada Group's backward-integrated model harmoniously amalgamates various renewable energy sources:

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- **Solar:** Harnessing the sun's limitless energy with pioneering, in-house manufactured top-tier solar panels.
- **Wind:** Utilizing infinite wind energy, transforming it into a steadfast, clean power source.
- **Water Battery:** Integrating innovative pumped hydro technologies, ensuring continuous, reliable green energy round the clock.
-

1.5 GLOBAL IMPACT, LOCAL ROOTS

Avaada Group is a value-based organization sensitive towards the wellbeing of society where it operates and aligned with 13 UN SDGs. It remains unwavering in its resolve to foster positive impacts within global communities whilst steadfastly adhering to local values and traditions.

1.6 TRUST FROM INVESTORS & PARTNERS


Backed by a respected consortium of global investors and partners, including Brookfield, PTT, Proparco, DEG, FMO, and ADB, GE Avaada Group's financial and strategic alignments signify a convergence of trust in its capabilities and alignment with its sustainable aspirations. These partnerships reflect a mutual commitment towards a future dominated by green energy.

1.7 STEERING TOWARDS A CARBON-NEUTRAL FUTURE

The Avaada Group stands not just as a manufacturer but as an innovator, visionary, and staunch advocate for a world where every kilowatt of energy generated and utilized is clean, green, and sustainable. The company charts a path towards a carbon-neutral future, ensuring future generations inherit a planet that is lush and vibrant.

1.8 ACCOLADES AND RECOGNITION

The Avaada Group has built one of the largest portfolios of solar/wind power projects in India, with a total capacity of around 7 GW and aims to reach 30 GW capacity by 2030. Avaada also has the honour of commissioning the world's largest solar power plant with a capacity of 1.25 GW at a single site in Bikaner, Rajasthan. Avaada Group was the first company in India to reach a GW scale operating renewable project in 2015 and the first company in Asia to monetize the operating 1.2 GW platform for 1.4 billion USD to Tata.

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2.0 PROJECT DESCRIPTION

AVAADA intends to set up Green Ammonia and Green Methanol plants in the states of Odisha and Maharashtra in India. Avaada seeks to procure Electrolyzers from reputed Electrolyzer manufacturers in the international market of the following capacity:

- 1) **700 MW** for the production of Green Ammonia in Odisha
- 2) **700 MW** for the production of Green Methanol in Maharashtra
- 3) **700 MW** for the production of Green Ammonia in Maharashtra
- 4) **350 MW** for the production of Green Methanol at a location which will be announced on a later date

3.0 SALIENT FEATURES OF BIDDING DOCUMENT

Bids can be submitted for all or each of the above-mentioned projects, the bidder is free to quote their supply quantity.


A)	Tender document No.	Electrolyzer-18112023
B)	Bidding Document on Website	https://avaada.com/tenders
C)	Due date of Receipt of Bidder's Queries for Pre-bid Meeting	January 19, 2024
D)	Last Date and time of Online submission of Bids (Bid Due Date)	January 26, 2024

The delivery schedule for each project is provided in Annexure 1

3.1 PRE-BID MEETING / FIELD VISIT

Pre-bid meetings will be conducted online on the date mentioned in the above table. Bidders or their authorized representatives are requested to attend the Pre-Bid Meeting so that their queries, if any, related to the Bidding document and Scope of Work can be addressed during the meeting. The bidders are requested to send queries/clarifications if any, by e-mail to AVAADA pr four preferably days before the pre-bid meeting. The clarifications shall be provided during the pre-bid meeting.

The bidder shall consider in their priced bid, all the pre-bid discussions and subsequent corrigenda issued if any, submitted on or before the bid due date, which shall be firm and final. No revisions to the quoted price and no further queries will be allowed thereafter.

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FOR ANY TECHNICAL/ COMMERCIAL RELATED QUERIES, PLEASE DIRECTLY CONTACT TO THE FOLLOWING PERSONS:

Mr. Ashish Tambi

Designation: Deputy General Manager - Procurement

Tel: +91- 0120-6757050

Mobile: +91-9799648819

E-mail: ashish.tambi@avaada.com

Mr. Prajnadipta Mohanty

Designation: Senior General Manager - Procurement

Tel: +91- 0120-6757093

Mobile: +91- 9821769427

E-mail: prajnadipta.mohanty@avaada.com

4.0 PRE-QUALIFICATION CRITERIA (PQC)

4.1 TECHNICAL CRITERIA

The bidder shall be a manufacturer or a channel partner of the manufacturer of either Alkaline Water Electrolyzer (AWE) or Anion Exchange Membrane (AEM) or Proton Exchange Membrane (PEM) or Solid Oxide Electrolysis Cell (SOEC)


AND

The Manufacturer or the Channel partner should have supplied an electrolyzer commercially operational, based on either of the above technology (AWE/ AEM/ PEM/ SOEC). The manufacturer shall submit documentary evidence of guaranteed performance, service life and power consumption along with the Technical offer.

4.2 FINANCIAL CRITERIA

a) The Bidder shall have sound financial status and positive Net Worth

Detailed financial information shall be sought from selected potential suppliers

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5.0 ELIGIBILITY OF BIDDERS

Parties who are affiliates of one another can decide which Affiliate will make a bid. Only one affiliate may submit a bid. Two or more affiliates are not permitted to make separate bids directly or indirectly. If two or more affiliates submit a bid, then any one or all of them are liable for disqualification. However, up to 3 affiliates may make a joint bid as a consortium, and in which case the conditions applicable to a consortium shall apply to them. “Affiliate” of a Party shall mean any company or legal entity which:


- (a) Controls either directly or indirectly a Party, or
- (b) Which is controlled directly or indirectly by a Party; or
- (c) Is directly or indirectly controlled by a company, legal entity or partnership which directly or indirectly controls a Party. “Control” means actual control or ownership of at least a 50% voting or other controlling interest that gives the power to direct, or cause the direction of, the management and material business decisions of the controlled entity.

Bids may be submitted by:

- a) A single person/ entity (called sole bidder).
- b) A newly formed incorporated joint venture (JV) which has not completed 3 financial years from the date of commencement of business.
- c) A consortium (including an unincorporated JV) having a maximum of 3 (Three) members.
- d) An Indian arm of a foreign company.

Fulfilment of eligibility criteria and certain additional conditions in respect of each of the above 4 types of bidders is stated below, respectively:

- a) In case of bidder(s) is / are a consortium (including an unincorporated JV), then the following conditions, as applicable, shall apply:
 - 1) Each member in a consortium may only be a legal entity and not an individual person.
 - 2) The bidder shall specifically identify and describe each member of the consortium.
 - 3) The consortium member descriptions shall indicate what type of legal entity the member is and its jurisdiction of incorporation (or of establishment as a legal entity other than as a corporation) and provide evidence by a copy of the articles of incorporation (or equivalent documents).
 - 4) One participant member of the consortium shall be identified as the “Prime member” and contracting entity for the consortium.
 - 5) This prime member shall be solely responsible for all aspects of the Bid/Proposal including the execution of all tasks and performance of all consortium obligations.

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6) The prime member shall fulfil each eligibility criteria.

7) A declaration shall be given from each of the consortium member in the form of a letter signed by a duly authorized officer clearly identifying the role of the member in the Bid and the member's commitment to perform all relevant tasks and obligations in support of the prime / lead member of the consortium and a commitment not to withdraw from the consortium.

8) No change shall be permitted in the number, nature or share holding pattern of the Consortium members after pre-qualifications, without the prior written permission of the owner.

9) No change in project plans, timetables or pricing will be permitted because of any withdrawal of failure to perform by a consortium member.

11) Entities that are affiliates of one another are allowed to bid either as a sole bidder or as a consortium only.


12) Any person or entity can bid either singly or as a member of only one consortium.

d) In case the bidder is an Indian arm (Subsidiary, authorized agent, branch office or affiliate) of a foreign bidder, then the foreign bidder shall have to fulfil each eligibility criteria. If such foreign company desires that the contract be entered in to with the Indian arm, then proper back to continuing (parent company) guarantee shall be provided by the foreign company clearly stating that in case of any failure of any supply or performance of the equipment, machinery, material or plant or completion of work in all respects and as per the warranties/ guarantees that may have been given, then the foreign company shall assume all obligations under the contract. Towards this purpose, it shall provide such comfort letter/ guarantees as may be required by Owner. The guarantees shall cover inter alia the commitment of the foreign company to complete the entire work in all respects and in a timely fashion, being bound by all the obligations under the contract, an undertaking to provide all necessary technical and financial support to the contract when awarded, an undertaking not to withdraw from the contract till completion of the work, etc.

6.0 EVALUATION CRITERIA

The techno-economic evaluation of the qualified bids will be carried out for the selection of bidder as described below:

SI.no.	Parameter
1.	Total number of operational units and capacity (MW) installed
2.	Year of installation of first Electrolyzer plant (>18 kg/h)
3.	Specific power consumption of Electrolyzer stack (DC) (kWh/kg Hydrogen)

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4.	Specific power consumption of Electrolyzer System (AC) (kWh/kg Hydrogen)
5.	Guaranteed Cooling water requirement
6.	Guaranteed DM water requirement
7.	Guaranteed Operating Hours
8.	Guaranteed availability of spares and support for future replacement
9.	Guaranteed liquid effluent quantities
10.	Levelized Cost of Hydrogen (LCOH)

The bidder must provide details required for the LCOH calculation in Annexure-2. The Levelized Cost of Hydrogen will be calculated based on the prices given below:

Prices of utilities will be as follows

S No.	Utilities	Unit	Price
1.	Cost of renewable energy	₹/kWh	4.5
2.	DM water	₹/m ³	65
3.	Treated water (cost for makeup Cooling Water)	₹/m ³	35
4.	Recirculating cooling water	₹/m ³	1.75
5.	KOH	₹/kg	150
6.	Nitrogen	₹/Nm ³	7.2
7.	Instrument air	₹/Nm ³	1.65
8.	Plant air	₹/Nm ³	1.6


7.0 OWNER'S RESPONSIBILITY

7.1 SITE FACILITIES:


- Make available the Site with access road usable for carriage of equipment, construction material etc.
- Provide requisite electric supply and water during construction of the Plant at single point

SPECIFICATIONS OF UTILITIES

1.0	Cooling Water	
	Supply Header Pressure, kg/cm ² g (Normal)	4.5

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	Return Header Pressure, kg/cm ² g (Normal)	3.5
	Supply Header Temperature, °C	36 °C
	Return Header Temperature, °C	45 °C
2.0	Demineralized Water	
	Supply Pressure, kg/cm ² g (Normal)	3.5 - 4.0
	Temperature, °C (Normal)	Ambient
	pH	6.5 – 7.0
	Total Hardness, ppm wt.	Not Detectable
	Sodium, ppm wt	Below 2 ppm
	Total Dissolved Solids, ppm wt. (max.)	Not detectable
	Conductivity at 20 °C, micromho/cm (max.)	< 0.2
	Alkalinity as CaCO ₃ , ppm wt.	Nil
	Chlorides	< 2ppm
	Iron as Fe	< 2 ppm
	Silica as SiO ₂	< 0.02 ppm
	Oil, ppm wt.	Nil
	Note: For Electrolyzer Demineralized water quality	Supplier to specify
3.0	Service Water	
	Supply Pressure, kg/cm ² g (Normal)	7.0
	Supply Temperature, deg C	Ambient
	Quality	Treated Water
4.0	Drinking Water	
	Supply Pressure, kg/cm ² g (Normal)	3.0
	Supply Temperature, deg C	Ambient
	Quality	Treated Water conforming to IS-10500:1991 standard require.
5.0	Fire Water	
	Supply Pressure, kg/cm ² g (Normal)	9.0
	Supply Temperature, deg C (Normal)	Ambient
	Quality	Free of dust, water drops, and oil
6.0	Utility Nitrogen	

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	Pressure, kg/cm ² G (Normal)	6.0 / 8.0
	Temperature	Ambient
	N ₂ + inert, Vol %, min	99.99 %
	O ₂ , Vol ppm	< 100
7.0	Instrument Air	
	Supply Pressure, kg/cm ² g	7.0
	Supply Temperature, °C	Ambient
	Dew point	(-) 45 °C
	Quality	Free of dust, water drops & oil
8.0	Service Air	
	Supply Pressure, kg/cm ² g (Normal)	7.0
	Supply Temperature, deg C (Normal)	Ambient
	Quality	Free of dust, water drops, and oil


8.0 SCOPE OF WORK

8.1 GENERAL:


Scope of the proposal shall include Design, Engineering, Fabrication, Packing, Forwarding, Supply (including mandatory spares), Transportation and handling, Custom duty (and any other duties), Freight, Insurance, Unloading, O&M support services and supervision of Erection, Commissioning, Testing, Performance Guarantees Test Run (PGTR). The bidder has to provide Training to Avaada's engineers in line with the specifications provided in this document.

Any items or works though not specifically mentioned in this specification but needed to complete the equipment & systems to meet the intent of the specification shall also be in the scope of work. Broad scope of supply and services are following:

- a. Basic Design Package of the plant using applicable Codes and Standards including preparation of plant definition manuals.
- b. Providing engineering, equipment sizing & performance data, instruction manuals, as built drawing for approval of Avaada and other information. This also include:
 - i. General Layout
 - ii. General arrangement plan
 - iii. Process flow drawing (PFDs) with mass and energy balance
 - iv. Piping & Instrumentation Diagrams (P&IDs)

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- v. Thermal load data
 - vi. Water balance
 - vii. Electrical Schematics/SLD, design Calculation, Datasheets, power & Control wiring diagram
 - viii. Cable sizing and Schedules etc.
 - ix. Pipeline & instrumentation diagram (PD)
 - x. Equipment Sizing and data sheet
 - xi. 3D Modeling at various stages
 - xii. Factory acceptance test (FAT)
 - xiii. One set of installation, operation & Maintenance Manual of system with detailed description.
- c. Bidder shall submit all engineering drawing and documents including (i) Operation & Control Philosophy, (ii) Drawings and Documents pertaining to Design and Engineering, (iii) Datasheets, (iv) Manufacturing & Field Quality Plan and its compliance, Calibration & Test certificates).
- d. Submission of list of Bill of quantity (BOQ), Mandatory Spares, Startup & Commissioning spares & consumables.
- e. Supply of items listed in BOQ as per the indicated specifications including Mandatory Spares, Startup & Commissioning spares & consumables.
- g. Packing, loading, transportation and unloading of material including all clearances.
- h. Receipt, storage, and preservation of equipment at the site.
- i. Supervision of Mechanical, electrical and C&I, erection including conducting all field tests.
- j. Conduct of all shop and field tests.
- k. Compliance with all statutory requirements.
- l. Performance Guarantee tests of 96 hrs. after completion of initial continuous trial operation of 7 days duration including supply and calibration of PG/PT or other Test instruments etc.
- m. In situ Training (Minimum Six (6) days) for 10 people encompassing design, O&M, troubleshooting etc., for Hydrogen Generation Plant.
- n. For all bought out items, individual guarantee/ warranty of equipment may be passed on to Avaada.
- o. Major equipment shall broadly conform to the relevant International/National standard of design, engineering & workmanship and shall be capable of performing the required duties in a manner acceptable Bidder. The Quality plan of major equipment shall be finalized during detailed engineering.

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p. Plant should be design & built to meet all safety/environment/regulatory requirement required by SWM 2013 rules, factory Act, PESO, Electricity Act, CPCB/ MPCB, and/or all other applicable & relevant guidelines by authorities.


q. The Bidder shall provide a list of all codes and standards that the Bidder shall use in their designs; this shall be submitted to Avaada for approval.

r. Prepare field equipment installation manual and share the same with OWNER.


8.2. Bidder's Scope of Work / Supply for Electrolyzer Stack and Balance of Plant

Bidder's scope of work/supply for the electrolyzer stack are, but not limited to the following:

1. Preparation of Basic Engineering Design Package (BEDP) for entire Green H₂ plant of capacity Kg/hr. (as quoted by bidder) i.e., electrolyzer stack and its Balance of Plant (BOP) like rectifier, feed purification/ polishing section, gas purification section, gas compression section (if required) etc.
2. The bidder shall carry out detailed engineering of electrolyzer stack and its associated components including its electrical & instrumentation, civil, structural works etc.
3. The bidder shall prepare Process Flow Diagrams (PFDs), Piping & Instrumentation Diagrams (P&ID), plot plan, process & mechanical design datasheets of all the major equipment of BOP as required.
4. The electrolyzer stack and its connected accessories may be containerized/ non-containerized including ventilation, lighting, H₂ leak detection system etc. as required.
5. The electrolyzer system may employ multiple rectifier and cell module (stack) design for added reliability and redundancy. The electrolyzer stack/modules shall be designed such that one or more modules can be removed online for maintenance, without affecting the plant operation.
6. The bidder shall design and supply adequate numbers of rectifiers to cater to the load of each Electrolyzer. The rectifier equipment shall be complete in all respects with its transformer, Rectifier, electronic control and annunciation, filter choke, etc. mounted in the suitable panel. Relevant IS/IEC standards shall be applicable for Rectifier Assembly.
7. Bidder has the sole responsibility for fabrication, assembly and supply of the electrolyzer stack and its associated component, to Avaada's site
8. Bidder shall supply the mandatory and commissioning spares, consumables as required for electrolyzer stack. Bidder shall provide the list of the same. The final spare list shall be finalized before inviting priced commercial offer.

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9. The bidder shall supply a PLC based control system having provision for display and monitoring the efficiency, power consumption, quantity and quality of hydrogen generated.
10. All measuring instruments, controller, PLC, and control valves required for automated remote and safe operation of the electrolyzer stack shall be provided.
11. The bidder shall provide Operation and Maintenance manual for the supplied electrolyzer stack including guidelines for normal operation and troubleshooting etc.
12. Bidder shall provide detailed procedures for online removal and its maintenance of defective module/s or stack/s.
13. All necessary software and licenses to be provided for the proper functioning and troubleshooting of logic / graphic / hardware.
14. The bidder shall mobilize all tools and tackle skill & unskilled manpower, for all erection job related to civil, electrical, mechanical, instrumentation etc. to the site for timely completion of the project.
15. Supply of items listed in BOQ as per the indicated specifications including Mandatory Spares, Startup & Commissioning spares & consumable. Submission of list of Bill of quantity (BOQ), Mandatory Spares, Startup & Commissioning spares & consumables.
16. Packaging, loading, transportation, unloading and storage at site of all the material under scope of supply, is under bidder's scope including all the clearances from regulatory authorities, as applicable.
17. A suitable Hydrogen Dryer shall be provided to remove moisture for Hydrogen and achieve the required purity. The operation of the Drying System shall be automatic and should be appropriately interfaced PLC maintenance work.
18. Appropriate Safety devices/ Hydrogen leak detection system is to be provided for safe release of Hydrogen, in case of upset.
19. All measuring instruments, controller, PLC and control valves required for automated remote and safe operation of the entire Green Hydrogen plant, shall be provided.
20. Plants should be designed & built to meet all safety/environment/regulatory requirements required by factory Act, PESO, Electricity Act, CPCB/ UPCB, and/or all other applicable & relevant guidelines by authorities.
21. The Hydrogen Generation System/ process should comply with all relevant National and International standards for safe and reliable operation of Hydrogen Generation system. Equivalent standards to ISO 22734 will be accepted.

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22. All necessary software and licenses to be provided for the proper functioning and troubleshooting of logic / graphic/hardware
23. The bidder must provide the O & M price on annual basis for the next 10 years with break up; man, material etc.
24. The bidder shall be responsible for arranging all the material, equipment and services for timely completion and smooth commissioning of the project.

8.3 TRAINING OF AVAADA's PERSONNEL

In order that Avaada's personnel become adequately familiar with the Process and are able to operate and maintain PLANT efficiently, Bidder shall arrange to impart training to Avaada's Engineers / operators including for all package units and critical equipment and machineries.

8.4 DELIVERABLES AFTER EFFECTIVE DATE OF CONTRACT:

The Bidder shall furnish a complete list of drawings / documents to be submitted after an EFFECTIVE DATE OF CONTRACT indicating different categories e.g. For AVAADA's approval, for reference / information etc. The documents to be approved by AVAADA shall be mutually agreed between AVAADA and the Bidder.


The bidder shall prepare and submit a detailed 60-day front-end schedule within one week of award of LOI. This schedule shall be the basis of monitoring of front-end activities. Activities of the Front-End Schedule should be a part of the Detailed Project Schedule. This schedule shall cover all activities to be started / carried out during the initial 60-day period of the CONTRACT. The schedule shall be reviewed in the Kick-Off Meeting (KOM). KOM to be held within 15 days of issuing of LOI at AVAADA.

Bidder's scope shall include the following, but not limited to it, for overall completion of the order.

9.0 COMMISSIONING / GUARANTEE TEST RUN

9.1. COMMISSIONING

1.1 After completion of all installation and necessary check, pre-commissioning & COMMISSIONING of the plant shall be done as per the guidelines and under supervision of the bidder's representative & experts.

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1.2 The COMMISSIONING will be done in the presence of Avaada' personnel. All the instruments/equipment will be tested for their functionality as per the specifications.

1.3 Bidder shall demonstrate the operating limits in terms of Capacity, Power consumption Product pressure, and product H₂ purity. The primary objective is to verify the start-up, shutdown, emergency, safety, and normal operation of the plant.

9.2. SERVICE LIFE GUARANTEE OF ELECTROLYSER MODULE/STACK:

Bidder shall ensure that guarantee life cycle of Electrolyzer stack is not less than **80,000** hours for Alkaline and PEM Electrolyzers and not less than 40,000 hours for SOEC and AEM Electrolyzers. Please refer Annexure -3 Guarantees and Liabilities for further information

9.3. GUARANTEE TEST RUN (PGTR):


- Guarantee Test Run (GTR) shall be carried out within one month of COMMISSIONING of the PLANT to ascertain the meeting of the guaranteed parameters mentioned in Annexure -3.
- Sustained Load Test (SLT) for 20 days at plant capacity > 95% during the period and meeting all guarantees.
- GTR duration shall be **120** continuous hours.
- The Bidder shall provide the GTR test procedure for approval of AVAADA. GTR test shall be carried out as per the approved GTR test procedure.
- The Bidder shall be responsible for providing all material, equipment, and manpower, specified or otherwise, which are required to carry out GTR.
- In case it is found that the equipment/ system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and/ or replacements and/ or be penalized as mentioned in Annexure -3 Guarantees and Liabilities.

The water Electrolyzer system shall be delivered as mentioned in annexure -1.

10. BILL OF QUANTITY

Bill of Quantity (BOQ) shall be provided by CONTRATOR as per the following for purpose of Bid Evaluation Criteria as mentioned in CHAPTER – 8 SCOPE OF WORK.

Sr. No.	Item Description	UOM	Price (\$)
1	1) Supply of Electrolyser modules/stack		

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2	Supply of Balance of Plant (BOP) equipment (transformer-rectifier, gas liquid separation, deoxy reactor, dryers etc.) along with its Mandatory Spares, special tools & tackles etc., installation at site.		
3	ALL SERVICES INCLUDING SUPERVISION OF ERECTION, INSTALLATION, COMMISSIONING, TESTING AND COMPLETION OF PLANT IN ALL RESPECTS: Design, Engineering, Erection (including all Mechanical, Electrical Works etc.) inspection, Stores Management, Pre-Commissioning, COMMISSIONING, GTR, etc., in line with scope of work of the RFP.		
4	1) O&M price for the next 10 years for material 2) O&M price for the next 10 years for human resource		

The prices are to be quoted inclusive of all taxes

11. GUIDELINE FOR OFFER SUBMISSION

11.1. SUBMISSION OF OFFER

Bidder shall submit their OFFER in **TWO SEPARATE PARTS**


PART – I shall contain Credentials of Bidder, Technical OFFER as under:

- PART-I A: CREDENTIALS OF Bidder
- PART-I B: TECHNICAL OFFER
- PART-I C: UNPRICED COMMERCIAL OFFER

The bidder is required to submit a soft copy of Part- I over email.

PART- II PRICED COMMERCIAL OFFER as per BOQ in Chapter 10.

1. The Bidder shall quote in the prescribed forms both in figures & words, the rates and amounts tendered by him for each item under the Commercial Portion in PART- II.

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2. OFFER shall be prepared in English language and all documents including drawings forming part of OFFER as well as any further information supplied by Bidder shall also be in English language.
3. The minimum Validity of the OFFER shall be Six months from last date of submission which shall be extended, if required, based on OWNER's request.
4. OFFER shall be treated as confidential. Analysis of OFFER may require discussions / negotiations with Bidder, who shall furnish details / clarifications on all points raised, arising out of each discussions / negotiations. No cost will be paid for submitting the OFFER.
5. The Successful Bidder shall with respect to his part, bear all costs, charges, and expenses of an incidental to signing of CONTRACT between the Bidder and Avaada.

11.2. NO ESCALATION

The prices quoted by Bidder shall remain firm and fixed and shall be valid until completion of the CONTRACT and shall not be subject to variation/ escalation on any account except as otherwise specifically provided in the CONTRACT documents.


11.3. REJECTION OF OFFER

OWNER reserves the right for the final selection or rejection of any OFFER without giving any reason thereof. Such rejection of any OFFER shall not entitle the Bidder to any claim of incidental costs, charges, expenses, claims, etc. whatsoever. The OWNER also reserves the right to split up WORK at their sole discretion and Bidder shall be bound by such decision and shall have no right to withdraw or change the OFFER on such account. This condition will equally apply even if it is decided by the OWNER to withdraw the invitation to Bidder.

Avaada is not bound to accept lowest OFFER or any OFFER or to assign any reasons for non-acceptance.

2. PART-I A: Credentials

- The location of Bidder's Head Office and Branch Office from where WORK will be undertaken for this Project, is to be mentioned.
- Bidder shall produce sufficient evidence with OFFER to show that they have well experienced, trained & qualified discipline and service wise manpower with required details to execute the work.


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- Approx. number of personnel working in Bidder's organization category wise, relevant experience of key personnel and back up staff who would be assigned to this project and organization chart of project group along with bio-data of the constituent members of the group.
- Indication of the current workload and possible future load for the period envisaged for this project, to ensure timely availability of right manpower of this project.
- List of plants, which can be visited by Avaada's personnel to obtain, feedback information, on operation and maintenance aspects.

3. PART-I B: Technical offer

OFFER shall include but not limited to the following:


- Confirmation of the scope of work as mentioned in chapter 8.
- The outstanding features of the electrolyzer technology offered along with advantages & disadvantages with respect to other technologies.
- Improvement and development in the process technology achieved in the recent past with special reference to reduction in capital cost, operating cost, product quality, energy efficiency, safety in operation.
- Basic process flow diagram, Preliminary material balance and process description indicating the operating pressure and temperature conditions and the functions of all the equipment used in the process.
- Anticipated normal and peak requirements of raw materials & utilities.
- Specifications of chemicals and consumables and their estimated consumption.
- Turndown ratio for PLANT.
- Specifications of the products, by-products, raw materials and utilities.
- Preliminary process specifications for equipment and machinery indicating dimensions / capacity, power, MOC, design and operating conditions, etc.
- Specifications and quantity of gaseous and liquid effluents of the PLANT. Details of the primary effluent treatment facilities included in the BATTERY LIMIT shall be stated.
- Specific consumption of feed, fuel, utilities, chemicals and other consumables and their guaranteed consumption figures. Estimated consumption for lower load as per turndown ratio is also to be provided. Utility streams from Battery limit should be indicated along with quantity and specifications. Peak and start-up requirements may be indicated to facilitate planning of utility system.

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- Basic equipment layout indicating total space requirement.
- Sample details showing inter-locking and trip system.
- List of measurement parameters indicating type of online measuring instruments along with desired overall accuracy required for establishing guaranteed figures of consumption norms, quantity, quality etc.
- Shop and field-testing as well as inspection procedures.
- Emergency power requirement and list of equipment with power rating for each connected to DG set, if applicable.
- Start-up facilities envisaged.
- Single line electrical distribution diagram.
- General Engineering Specifications and Standard Technical particulars / Specifications for all Electrical Items, Technical details of all electrical equipment. Approx. number of motors with range of KW rating giving approx. HT / LT break-up.
- Transformer and switchgear sizing and ratings.
- Time schedule: Bidder shall present OFFER with a Bar Chart schedule for completion of the various phases of WORK (i.e. Basic Engineering, Detail Engineering, Inspection, Supply lead time, Erection and its Supervision, Pre-commissioning & COMMISSIONING, GTR, etc.) and the number of months required to reach the date of completion for each phase of the work.
- Deviations: Bidder shall clearly state in a separate section, explicitly devoted to the purpose, any and all exceptions to the specifications (including any annexures) of this document. Unless exceptions are specifically listed, the specifications of this document shall apply. Also, if this documents specifications do not include any aspect of the WORK required to be done for completion of the project for proper operation & maintenance of PLANT, the Bidder shall include such WORK in the OFFER & provide the same.
- The bidder must provide the information required in annexure-4 along with the technical offer


4. PART - II: COMMERCIAL OFFER

This will also be super-scribed and sealed as PART-II - **COMMERCIAL OFFER** in the format provided in Chapter-10 BOQ. The Commercial offer is to be submitted within 7 working days from the date of submission of the technical offer.

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Annexure-1 Delivery Schedule for Electrolyzers


Sl.no.	Project Name	Delivery Schedule
1.	600 MW for the production of Green Ammonia in Odisha	18 Months from LOI
2.	600 MW for the production of Green Methanol in Maharashtra	24 Months from LOI
3.	700 MW for the production of Green Ammonia in Maharashtra	24 Months from LOI
4.	350 MW for the production of Green Methanol at a location which will be announced on a later date	24 Months from LOI

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Annexure-2 Details for LCOH calculation

Bidder shall submit following information required for calculation of LCOH for period of 10 years as per the table given below:


Sr. No.	Parameter	UOM	Value 1st year To 10th year	% YoY Increase / Decrease
i	DM water consumption as feed to unit for H ₂ production @ bid capacity Kg/hr.	m ³ /hr	1.	
			2.	
			3.	
			4.	
			5.	
			6.	
			7.	
			8.	
			9.	
			10.	
ii	Electricity Power consumption by the electrolyser stack/s, for bid capacity Kg/hr of H ₂ production.	kWh	1.	
			2.	
			3.	
			4.	
			5.	
			6.	
			7.	
			8.	
			9.	
			10.	
iii	Electricity Power consumption Balance of Plant (BOP), for bid capacity Kg/hr of H ₂ production.	kWh	1.	
			2.	
			3.	
			4.	
			5.	

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			<div>6.</div> <div>7.</div> <div>8.</div> <div>9.</div> <div>10.</div>	
iv	Cooling water flow requirement	m ³ /hr	<div>1.</div> <div>2.</div> <div>3.</div> <div>4.</div> <div>5.</div> <div>6.</div> <div>7.</div> <div>8.</div> <div>9.</div> <div>10.</div>	
v	N ₂ consumption at B/L	Nm ³ /hr	<div>1.</div> <div>2.</div> <div>3.</div> <div>4.</div> <div>5.</div> <div>6.</div> <div>7.</div> <div>8.</div> <div>9.</div> <div>10.</div>	
vi	KOH/NaOH or other chemical/s, if required	kg/yr	<div>1.</div> <div>2.</div> <div>3.</div> <div>4.</div> <div>5.</div> <div>6.</div>	

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			<p align="center">7.</p>	
vii	Other utilities, if applicable.	kg/hr	<p align="center">8.</p>	
			<p align="center">9.</p>	
			<p align="center">10.</p>	
			<p align="center">1.</p>	
			<p align="center">2.</p>	
			<p align="center">3.</p>	
			<p align="center">4.</p>	
			<p align="center">5.</p>	
			<p align="center">6.</p>	
			<p align="center">7.</p>	
Viii	Degradation in electrolyzer stack performance	% per year	<p align="center">8.</p>	
			<p align="center">9.</p>	
			<p align="center">10.</p>	
			<p align="center">1.</p>	
			<p align="center">2.</p>	
			<p align="center">3.</p>	
			<p align="center">4.</p>	
			<p align="center">5.</p>	
			<p align="center">6.</p>	
			<p align="center">7.</p>	

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Annexure-3 Guarantee and Liabilities


The bidder must guarantee the following parameters at the battery limit

1)PRODUCT (H₂) & BY PRODUCT (O₂) SPECIFICATION FOR GREEN AMMONIA PRODUCTION IN ODISHA

1.0	Hydrogen Generation Facility	
	Electrolyzer Capacity (MW)	700
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Hydrogen Purity	99.9999% by Vol.
	O ₂ , Vol ppm	< 1 PPMv
	Water Vapor	< 1 PPMv
	Dew Point at Supply Pressure	Max (–) 70 ° C
	Lye	NIL
2.0	Oxygen Generation Facility	
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Oxygen Purity	98.5 % by Vol.

2) PRODUCT (H₂) & BY PRODUCT (O₂) SPECIFICATION FOR GREEN AMMONIA PRODUCTION IN MAHARASHTRA

1.0	Hydrogen Generation Facility	
	Electrolyzer Capacity (MW)	700
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Hydrogen Purity	99.9999 % by Vol.
	O ₂ , Vol ppm	< 1 PPMv
	Water Vapor	< 1 PPMv
	Dew Point at Supply Pressure	Max (–) 70 ° C
	Lye	NIL
2.0	Oxygen Generation Facility	

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	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Oxygen Purity	98.5 % by Vol.

3) PRODUCT (H₂) & BY PRODUCT (O₂) SPECIFICATION FOR GREEN METHANOL PRODUCTION IN MAHARASHTRA

1.0	Hydrogen Generation Facility	
	Electrolyzer Capacity (MW)	700
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Hydrogen Purity	99.9999 % by Vol.
	O ₂ , Vol ppm	< 1 PPMv
	Water Vapor	< 1 PPMv
	Dew Point at Supply Pressure	Max (–) 70 ° C
	Lye	NIL
2.0	Oxygen Generation Facility	
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Oxygen Purity	98.5 % by Vol.

4) PRODUCT (H₂) & BY PRODUCT (O₂) SPECIFICATION FOR GREEN METHANOL PRODUCTION AT LOCATION TO BE ANNOUNCED LATER


1.0	Hydrogen Generation Facility	
	Electrolyzer Capacity (MW)	350
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Hydrogen Purity	99.9999 % by Vol.
	O ₂ , Vol ppm	< 1 PPMv
	Water Vapor	< 1 PPMv
	Dew Point at Supply Pressure	Max (–) 70 ° C
	Lye	NIL

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2.0	Oxygen Generation Facility	
	Delivery Pressure at B/L kg/cm ² g	Vendor to specify
	Temperature, °C	40
	Oxygen Purity	98.5 % by Vol.


The liabilities in case of not meeting the process guarantees are as follows:

S. No.	Process Guarantees	Guaranteed parameter	Amount liquidated in case of deviation in guaranteed parameter as % of total contract value
A	Minimum Process Performance Guarantees (Note-1 & 2)		
1.	Plant capacity (TPD) in terms of production of Green H ₂ product, Min.	As per bidder quote	5%
2.	Green H ₂ Product Purity, Min.	99.9999%	5%
3.	Total Oxygen content in Green H ₂ Product, Max.	1 ppmv	2%
4.	Total water vapor in Green Hydrogen Product, Max.	1 ppmv	2%
5.	Total Continuous DC Power Consumption (KWh/KG-H ₂) for Electrolyzer at the Beginning of Life, maximum and at 100% throughput (55kWH Max.)	As per bidder quote	5%
6.	H ₂ Delivery Pressure at Unit Battery Limit, Min.	24 barg – Green ammonia 28 barg – Green Methanol	2%


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S. No.	Process Guarantees	Begin Liquidation at	Fully Liquidated at	Amount liquidated as % of total contract value excluding Operations part (Applicable on prorate basis)
B	Process Performance Guarantees (Note-1 & 2)			
1.	Unit Turndown capacity, Max.	>100 % guarantee	120 % guarantee	2%
2.	Total Continuous AC Power Consumption (KWh/KG-H ₂) for Balance of Plant (Note – 3)	>100 % guarantee	110 % guarantee	2%
3.	DM Water consumption (m3/hr) per metric ton of Green Hydrogen product, Max.	>100 % guarantee	110 % guarantee	2%
4.	Total Continuous Cooling water consumption (m3/ hr), Max.	>100 % guarantee	110 % guarantee	2%


S. No.	Guarantee parameter	Liability
1	Life of Electrolyzer Stack	In case of any defect in Electrolyzer Stack or failure in its performance within the guaranteed life offered by bidder starting from time of commissioning, whichever is earlier, Bidder shall repair or replace the Electrolyzer at designated site free of cost to the Owner (including to and fro cost of transportation to site, etc.).

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		<p>In case bidder is not able to repair or replace the Electrolyzer within a period of 6 months from the identification of such defect, following penalty shall be applicable on bidder,</p> <p>a) If Electrolyzer stack fails to perform within 8000 hrs of operation, BIDDER shall reimburse 100 % of the cost incurred for purchase of new Electrolyzer stack (including cost of transportation to site, etc.)</p> <p>b) If Electrolyzer stack fails to perform any time from 8000 hrs of operation to the guaranteed life, the penalty to be given by the BIDDER shall be calculated as the percentage of total cost incurred by Owner for purchase of stack, arrived at by the following formula as per the applicable clause indicated above.</p> <p>Percentage =</p> $(((\text{Guarantee life in hours}) - (\text{Actual achieved life in hours})) / (\text{Guaranteed life in hours})) * 100$ <p>I. List of Parameters for Electrolyzer stack performance</p> <ol style="list-style-type: none"> 1) Guaranteed - Plant capacity (TPD) in terms of production of Green H₂ product, Min. (average for one-month period) 2) Guaranteed – Green H₂ Product Purity, Min. 3) Guaranteed – Green H₂ Product Delivery Pressure at Unit Battery Limit, Min 4) Guaranteed – Total Oxygen content in Green H₂ Product, Max. 5) Guaranteed – Total Moisture content in Green H₂ Product, Max. 6) Guaranteed DC Power Consumption (KWh/Kg-H₂) for specific period estimated based on consumption at the beginning of life and guaranteed incremental power consumption per year at 100% throughput.
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2	<p>Life of Catalyst/adsorbent with guaranteed life more than one year</p>	<p>a) If catalyst fails to perform and because of which any of the minimum process performance guarantees are not met within 12 months of introduction of feed stock, BIDDER shall reimburse 100 % of the cost incurred for purchase of Catalyst to Owner (including cost of transportation to site, etc.)</p> <p>b) If catalyst fails any time from 13th month to the guaranteed life, the penalty to be given by the BIDDER shall be calculated as the percentage of total cost incurred by Owner for purchase of catalyst, arrived at by the following formula as per the applicable clause indicated above.</p> <p>Percentage = $\frac{[(\text{Guarantee life in months}) - (\text{Actual achieved life in months})]}{(\text{Guaranteed life in months})} \times 100$</p> <p>c) The BIDDER 's liability to replace the catalyst/adsorbent shall apply to each replacement charge, which shall, unless otherwise agreed, carry a guaranteed life, which is not less than the residual guaranteed life of the original charge.</p> <p>d) The cost incurred by the Owner for procurement of catalyst shall be as specified in commercial terms and conditions.</p> <p>e) Owner at its option can decide to choose replacement of catalyst or reimbursement of catalyst cost.</p>
3	<p>For catalysts/adsorbents with guaranteed life less than or equal to one year</p>	<p>BIDDER shall be liable for the full replacement of the catalyst/ adsorbent at designated site free of any cost to the Owner.</p>


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Annexure-4 Information on Various Parameters of Electrolyzer System


	Criteria: Technology type, Manufacturing and R&D capability	
1.	Type of Electrolyzer Technology for the bid (Alkaline/PEM/AEM/SOEC, Etc.)	
2.	Annual Manufacturing capacity	
3.	Location of Manufacturing Facilities with annual capacity	
4.	Location of R&D facility	
5.	Location of Corporate Office	
6.	List of installations with date of commissioning	
7.	Is Electrolyzer design and manufacturing the core business of the company?	
8.	Human resources involved in Manufacturing of electrolyzers	
9.	Human resources involved in the R&D of electrolyzers	
10.	1. No. of Patents on the electrolyzer technology (please attach component-wise List with name of owner and validity)	
	2. Number of copyrights	
11.	Do you provide the Balance of the plant?	
12.	Whether the manufacturer has in-house capability for all other sub-systems	
	1. Power supply system	
	2. Water management system	
	3. Hydrogen purification system	
	4. Oxygen purification system	
	5. Cooling system	
	6. compression unit	
	7. Hydrogen storage unit	
	8. Leakage detection	
	9. Control system	
	10. Any other	
13.	Any innovation in cell materials or stacking method?	

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14.	Whether any agreement/technology tie-up with a third party is required for any item/material used in the Manufacturing of the electrolyzer system; if yes, please specify.	
15.	Does your company have EPC capability?	
16.	Any simulation software used for the development of the electrolyzer and associated system?	
Criteria: Quality of gases produced		
1.	Production rate of hydrogen (kg/h)	
2.	Production rate of oxygen (kg/h)	
3.	Output temperature (°C) and Pressure of H ₂ (in Barg)	
4.	Output temperature (°C) and Pressure of O ₂ (in Barg)	
5.	Hydrogen purity in % (with and without dryer) Please mention the type of purification system (PSA, TSA, or VSA) and the amount of waste gas produced per hour.	
	H ₂ vol% min	
	O ₂ , ppmv max	
	H ₂ O ppmv max	
	KOH ppmv	
	Other impurities	
6.	Oxygen quantity and quality (with and without dryer) O ₂ produced, kg/hr O ₂ pressure, kg/cm ² g O ₂ vol% min H ₂ , vol% max H ₂ O, ppmv max KOH, ppmv Other impurities	
Criteria: Consumables and operating conditions		
1.	Specific energy consumption of stack (BOL and EOL in kWh/Nm ³ of H ₂ or kWh/kg of H ₂)	

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2.	What is the degradation rate of the electrolyzer stack? (%/year) or (%/1000 hours)	
3.	<p>Specific energy consumption of equipment in Balance of Plant with degradation rate (BOL and EOL in kWh/Nm³ of H₂ or kWh/kg of H₂) concerning the largest available stack/system.</p> <p>Lye/DM water recirculation pump</p> <p>Cooling water pump</p> <p>Chiller</p> <p>Deoxo unit</p> <p>Adsorption dryers</p> <p>Other</p>	
4.	List of spares needed and duration for replacement. (typical annual cost)	
5.	Annual O&M cost	
6.	Water required per kg of H ₂ generated	
7.	Cooling water required (m ³ /h)	
8.	Chiller water required (m ³ /h)	
9.	Control range (% of nominal power) and turndown ratio	
10.	Time taken for Standby start to nominal power in sec.	
11.	Designed life of stack in hours/years	
12.	Designed life of Electrolyzer System in years	
13.	Can the stack be refurbished, or does it need to be replaced?	
14.	After how many operating hours does it need refurbishment or replacement?	
15.	What is the cost of refurbishment or replacement?	
16.	What is the lead time for refurbishment or replacement?	
17.	Are the Control system panels and software self-developed / compatible with Indian Standards?	
18.	Any optimization is done w.r.t BOP items; please share references.	
19.	What is the ramp-up and ramp-down rate of the electrolyzer? (Separately for each electrolyzer type)	
20.	Quality of water needed by the Electrolyzers?	

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	pH	
	Conductivity at 20° C μ s/cm	
	TDS mg/l	
	Total hardness mg/L as CaCO ₃	
	Silica (Total) mg/L as SiO ₂	
21.	What are the cooling Water requirements in the Hydrogen Generation Plant? (Separately for Power system, Hydrogen cooling, Oxygen cooling, stack cooling)	
	What is the flow rate required for the largest stack? And heat load in ____ watts/lpm or percentage of power consumed	
22.	Are there any emissions/wastes that need to be addressed?	
23.	Plant availability (%/ year)	
24.	What are the various areas where the Leak Detection System is installed?	
25.	Purge gas requirement?	
Criteria: Costs, sizing, and compliance with standards		
1.	Typical Levelized cost of hydrogen for electricity cost of ₹6/kWh and round-the-clock power	
2.	What is the footprint and weight of the system?	
3.	Certification and compliance of Electrolyzer plant	
4.	Compliance with IS, ISO and IEC codes and standards	
5.	Density of hydrogen considered for kg to Nm ³ conversions	
6.	Details for stack to be supplied	
	1. No of cells	
	2. Stack active area	
	3. Footprint area (m ²)	
	4. Operating Range (% of nominal power)	
	5. Operating Temperature (°C)	
	6. Operating Pressure (Bar)	
	7. Current/stack (A)	
	8. Individual cell voltage (V)	
	9. Total stack voltage (V)	

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	10. Nominal current density (A/cm2)	
	11. Broad List of raw materials for stack manufacturing	
	12. Faradaic efficiency (%)	
	13. Voltage Efficiency	
	14. CAPEX (\$/kW)	
	15. OPEX	
	16. Start-up time (hot start)	
	17. Start-up time (cold start)	
	18. Ramp up time	
	19. Ramp down time	
	20. . Electrolyte concentration	
	21. Stack weight (dry)	
	22. Stack weight (wet)	
7.	Typical Lead time	
8.	Commissioning time	
9.	Warranty	
Criteria: supply chain		
	Typical Raw material used in the stack	(kg/kW)
1.		
2.		
3.		
4.		