

NTPC Limited

(A Government of India Enterprise)



Invites

Expression of Interest

(EoI)

From

An Indian/Global Company/their Consortium/Affiliates/Representatives

For Setting Up

Pilot Project for Production of part quantity of Hydrogen using electrolyser technology (other than alkaline, PEM and SOEC), required for demonstrating hydrogen co-firing in one of the existing gas plants of NTPC along with requisite storage, fuel cell for standalone microgrid and equipment for blending with cooking natural gas

DOCUMENTS OF EoI

This EOI document comprises of the following sections:

- (i) Section I : EoI Information
- (ii) Section II : Introduction
- (iii) Section III : Instructions to the Applicants
- (iv) Section IV : Consideration of Response
- (v) Section V : Application Form and Annexures

Section – I

Eol Information

(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

DETAILED NOTICE INVITING EXPRESSION OF INTEREST (Eoi)

Eoi No. NTPC/PEE/EOI-01/2022-23

Date: 30.06.2022

NTPC is Inviting Expression of Interest from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up a Pilot Project for Production of part quantity of Hydrogen using electrolyser technology (other than alkaline, PEM and SOEC), required for demonstrating hydrogen co-firing in one of existing gas plants of NTPC along with requisite storage, fuel cell for standalone microgrid and equipment for blending with cooking natural gas.

DOWNLOAD AND TIMELINES FOR SUBMISSION OF Eoi

- a. Interested APPLICANTs may download the documents of Eoi free of cost from www.ntpctender.com & <https://eprocurementpc.nic.in>

- b. **Last date for submission of Eoi** : **10.08.2022**

- c. **Last date for queries/ seeking clarifications** : **03.08.2022**

- d. **Date of opening of Eoi response** : **11.08.2022**

- e. **Response Validity** : **6 months
from the last
date for EOI
Submission**

1.0 NTPC encourages submission of Eoi in soft copy. For consideration of Eoi, APPLICANTs are required to e-mail softcopy of Eoi, completed in all respect, through e-mail mentioned hereunder.

Email: SUNEETMEHTA@NTPC.CO.IN / DIPANKARHALDER@NTPC.CO.IN

2.0 NTPC shall not be liable for any postal/ Mail delivery issue delays what so ever in receipt of EOI documents and EOI received after the stipulated date and time shall not be entertained. EOIs submitted without supporting document will summarily rejected.

3.0 NTPC reserves the right to reject or accept any or all applications, cancel/withdraw the Eoi process without assigning any reason whatsoever and in such case, APPLICANT shall not have any claim arising out of such action. NTPC bears no responsibility or liability of any kind in reference to the Eoi.

Section - II

Introduction

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1.0 INTRODUCTION

- i. NTPC Limited (www.ntpc.co.in) is a leading power generation company of India. It has been ranked No#2 Independent Power Producer (IPP) worldwide as per Platts (2019). The Company is listed on the Indian stock exchange with a market capitalisation of INR 833.12 billion.
- ii. NTPC Limited produces around 361 Billion units of electricity annually through its cluster of gas, coal, hydro and RE based power stations of more than 69 GW capacity spanning across the country. Further, NTPC plans a target capacity of 130 GW by 2032.
- iii. NTPC Limited has total income INR 1200 billion (16 billion USD). NTPC group achieved a net profit of INR 161.11 billion (2.15 billion USD) in the financial year 2021-22 and has been consistently paying dividends to its shareholders for the last 28 years.
- iv. NTPC Limited, being the largest power generator in India, wants to play a key role in India's adoption of the hydrogen economy. Since hydrogen co-firing is a potential pathway for decarbonizing gas plants, utilizing the existing gas assets and providing the required flexible operation in renewable era, NTPC wants to explore the feasibility of hydrogen co-firing in existing NTPC gas turbines (Kawas/Auriya/Faridabad/Dadri/Kayamkulam/Gandhar/Anta).

2.0 INTENT OF THE EXPRESSION OF INTEREST (EoI)

- i. NTPC intends to source part quantity of hydrogen through in-house production using electrolyser technology (which is presently not implemented/not under pilot implementation by NTPC) for demonstrating the capability of hydrogen co-firing in one of the existing NTPC gas turbines and comparing different electrolyser technologies, along with all the required infrastructure for storage and compression (if applicable). Presently, alkaline, PEM and SOEC technologies are already implemented/ under pilot implementation by NTPC.
- ii. Further, it is also intended to utilize the hydrogen produced either through a standalone fuel cell micro-grid or by mixing the stored hydrogen with cooking natural gas for the same NTPC Gas plant premises after trial run of gas turbine/when the hydrogen is not being used for co-firing in gas turbine.
- iii. In view of above, NTPC intends to set up the following at one of the existing NTPC Gas Plants:
 - Hydrogen production infrastructure (Min: 10 Kg and Max.: 15 Kg per day) using electrolyser technology (other than alkaline, PEM and SOEC). The electrolyser shall be designed for 8 hours operating time.
 - Infrastructure for storage of hydrogen (30 Kg) at 150 Kg/cm².

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- Standalone Fuel-cell based Microgrid system (25 KW)
- Infrastructure for blending hydrogen (5-10%) with cooking natural gas

The indicative scheme for the above is attached as **Annexure-4**.

- iv. The initiative intends to source part quantity of hydrogen required for hydrogen co-firing in existing gas turbines for demonstrating the capability, analyzing the techno-commercial feasibility, validating performance and subsequently developing product/solutions which can be a pathway for decarbonizing gas turbines. The pilot project shall in developing experience in sourcing, storing, transporting and handling hydrogen infrastructure for co-firing in gas turbines. Further, adoption of different electrolyser technology (from the ones already implemented/under pilot implementations) helps in comparing the technical parameters such as output, hydrogen purity, pressure, efficiency, requirement of water quality and quantity, power consumption, cooling water requirement, footprint area etc. of different electrolyser technologies in the market. Further, it shall also help in evaluating different configurations of the blending equipment, life cycle cost, cost, area required etc.
- v. The interested applicants will specify the technical specification, guarantee parameters, the total estimated project cost and shall propose the financial contribution to be shared by themselves and by NTPC.
- vi. Based on the techno-commercial analysis of responses in the EOI, if it is found commercially feasible, qualified parties (as per technical qualifying requirement as specified at clause no. 3.0 of this section) with most suitable technologies as per the methodology for shortlisting of qualified applicants as specified at clause no. 2.0 of Section-IV, will be short listed for pilot project for hydrogen production infrastructure through electrolyser technology (other than alkaline, PEM and SOEC), requisite storage infrastructure, fuel-cell based microgrid and blending with cooking natural gas.
- vii. NTPC reserves the right to implement the project either on nomination basis or through Request for Proposal (RFP) process amongst the shortlisted parties identified through this Eol Process.
- viii. The intellectual property generated from the pilot project will be co-owned by NTPC and the applicant. The same may be monetized separately during the commercialization of the technologies.
- ix. Based on the responses in the Eol and further discussions with short listed/ interested parties, NTPC may go for pilot installation at any of the existing NTPC gas plants / may not proceed with any project at this stage.
- x. The response(s) received in the Eol will be utilized by NTPC for:
 - a. Identification for suitable technologies which fits the intended use cases

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AND/OR

- b. Formulation of specifications for various systems/stages required for execution of demonstration/commercial project(s)

AND/OR

- c. Shortlisting of parties for forthcoming Request for Proposals (RFP) / limited tenders by NTPC for undertaking demonstration/commercial project(s)

The Applicants may express their interest in respect of their offerings along with other inputs as indicated in relevant Annexures/formats

3.0 Technical Qualifying Criteria for EOI Applicant

- a. The applicant should own the proposed technology for hydrogen generation or should have valid license/ technology tie up with the technology owner/developer/IP Owner for a minimum validity period of three years from the date of award of project or till the completion of project whichever is later.
- b. The applicant or its technology owner/developer/IP Owner should have designed, engineered and installed the pilot/commercial project for hydrogen production plant using the proposed technology for hydrogen generation and the pilot/commercial plant should be in successful operation.
- c. Further, applicant will be rejected if hydrogen purity is offered less than 99.997%.

4.0 Broad Scope of Work

The key roles and responsibilities of the stakeholders under the project shall include but not limited to the following:

NTPC's Role:

- a. Land for installation and commissioning of the system within NTPC gas plant premises and provide necessary support during operation and maintenance (O&M) of the pilot project
- b. NTPC shall provide clarified water source at nearest available terminal points. However, connection from existing terminal point to hydrogen production plant shall be in the scope of vendor.
- c. NTPC shall provide power supply feeder from the nearest available switchgear. However complete electrical system from terminal point (power supply feeder at switchgear) onward shall be in the scope of vendor.
- d. Facilitate the applicant in applying for statutory clearances for the project
- e. Facilitate the installation and commissioning of the system
- f. Support in Data collection and analyzing the performance of the system during testing and subsequent operation

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Applicant's Role

- a. Design, engineering, manufacture, supply, erection, commissioning and testing of hydrogen plant based on selected technology (other than alkaline, PEM and SOEC), production and storage infrastructure, fuel cell based microgrid and blending system (for blending with cooking natural gas) which best fits the intended use cases, along with all associated electrical, civil/ structural, control and instrumentation and other accessories required for completion of the pilot project.
- b. Integration to existing electrical system and integration to the cooking natural gas pipeline
- c. Routine maintenance of the systems for a period of 3 years from the date of commissioning
- d. Data collection and analysing the performance of the system during testing and subsequent operation
- e. Getting required statutory clearances for installation and operation of the system
- f. Sharing the stack and system level information for comprehensive understanding of the system

Section - III

Instructions to the Applicants

(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

1.0 The Applicants should note that:

- a. Language of the responses to Eol or any query/clarifications/correspondences shall be in English only.
- b. For expression of interest, Application Form and Annexures given in Section-V shall be duly filled and sent to NTPC by the APPLICANT in soft copy.
- c. Applicants should go through Section-I and Section-II thoroughly before filling and submitting the application form and annexures in Section-V.
- d. Applicants shall mention the name and contact details of two persons, with complete address, phone number and email id.
- e. NTPC Ltd. may, at its sole discretion, ask for additional information/ documents and/ or seek clarifications from the Applicant(s) after the Deadline for submission of response, inter alia, for the purpose of removal of inconsistencies or infirmities in their responses.

2.0 Enquiries and clarifications

Any clarifications on the Eol may be sought to the following via e-mail:

To: SUNEETMEHTA@NTPC.CO.IN

CC to: DIPANKARHALDER@NTPC.CO.IN

3.0 Corrigendum

At any time before the last date of submission of Eols, NTPC may, for any reason, whether at its own initiative or in response to a clarification requested by an Applicant, modify the Eol document. The amendment will be posted on the website and will be binding on the Applicants and the Applicant will give due consideration to the same, while they submit their Eols, and would invariably enclose documents/ information, as required, on account of the amendment, as a part of the Eol. NTPC may, at its discretion, extend the deadline for the submission of Eols.

4.0 Preparation of the response to Eol

The application of Eol consists of the following:

- (a) Annexure 2, 3 & 4 of Section-V

5.0 Validity of the responses

The Applicant shall submit the responses which shall remain valid up to six (6) months after the response Deadline ("Response Validity"). NTPC reserve the right to reject any response, which does not meet the aforementioned validity requirement.

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NTPC may solicit the Applicant's consent for an extension of the period of validity of the response. The request and the response in this regard shall be in writing. In the event any Applicant refuses to extend its response validity as requested by NTPC, NTPC shall terminate processing of such Applicant's responses. An Applicant accepting NTPC request for validity extension shall not be permitted to modify its response.

6.0 Submission of the response to Eol

The responses to the Eol are to be submitted in soft copy via below e-mail format

To:

CC to:

**Ref. Eol No.
Dated**

Envelope: Original / Copy #

Due date of Opening: _____

Submitted to:

Name, designation & address of the concerned officer of NTPC

Submitted by:

Name, address & contact no. of the Applicant

All the pages of the response should be duly stamped and signed by the authorized signatory in whose favour the Power of Attorney is issued.

The responses to the Eol should be submitted within the Deadline at the address provided in the Section-I of this Eol.

7.0 Opening of responses to the Eol

The responses to the Eol shall be opened as per the time schedule 1500 HRS at date as mentioned in Section-I and will be communicated to the Applicants via e-mail.

In the event of any of above dates falling on a day which is not a working day or which is a public holiday, the responses shall be opened on the next working day at the same venue and time.

8.0 Costs and expenses towards response to Eol

The Applicants shall be responsible for all the costs associated with the preparation of the response and participation in discussions and finalization & execution of the documents related with this Eol, NTPC shall not be responsible in any way for such costs, regardless of the conduct or outcome of this short-listing/ selection process.

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9.0 Confidentiality

The Applicants undertake to hold in confidence this Eol and any document related or pursuant to this Eol and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

- (a) To their professional advisors;
- (b) To their officers, contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities;
- (c) Disclosures required under applicable Law, without the prior written consent of the other parties of the concerned agreements.

Provided that the Applicant(s) agrees and acknowledges that NTPC may at any time, disclose the terms and conditions of this Eol and any document related or pursuant to this Eol to any person, to the extent stipulated under the applicable Law.

10. Disclaimer

- (a) This Expression of Interest (Eol) has been prepared by NTPC Ltd. for response from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up Pilot Project for Production of part quantity of Hydrogen using electrolyser (other than alkaline, PEM and SOEC), for demonstrating hydrogen co-firing in one of existing gas turbines of NTPC along with requisite storage, fuel cell for standalone microgrid and equipment for blending with cooking natural gas.
- (b) In submitting an expressed Eol in response to the Eol, the Applicants certify that it understands, accepts and agrees to the disclaimers on this page. Nothing contained in any other provision of the Eol nor any statements made orally or in writing by any person or party shall have the effect of negating or superseding any of the disclaimers set forth herewith.

Section-IV

Consideration of Response

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1.0 Responsiveness check

The responses submitted by Applicants shall be scrutinized to establish interest in setting up hydrogen production infrastructure using electrolyser technology (other than alkaline, PEM and SOEC) for part quantity of the hydrogen required for co-firing in one of the existing NTPC Gas plant (Kawas/Auriya/Faridabad/Dadri/Kayamkulam/Gandhar/Anta), requisite storage along with a standalone fuel-cell based microgrid system and all equipment for blending with cooking natural gas using the above Hydrogen Infrastructure. Responses shall be deemed non-responsive for following reasons:

- a. Responses that are incomplete, i.e. not accompanied by any of the applicable formats inter alia covering letter, power of attorney, applicable undertakings, provided in more details at annexure in Section-V;
- b. Responses not signed by authorized signatory and / or stamped in the manner indicated in this EoI;
- c. Material inconsistencies in the information/ documents submitted by the Applicant
- d. An Applicant submitting more than one response to this EoI either itself or through an affiliate or subsidiary company;
- e. Response validity being less than that required as per Clause 5 of section-III of this EoI;
- f. Response being conditional in nature;
- g. Response not received by the response Deadline;
- h. Response having Conflict of Interest;
- i. Applicant delaying in submission of additional information or clarifications sought by NTPC, as applicable;

All bids that shall meet the responsive check requirements set out above in this section of the EoI document shall be considered as responsive. In case of non-submission of relevant details as above, the responses may be considered as “**Non-responsive**”, at the sole discretion of NTPC and will not be considered further.

2.0 METHODOLOGY FOR SHORTLISTING OF QUALIFIED APPLICANTS

The proposals of qualified applicants will be evaluated based on applicant's expertise/credentials in proposed hydrogen production, storage and blending technology, timelines, equipment cost, technology support, efficiency, reliability, maintenance challenges, life cycle cost, footprint, timeline for implementation, import content, power consumption (for hydrogen production and for auxiliaries), water quality requirement, water consumption etc.

Section-V

Application Form & Annexures

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Annexure-1

FORMAT FOR COVERING LETTER CUM UNDERTAKING

(The covering letter should be on the Letter Head of the Applicant)

Date : _____
Place : _____

To,
.....

Sub.: (INVITATION FOR EXPRESSION OF INTEREST)

Ref.: Eol No. _____, dated _____ (the "Eol")

Dear Sir,

We, the undersigned [insert name of the "Applicant"] having read, examined and understood in detail the **(INVITATION FOR EXPRESSION OF INTEREST)**. We confirm that neither we nor any of our Parent Company/ Affiliate/ Ultimate Parent Company has submitted response other than this response directly or indirectly in response to the aforesaid Eol.

1. We give our unconditional acceptance to the Eol, issued by NTPC, as amended. In token of our acceptance to the Eol, the same have been signed & stamped by us and enclosed to the response. We hereby confirm that the provisions of the Eol shall be binding on us.
2. We have submitted our response strictly as per provisions and formats of the Eol, without any deviations, conditions and without mentioning any assumptions or notes.
3. We hereby unconditionally and irrevocably agree and accept that the decision made by NTPC in respect of any matter regarding or arising out of the Eol shall be binding on us. We hereby expressly waive any and all claims in respect of Eol process. We confirm that there are no litigations or disputes against us, which materially affect our ability to participate or function under the obligations with regard to Eol.
4. Details of the contact person are furnished as below:
Name :
Designation:
Address:
Contact numbers:
email id:

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5. We are enclosing herewith the entire response containing duly signed formats in electronic format sent via email to: ***** as per the EoI for consideration.
6. It is confirmed that our response is consistent with all the requirements of submission as stated in the EoI and subsequent communications from NTPC, if any.
7. The information submitted in our response is complete, strictly as per the requirements stipulated in the EoI and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our response.
8. We confirm that all the terms and conditions of our response are valid for acceptance for a period of six (6) months from the response Deadline.
9. We confirm that we have not taken any deviation so as to be deemed “**Non-Responsive**” as stipulated in Section-IV of this EoI.
10. We understand that you are not bound to accept any response you receive.

We remain,

Yours sincerely

(Name, Designation and Signature of Authorized Person in whose name Power of Attorney is issued)

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Annexure-2

INFORMATION TO BE SUBMITTED BY APPLICANT

(Note: Documents in support of meeting the respective requirement shall be submitted by the Applicant.)

1.0 Applicant's Organization details

- i. Name of the Company/Lead Partner of Consortium:
- ii. Legal status of the Company/Consortium:
- iii. Brief description of the Company/Consortium including details of its business groups/subsidiaries/ affiliates:
- iv. Existing Manufacturing facilities – Locations, Capacity
- v. Date of Incorporation:
- vi. Date of Commencement of Business:
- vii. Full address including Telephone nos. / Fax nos.:
 - a. Registered Office:
 - b. Head Office:
 - c. Address for communication:
 - d. Contact Details:
 - e. Office Address in India, if any:
- viii. Collaborations/tie-ups with manufacturer (if applicable),

2.0 Technical information:

- i. Detailed write up of the proposed Electrolyzer technology for Hydrogen production including basic principle, major operating conditions/parameters, input requirements (power consumption, water quality & quantity etc), quality, purity and parameters of Hydrogen produced etc.
- ii. Basic scheme of proposed system
- iii. Merits and demerits of offered technology as compared with other Electrolyzer technologies available in the market
- iv. Reference list of Hydrogen plants presently running on proposed Electrolyzer technology
- v. Module Size, module efficiency and hydrogen generation per module.
- vi. Electrolyzer life in Hrs. of operation. (Based on 24 X 7 operation).
- vii. Turn down ratio.
- viii. Ramp up / Ramp down capabilities of Hydrogen plant.
- ix. Brief about the auxiliary system.
- x. Execution Period from award of job till Commissioning and Guarantee Test Run.
- xi. Quality and quantity of Oxygen produced (if applicable)
- xii. Quality of water required
- xiii. Pressure and temperature at which Hydrogen / Oxygen shall be produced (at electrolyser output).
- xiv. Power & water required per kg of Hydrogen production.
- xv. Cooling Water requirement
- xvi. Plot size required for the project.
- xvii. Utilities required for normal operation of the plant.
- xviii. Effluent generation, if any.
- xix. Guarantee / Warranty offered for the Electrolyzer / project
- xx. Compressor capacity and pressure

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- xxi. Storage hydrogen pressure
- xxii. Fuel cell technical data sheet
- xxiii. Pressure regulator details for blending with natural gas
- xxiv. Previous experience, in implementing proposed Electrolyzer based hydrogen production projects, fuel cell standalone microgrid and blending hydrogen with natural gas
- xxv. Engineering strength of Applicant/Lead partner of consortium/developer for execution of the project.
- xxvi. Any other technical detail which Applicant would like to highlight, about its technology for consideration of EOI.

Applicant is requested to provide the technical data as per format given in **Annexure-3**.

3.0 Budgetary Cost :

I. Estimated total capital investment for the pilot project with cost breakup of all major components preferably as listed below:

- i. Electrolyser and associated equipment
- ii. Hydrogen Purifier (if required)
- iii. Compressor and its accessories
- iv. Storage Infrastructure
- v. Blending equipment
- vi. Control System
- vii. Water Purifier (if required)
- viii. Fuel cell
- ix. All Equipment for blending with existing cooking natural gas
- x. Integrating with existing switchgear
- xi. Installation and Commissioning
- xii. Miscellaneous Items
- xiii. Package BOP (Transformer / Inverters/ control systems etc. as required for completion of the pilot project)
- xiv. Safety and protection systems for handling hydrogen
- xv. Applicant shall separately mention taxes, duties, freight, insurance applicable for above items/project.
- xvi. Applicant shall mention budgetary cost equipment supply for Indian item and imported item separately.

II. Estimated Operation & Maintenance cost for 3 years with spares and consumables.

4.0 Project Timeline:

Applicant shall mention project completion period from award of job till Commissioning and Guarantee Test Run with necessary details.

5.0 Financial Turnover:

Applicant is requested to submit Annual financial turnover during the last three (3) preceding financial year. Applicant to submit audited Balance Sheet and Profit & Loss account for the above three financial years.

6.0 Declaration:

Applicant is requested to provide declaration stating that their firm is neither put on Holiday or Black-listed by any Government / PSU / Private firm or Financial Institution. Applicant is requested to provide Self Declaration on Applicant's Letter Head.

7.0 Validity:

Applicant is requested to mention validity of the proposal submitted.

Sign & Company Seal)
Authorized signatory

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Annexure-3

Technical Specification Data

(To be submitted by the Applicant as per Clause no.2 of Annexure-2)

Sl.No.	Description	Applicant to fill
Data for Qualifying Requirement (Refer clause no.2.0 of Section-II)		
1.	Type of Electrolyser technology proposed by Applicant	
2.	Whether Technology is owned by Applicant	Yes/No
2.1	If no, Name of Technology owner/ developer/ IP Owner	
2.2	Registered office of Technology owner/ developer/ IP Owner	
2.3	Whether Applicant has technology tie up/ collaboration with Technology owner/ developer/ IP Owner	Yes/No (Attached copy of Technology tie up/ collaboration agreement)
2.4	Validity period of agreement	
3.0	Details of pilot/commercial Installations	
3.1	Name of project where Applicant/ Its Collaborator/ associate installed / is installing hydrogen production plant using proposed Electrolyser technology	
3.2	Name and address of owner of plant	
3.2	Scale of plant	(Commercial/ pilot plant)
3.3	Design capacity of Hydrogen production of plant (Kg/hr)	
3.3	Date of award to applicant	
3.4	Date of completion of plant	
3.5	If installation not yet completed, Present status and date of expected completion	
3.6	Scope of work of Applicant (Furnish copy of LOA)	
3.7	Hydrogen purity of reference plant	
3.8	Pressure of generated hydrogen (output of Electrolyser) . (Bar (G))	
Details of Electrolyzer		
1.	Type of Electrolyzer (Other than Alkaline, PEM and SOEC)	
2.	Name of Manufacturer	
3.	Country of Origin	
4.	Model No.	
5.	Module size (kW)	
6.	Hydrogen Generation per Module (kg/hr)	
7.	Nos. of Modules in Electrolyzer Stack (Nos.)	
8.	Hydrogen Purity (Minimum 99.997%)	
9.	Pressure of Hydrogen at delivery point (BAR(g))	

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10.	Temperature of Hydrogen at electrolyser output (deg. C)	
11.	Effluent Generation data with Quality : - Solid (if any) - Liquid (if any) - Gaseous (if any) In case of any effluent, include details of treatment required	
12.	Electrode material	
13.	Electrolyte type & make up quantity	
14.	Cell temperature	
15.	Efficiency	
16.	Start-up time (up to full load)	
17.	High ramp up/down capability	
18.	Ramp up capability	
19.	Minimum or Turndown load and turn down ratio	
20.	Electrolyzer Stack life in hours	
21.	Electrolyzer Stack replacement frequency (hrs)	
22.	Electrode coating requirement (if any) & coating frequency	
23.	Expected life of entire project as a whole (Years)	
24.	Annual maintenance requirement Maintenance Activities with frequency.	
25.	No. of shutdown days per year	
26.	Oxygen Production (kg/hr)	
27.	Other Byproduct, if any (kg/hr)	
Utility Requirement		
28.	Power Requirement	
28 a	Total Power Consumption of plant (MW)	
28 b	Electrolyzer Power (MW)	
28 c	Auxiliaries Power (KW)	
28 d	Power for compressor (KW)	
29.	Cooling Water	
29 a	Flow (m ³ /hr)	
29 b	Pressure (kg/cm ²)	
29 c	Inlet/Outlet Temperature (°C)	
30.	Water requirement for H2 Generation	
30 a	Quality of water required	DM Water/ Raw water (Tick)
30 b	Flow (m ³ /hr)	
30 c	Pressure (kg/cm ²)	
30 d	Inlet Temperature (°C)	
30 e	Water Quality required (indicate parameters required)	
31.	Nitrogen Requirement (if any):	
31 a	Nitrogen (Nm ³ /hr)-Normal	
31 b	Nitrogen (Nm ³ /hr)-Peak	
32.	Instrument Air (Nm ³ /hr)	
33.	Service Air (Nm ³ /hr)	

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34.	Others, if any. Please specify	
35.	Land Area Required (m ³)	
35 a	Land area require for hydrogen generation system	
35 b	Land area required for Hydrogen Storage and blending system	
Adsorbents/Chemicals/Catalyst		
36.	Adsorbents/Catalysts for First Charge (Name/Quantity/Life)	
37.	Chemicals for continuous consumption (Name/Quantity)	
Guarantee Conditions		
38.	Hydrogen Production in standard operating conditions (kg/hr)	
39.	Pressure of Hydrogen Produced (Bar _g)	
40.	Minimum Purity of Hydrogen (%) by Volume)	
41.	Maximum Moisture in Hydrogen (ppm)	
42.	Maximum Oxygen in Hydrogen (ppm)	
43.	Maximum alkali content in Hydrogen (ppm)	
44.	Any other impurities (Applicant to specify with limits)	
45.	Electricity Consumption for Hydrogen Generation (kwh/kg of H ₂)	
46.	DM Water / Raw water Consumption for Hydrogen Generation (Litre/kg of H ₂)	
47.	Electrolyzer Stack life in hrs.	
48.	Degradation factor for Hydrogen Generation as % of Rated Capacity/Year Note: If degradation is not constant for the given life of Electrolyzer then specify year wise degradation.	
49.	Guarantee/Warrantee :	
49 a.	For Electrolyzer Stack	
49 b.	For Balance of Plant.	
50	Storage details	
50 a	Type of compressor	
50 b	Compressor capacity (FAD) M3/hr	
50 c	Compressor discharge pressure (Bar(g))	
50 d	No. of stage of compressor	
50 e	Power consumption and motor rating of compressor	
50 f	Storage vessel/ cylinder capacity and design pressure	
50 g	Material and type of storage vessel/cylinder	

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50 h	Storage vessel/ cylinder operating pressure and design pressure	
51.	Fuel cell data sheet	
51 a	Storage capacity and Power output	
51 b	Technology detail of Fuel cell	
52.	Blending equipment data sheet	
Other Data		
1.	% of Indian content of equipment supply	
2	% of Imported content of equipment supply and source of country	
3.	Completion schedule of project (in month)	
4.	Financial contribution to be shared by Applicant (% of total Project cost)	
5.	In case Applicant has technology tie up/ collaboration with technology owner/ developer/IP Owner, detail scope of technology support from collaborator to be indicated	

Financial data of Applicant

		Financial year 2021-22	Financial year 2020-21	Financial year 2019-20
1	Turnover			
2.	Net worth			
3.	Profit			

(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

Annexure-4

Indicative Scheme for production of part quantity of hydrogen using electrolyser technology (other than Alkaline, PEM and SOEC) required for demonstrating hydrogen co-firing in one of the existing gas plants of NTPC along with requisite storage, fuel cell for standalone microgrid and equipment for blending with cooking natural gas

