(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

NTPC Limited

(A Government of India Enterprise)

Invites

Expression of Interest

(EoI)

From

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

For

Setting up of Pilot Project on Hydrogen Blending with Natural Gas in City Gas Distribution (CGD) Network in India

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

EoI Information

(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

DETAILED NOTICE INVITING EXPRESSION OF INTEREST (EoI)

EoI No. RE/H2/EoI/2021/3370/01 **Date: 13.08.2021**

NTPC/NTPC affiliates are Inviting Expression of Interest from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up Pilot Project on Hydrogen Blending with Natural Gas in CGD Network in India.

1. NTPC Limited (A Government of India Enterprise), a leading power generation company in India, has been ranked No#2 Independent Power Producer (IPP) in the world as per Platts (2020). The company is listed in stock exchange with a market capitalization of around INR 800 Billion.

   NTPC produces around 300 Billion Units of electricity annually through its cluster of gas, coal, hydro and RE based power stations of around 67 GW capacity spanning across India.

   NTPC Limited, with its objective to become a key player in India's adoption of Hydrogen Economy, is currently exploring the possibility of blending green hydrogen with natural gas in CGD network. Setting up of pilot project on hydrogen blending with natural gas in CGD network in India is to analyze the technical and commercial implications of blending and substituting natural gas with green hydrogen.

   In this regard, NTPC Limited (NTPC) invites Expression of Interest (EoI) from any Indian/Global Company/their Consortium/Affiliates/Representatives (**herein after called APPLICANT**). The participation in EoI may also be done through consortium; however, the consortium shall have a lead partner.

2. Accordingly, the Company, either directly or through any of its affiliate Company, intends to set up a pilot project on hydrogen blending in CGD network in India.

3. **DOWNLOAD AND TIMELINES FOR SUBMISSION OF EoI**

   a. Interested APPLICANTs may download the documents of EoI free of cost from www.ntpctender.com & https://eprocurentpc.nic.in

   b. Last date for queries/ seeking clarifications : **07.09.2021**

   c. Last date for submission of EoI : **13.09.2021**

   d. Date of opening of EoI response : **14.09.2021**

   NTPC reserves the right to consider only those responses which will be submitted by last-date of submission(c) for immediate requirements. However, applicants are free to submit even after the last date for submission. Such delayed responses will be evaluated at a later stage and appropriately considered for future requirements.

4. For consideration of EoI, APPLICANTs are required to submit softcopy of EoI, completed in all respect, through e-mail till last date of submission of EoI to the following email id:

To: ckstarun@ntpc.co.in

5. 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

(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

1. INTRODUCTION

i. NTPC Limited (A Govt. of India Undertaking) is a leading power generation company of India. NTPC produces around 300 Billion units of electricity annually through its cluster of gas, coal, hydro and RE based power stations of around 67GW capacity spanning across the country. Further, NTPC plans target capacity of 130 GW by 2032 through addition of 60GW of renewable energy capacity by 2032.

ii. NTPC has revenues from operations ₹ 992 billion ($ 13.32 billion) through its paid-up equity of ₹ 96.96 billion ($ 1.3 billion). NTPC group achieved a net profit of ₹ 137.69 billion ($ 1.85 billion) in the financial year 2020-21 and has been consistently paying dividends to its shareholders for the last 26 years.

iii. NTPC, being the largest power generator of India wants to play a key role in India's transition to hydrogen economy. Since partial decarbonization of existing natural gas end use applications through hydrogen blending is not capital intensive, NTPC wants to explore the feasibility of undertaking this initiative at a pilot scale. Based on the experience of the pilot, hydrogen blending maybe undertaken on a much larger scale.

2. INTENT OF THE EXPRESSION OF INTEREST (EoI)

i. NTPC intends to blend hydrogen with natural gas as part of the pilot at one of the NTPC townships. This identified cluster uses natural gas purely for domestic cooking.

ii. The initiative intends to analyze the commercial feasibility, test the solution at NTPC premises to prove the reliability, develop in-house expertise and subsequently develop a blending solution which can be implemented at much bigger scale in other clusters as a means to substitute part of natural gas and decarbonize the end use applications using gas.

iii. Different configurations of blending equipment, electrolyser technologies and hydrogen storage are possible for creating a hydrogen blending solution.

iv. The interested applicants will specify in their response, the technical specification, costs, timelines, footprint and other data as detailed in Annexure-3. NTPC reserves the right to implement the project through Request for Proposal (RfP) process amongst the shortlisted parties identified through this EoI Process or through a separate tender.

After the successful completion of the pilot project, similar systems will be setup at different locations to serve the bigger clusters within the CGD network.

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

a. NTPC's Role:

- Facilitate installation and commissioning of system within or outside NTPC premises.
- Routine operation of the system.
- Support in data collection.
- Facilitating the participant in applying for statutory clearances for the project.
- Capital Investment in procuring, installation and commissioning the system (milestone funding based on mutually agreed milestones).

b. Applicant's Role:

- Design of blending system, selection of the technology for electrolyser and hydrogen storage which best fits the intended use case.
- Engineering, supply of all parts of the system, erection, testing and commissioning of the system and integration with nearby PNG pipeline.
- Getting the required statutory clearances for installing the system.
- Routine Maintenance of the system for a period of 3 years from the date of commissioning.
- Data collection and analyzing the performance of the system during testing and subsequent operation as part of routine maintenance.

The Applicants may express their interest in following components alone or as a combined solution along with other inputs as indicated in relevant Annexures/formats:

a. Blending equipment
b. Electrolyser and Hydrogen storage

Vendors providing complete solution **(a+b)** would be given preference over vendors providing **'a'** or **'b'** alone.

vi. Details about the pilot project are enclosed at Annexure 4.

vii. The response(s) received in the EoI will be utilized by NTPC for:

- Identification of possible configurations of hydrogen blending system.
- Investigate the main components of blending skid.
- Formulation of specifications for various systems required for execution of pilot/commercial project(s).
- Examining viability of the CAPEX and OPEX over the lifetime.

- Identification of companies/consortiums capable of providing hydrogen blending solutions for pilot (100scm/day natural gas) and future commercial projects (up to 20,00,000 scm/day natural gas).

Section - III

Instructions to the Applicants

(GLOBAL INVITATION FOR EXPRESSION OF INTEREST)

1. The Applicants should note that:

a. Language of the responses to EoI 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 as soft copy through email.

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 relevant person(s), with complete address, phone number and email id.

e. NTPC 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. Enquiries and clarifications

Any clarifications on the EoI may be sought to the following via e-mail:
To: ckstarun@ntpc.co.in
CKS TARUN,
Manager (RE-Hydrogen),
NTPC Ltd, EOC, Noida
+91-9445002690

3. Corrigendum

At any time before the last date of submission of EoIs, NTPC may, for any reason, whether at its own initiative or in response to a clarification requested by an Applicant, modify the EoI 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 EoIs, and would invariably enclose documents/ information, as required, on account of the amendment, as a part of the EoI. NTPC may, at its discretion, extend the deadline for the submission of EoIs.

4. Preparation of the response to EoI

The application of EoI consists of the following**:**

(a) Annexure 1, 2 and 3 of Section-V

5. Validity of the responses

The Applicant shall submit the responses which shall remain valid up to twelve (12) months after the last date of submission ("Response Validity") or after date of submission (if submitted after submission deadline). NTPC reserve the right to reject any response, which does not meet the aforementioned validity requirement.

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. Submission of the response to EoI

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

To: ckstarun@ntpc.co.in

Ref. EoI No.:
Dated:

Due date of Opening: _____

Submitted to:
Name, designation and address of the concerned officer of NTPC
CKS TARUN,
Manager (RE-Hydrogen),
NTPC Ltd, EOC, Noida
+91-9445002690

Submitted by:
Name, address and 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 EoI should be submitted within the Deadline through email to the email id provided in the Section-I of this EoI.

7. Opening of responses to the EoI

The deadline for response to the EoI and opening shall be 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. Costs and expenses towards response to EoI

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

9. Confidentiality

The Applicants undertake to hold in confidence this EoI and any document related or pursuant to this EoI 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 EoI and any document related or pursuant to this EoI to any person, to the extent stipulated under the applicable Law.

10. Disclaimer

(a) This Expression of Interest (EoI) has been prepared by NTPC for response from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up Pilot Project on Hydrogen Blending in CGD Network in India.

(b) In submitting an expressed EoI in response to the EoI, the Applicants certify that it understands, accepts and agrees to the disclaimers on this page. Nothing contained in any other provision of the EoI 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

RESPONSIVENESS/EVALUATION METHODOLOGY

1. Responsiveness check

The responses submitted by Applicants shall be scrutinized to establish interest in setting up pilot project on hydrogen blending with natural gas in CGD networks in India. 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 having Conflict of Interest;

h. 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. Evaluation Methodology

The responses shall be evaluated with regards to simplicity of design, capital and operating cost, timelines, area footprint, scalability and reliability.

Section-V

Application Form & Annexures

Annexure-1

FORMAT FOR COVERING LETTER CUM UNDERTAKING

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

Applicant's Ref. No. : _____
Date : _____
Place : _____

To,
…….

Sub.: (INVITATION FOR EXPRESSION OF INTEREST)

NTPC Ref.: EoI No. _____, dated _____ (the "EoI")

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 EoI.

1. We give our unconditional acceptance to the EoI, issued by NTPC, including its amendments and/or clarification, if any, the receipt of which is hereby acknowledged. In token of our acceptance to the EoI, the same have been signed & stamped by us and enclosed to the response. We hereby confirm that the provisions of the EoI shall be binding on us.

2. We have submitted our response strictly as per provisions and formats of the EoI, 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 EoI shall be binding on us. We hereby expressly waive any and all claims in respect of EoI 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 EoI.

4. Details of the contact person of applicant are furnished as below:
    a. Name:
    b. Designation:
    c. Address

d. Contact numbers
e. Email id

5. We are enclosing herewith the entire response containing duly signed formats in electronic format sent via email to: ckstarun@ntpc.co.in 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 twelve (12) 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 NTPC is not bound to accept any response it receives.

We remain,

Yours sincerely

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

Annexure-2

INFORMATION TO BE SUBMITTED BY APPLICANT

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

1. Name of the **Company/**Lead Partner of Consortium/** Affiliates/**Representatives:

   (**strike off whichever is not applicable)

2. Legal status of the Company/Consortium/Affiliates/Representatives:
3. Brief description of the Company/Consortium/Affiliates/Representatives including details of its business groups/subsidiaries:
4. Date of Incorporation:
5. Date of Commencement of Business:
6. Full address including Telephone nos.:
   a. Registered Office:
   b. Head Office:
   c. Address for communication:
   d. Contact Details:
   e. Office Address in India, if any:
7. Documents to be enclosed:

   Technical Credentials – Relevant Product/System catalogues, Experience /Reference List, Copies of Customer Certificates, Engineering strengths, collaborations/tie-ups with manufacturer (if applicable), quality accreditations, etc.

   Financial Credentials – Copies of Audited Financial statements (Annual Reports) for last 3 years, Credit Rating, Market share (Domestic/International), Segmental Revenue in the applied category (ies).

8. Any other documents considered relevant.

(Sign & Company Seal)
Authorized signatory

Annexure-3

INFORMATION TO BE SUBMITTED BY APPLICANT

1. Suggested electrolyser technology, hydrogen storage and details of blending skid along with configuration (P&ID) which best fits the use case.
2. Technical specification of the entire system for pilot project and requirements to be made available at the location of implementation.
3. Approximate power requirement of all major components.
4. Area footprint of the pilot project.
5. As per setup's design, minimum natural gas flow to be defined below which blending may seize.
6. Timeline for implementing the pilot project.
7. Estimated capital investment for the pilot project with cost breakup of all major components as listed below (not exhaustive):
    a. Electrolyser
    b. Hydrogen Purifier
    c. Hydrogen Storage
    d. Blending equipment
    e. Control System
    f. Water Purifier (if required)
    g. Installation and Commissioning
    h. Miscellaneous Items
8. Estimated maintenance cost and operation cost for 3 years with spares and consumables.
9. Previous experience of the applicant in implementing hydrogen-based projects, blending of flammable gases or hydrogen with natural gas, hydrocarbon industry or any other relevant sector.

Annexure-4

Pilot Project on hydrogen blending with natural gas in CGD network in India

1. Pilot Project details:

- The cluster identified for this pilot is at one of the NTPC townships and end use application is domestic cooking.
- Daily requirement of natural gas in this cluster is approximately 100 scm.
- Initial hydrogen blending would be constant 5 % by vol which would ultimately be increased to 20% by volume.
- Requirement of hydrogen would be 5 scm/day (@5% by vol) eventually increasing to 20 scm/day (@20% by vol).
- Upon successful completion of this pilot project, the hydrogen blending scheme will be implemented within the neighboring bigger clusters and the CGD network at large.

2. PNG Flow (Anticipated):

- Maximum - 15 scm/hr, Minimum - 0 scm/hr, Nominal - 7 scm/hr.

3. PNG Composition:

Typical Natural Gas Composition	**% Vol**
Methane	95.4
Ethane	3.657
Propane	0.534
n-Butane	0.105
I-Butane	0.091
n-Pentane	0.0028
i-Pentane	0.0077
C6+	0.0019
N_2	0.2
CO_2	0.000025
Total	99.999425
GCV Kcal/scm	9351
NCV Kcal/scm	8340
Avg. Molecular Weight	16.78

Boundary Condition Parameters	**Limit**

Hydrocarbon dew point (^{O}C, max)	0
Water dew point (^{O}C, max)	0
Hydrogen Sulphide (ppm by wt. max)	5
Total Sulphur (ppm by wt. max)	10
Carbon Dioxide (mole % max)	6
Total Inerts (mole %)	8
Temperature (^{O}C, max)	50
Temperature (^{O}C, min)	10
Oxygen (% mole vol. max)	0.2
Wobbe Index for domestic consumers (based on MJ/SCM)	39-53

4. PNG Pressure and Temperature:

- Pressure: Minimum – 1 bar, Nominal - 4 bar, Maximum – 6 bar.
- Temperature: Maximum - 50 Deg C, Minimum - 10 Deg C.

5. Hydrogen Purity and Pressure:

- Electrolysis based production with minimum 99.99% purity and pressure as per applicant's design considering the maximum natural gas pressure (6 bar).
- Electrolyzer for hydrogen production of 1 scm/hr capacity is envisaged.
- Higher pressure of produced hydrogen will ensure blending of hydrogen from storage without needing any compression.

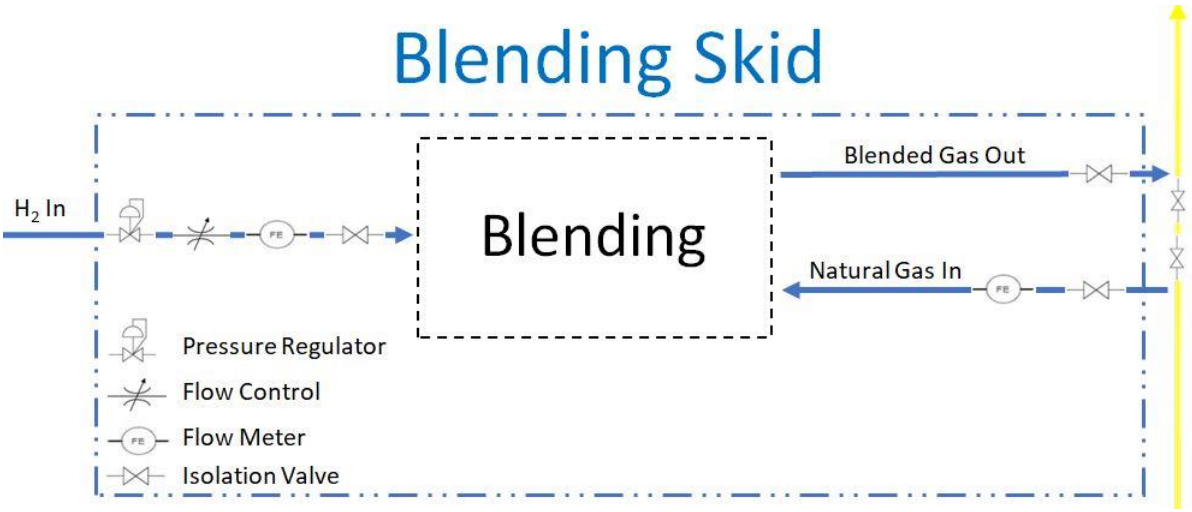
6. Hydrogen Storage:

- Tentative storage requirement of 15scm (to avoid application of rules as per Clause No.3 of SMPV Rules, 2016).
- A single vessel maybe preferred over bank of cylinders.

7. Blending Skid tie in sketch (Representative Only):

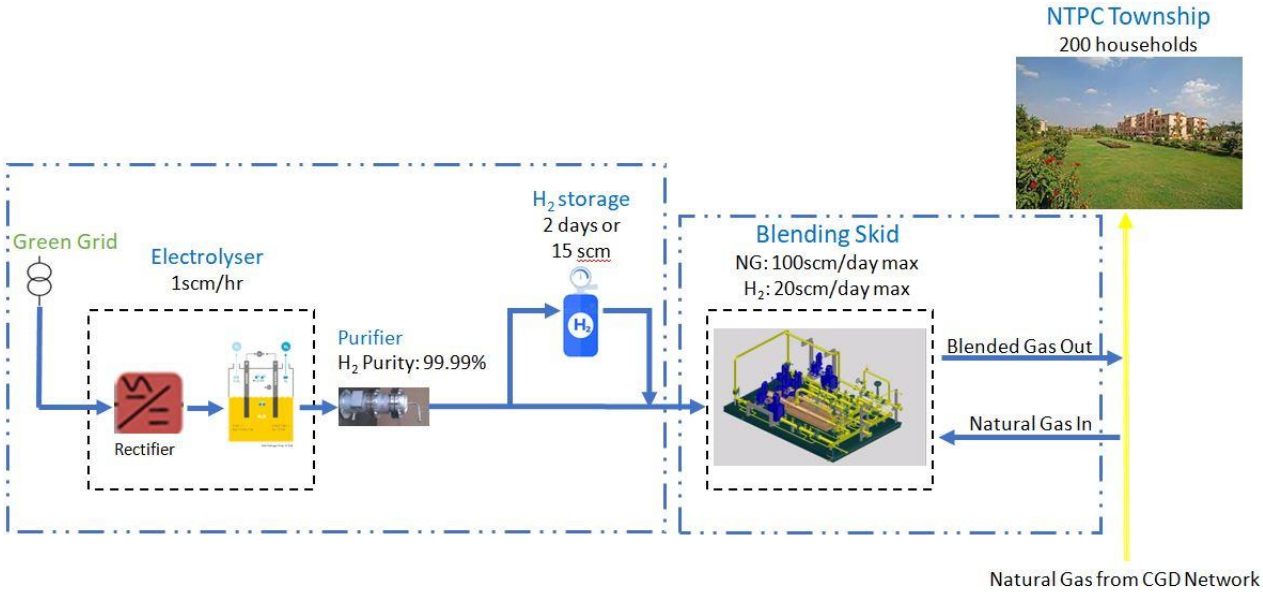
- The entire gas from the main PE pipeline (90mm) will be diverted into the blending setup through isolation valves.
- After blending of hydrogen into natural gas at the required %, the blended mixture will be returned to the PE pipeline highlighted in yellow.
- Incoming natural gas to be metered.
- The entire blending setup can be bypassed using isolation valves and so as to ensure continuous supply of natural gas to consumers while undertaking maintenance on blending skid.
- Maximum H_2 pressure of 35 bar to be considered in case only blending skid is being offered by vendor.

- Vendor to provide isolation valves along with flange and counter flange set (for connection with PNG line) for both natural gas in and blended gas out line.



8. Hydrogen Blending Setup:

- Hydrogen purity and H_2 % in blended gas to be logged in control system.
- Should comply with PNGRB regulations on natural gas CGD networks and PESO guidelines(if applicable) for installations using hydrogen.



9. Control System:

- Interface with electrolyser, storage, blender, transmitters, analyzers and safety sensors.
- Logic for safe startup, operation and stopping of the entire pilot plant along with emergency shutdown.
- Remote monitoring using web interface.

10. Water and Power Availability:

- Sufficient renewable energy is available and will be supplied by NTPC throughout the day to power the entire pilot project.
- Power would be available at AC 415V level within 100 meters of the proposed site.
- Potable water at minimum 1 bar pressure is already available inside the township within 100 meters of the proposed site.
- Typical Water Quality:

Test	Unit	Result
pH		6.75
Conductivity	µs/cm	630
FRC	ppm	0.7
Turbidity	NTU	1.8
P. Alkalinity	ppm	0
M.Alkalinity	ppm	50
Chloride	ppm as $CaCO_3$	100
Total Hardness	ppm as $CaCO_3$	140
Ca.Hardness	ppm as $CaCO_3$	40
Mg.Hardness	ppm as $CaCO_3$	100
Silica	ppm	19
Organic Matter (KMnO4 No)	ppm	1.2

11. Miscellaneous:

- Sufficient care to be taken to design the entire pilot plant for coastal area.
- Single container with separate sections for housing electrolyzer and control system to be provided.
- All safety aspects to be considered while designing and integrating different components of the systems.
- Required civil works in the scope of applicant.