

(GLOBAL INVITATION OF EXPRESSION OF INTEREST)

NTPC Limited

(A Government of India Enterprise)



Invites

Expression of Interest

(EOI)

For Setting Up

A Pilot Project for Water Savings for Flue Gas Desulfurization System and Improvement of Thermal Plant Efficiency by Recovering Waste Heat from Flue Gas of 500MW Unit Coal Fired Plant and Utilization Same In Condensate Cycle of Thermal Power unit

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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

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Section – I

EOI Information

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[DETAILED NOTICE INVITING EXPRESSION OF INTEREST \(EOI\)](#)

EOI No. NTPC/ET&PR/EOI-04/2024-25

Date: 13.06.2024

NTPC is Inviting Expression of Interest for setting up a pilot project for water savings for Flue Gas Desulfurization system and improvement of Thermal Power plant efficiency by recovering waste heat from flue gas and hence reducing temperature of flue gas at the inlet of absorber tower and further utilization of same heat in condensate cycle of thermal power unit .

DOWNLOAD AND TIMELINES FOR SUBMISSION OF EOI

- a. Interested APPLICANTs may download the documents of EOI free of cost from <https://ntpctender.ntpc.co.in>
- b. **Last date for submission of EOI** : **30.08.2024**
- c. **Last date for queries/ seeking clarifications** : **20.08.2024**
- d. **Date of opening of Eoi response** : **02.09.2024**
- e. **Response Validity** : **6 months from the last date for EOI Submission**

1.0 For consideration of EOI, APPLICANTs are required to e-mail signed and scanned copy of EOI duly filled and completed in all respect, through e-mail mentioned hereunder.
Email: sankardask@ntpc.co.in / dipankarhalder@ntpc.co.in

2.0 NTPC shall not be liable for any postal/ Mail delivery issue delays whatsoever 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.

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Section - II

Introduction

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INTRODUCTION

1.0 ABOUT NTPC

NTPC is India's largest energy conglomerate with roots planted way back in 1975 to accelerate power development in India. Since then, it has established itself as the dominant power major with presence in the entire value chain of the power generation business. From fossil fuels it has forayed into generating electricity via hydro, nuclear and renewable energy sources. This foray will play a major role in lowering its carbon footprint by reducing greenhouse gas emissions.

The total installed capacity of the company is 76,015 MW (including JVs). Own stations include 27 coals based, 7 gas based, 1 Hydro, 1 Wind, 15 Solar PV and 1 Small hydro project. Under Joint Venture/Subsidiaries, NTPC has 9 coals based, 4 gas based, 8 hydro, 1 Small hydro, 16 Solar PV and 4 wind projects. The capacity will have a diversified fuel mix and by 2032, non-fossil fuel-based generation capacity shall make up nearly 30% of NTPC's portfolio. NTPC Limited produces around 400 billion units of electricity annually

NTPC Limited has reported a total income INR 1779.77 billion (21.6 billion USD) in the financial year 2022-23. NTPC group achieved a net profit of INR 171.21 billion (2.08 billion USD) in the financial year 2022-23 and has been consistently paying dividends to its shareholders.

2.0 INTENT OF THE EXPRESSION OF INTEREST (EOI)

2.1 Water scarcity presents a critical global challenge. In India, where 100 million people are grappling with a nationwide water crisis and numerous major cities are confronting acute shortages, the imperative for water conservation is clear. One significant area of water conservation is the reduction in water consumption in thermal power plants which contributes a substantial portion of India's water consumption. On the other hand, decarbonizing thermal power plants is crucial to meet India's carbon reduction targets as per its NDC. Increasing the energy efficiency of thermal power plants will play a key role in decarbonization of power sector. Recovery of waste heat from flue gas upstream of Flue Gas Desulfurization system (FGD) and utilizing it in the thermal plant feed water cycle is one promising avenue which can help meet both the targets. This approach not only reduces water consumption in FGD processes significantly but also enhances the overall efficiency of the thermal plant. NTPC Ltd has already successfully demonstrated several pilot projects for recovery of waste heat from flue gas of coal fired power plants, utilizing conventional heat exchanger. However, those pilot projects did not yield the results necessary to achieve a technologically and economically viable solution.

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2.2 In view of above, NTPC intends to set up a pilot plant for water savings for Flue Gas Desulfurization system and improvement of Thermal Power plant efficiency by recovering waste heat from 5% of flue gas (approx. 120TPH Flue gas) of 500MW Thermal power unit of NTPC and hence reducing its temperature at the inlet of absorber tower, employing innovative technology and further utilizing same heat in heating the condensate of thermal power unit. Flue gas of temperature at 125°C shall be tapped from discharge of Booster fan of FGD system and after heat recovery, flue gas temperature shall be reduced to 65°C (maximum) and the same shall be connected to main flue gas duct at the inlet of absorber tower. Flue gas temperature variation of +/-25°C will be there. Apart from the conventional tube bank for water heating, alternate innovative efficient technologies, which can ensure average metal temperature of heat exchanger in contact with flue gas closer to flue gas outlet temperature, prevents potential of condensate entering into flue gas path, ensure no corrosion due to condensing acid in the flue gas path and low heat transfer surface area in flue gas path ensuring minimum pressure drop along flue gas path, shall be preferred. Accordingly, NTPC is inviting expression of interest from Indian/foreign companies who may set up a pilot project as stated above. Above pilot plant shall be designed considering flue gas temperature of 125°C as stated above and system should also be capable to operate with the variation of Flue gas temperature as defined. Further, heat recovered from waste flue gas shall be used to heat condensate from Gland Steam Cooler outlet to raise temperature from 46°C to minimum 58°C. The quantity of condensate to be heated shall be decided by Applicant to optimize the system. Total quantity of condensate available at full load of unit is 1152TPH. Indicative scheme of pilot plant indicating broad scope is attached as Annexure-6.

2.3 To evaluate different technologies on a same platform, various design parameter, operational data and other information sought in EOI may be furnished considering reference data of Coal analysis and Flue gas analysis enclosed as Annexure-5. In addition to above data corresponding to attached coal and flue gas, operational/ design data for best and worst quality of coal and flue gas for the proposed technology is also to be included in EOI submission.

2.4 The initiative intends to demonstrate energy efficiency improvement through Flue gas waste heat recovery, analyze the techno-commercial feasibility, validate the performance, and subsequently develop product/solutions which can be a pathway for large scale implementation of flue gas waste heat recovery systems in thermal power plants that is commercially viable and sustainable.

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2.5 The interested applicants will submit the technical data/ information, guarantee parameters, the total estimated project cost and shall propose the financial contribution to be shared by themselves and by NTPC and other information as sought in Section-V.

2.6 Based on techno-commercial analysis of the responses in the EOI and further discussions with interested parties, if it is found commercially feasible, NTPC may go for pilot installation / may not proceed with any project at this stage.

2.7 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 EOI Process.

2.8 The response(s) received in the EOI/ information received post feasibility study will be utilized by NTPC for:

- a. Identification for suitable technologies which fits the intended use cases

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) / 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 Indicative Role and Responsibilities of Parties for Pilot Project

Indicative roles and responsibilities of the parties for pilot project shall include but not limited to the following:

3.1 NTPC's Role:

- Land for installation and commissioning of the system within NTPC premises.
- NTPC shall provide the required quantity of flue gas from its thermal power unit for the pilot project.
- NTPC shall provide power supply feeder from the nearest available switchgear. However complete electrical system including cabling, termination etc., from terminal point (power supply feeder at switchgear) onward shall be in the scope of vendor.

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- NTPC shall provide water (if required) from nearest available terminal point. However, water treatment (if required), connections, piping and system from terminal points onward shall be in the scope of vendor.
- NTPC shall provide Instrument air (if require), Service Air (If require), service water/ cooling water (if require) and other utilities, from nearest available terminal points. However, piping and system from terminal points onward shall be in the scope of vendor.
- Facilitate the applicant in applying for statutory clearances for the project.
- Facilitate the installation and commissioning of the system.
- Support in Data collection and analyzing the performance of the system during testing and subsequent operation.

3.2 Applicant's Role

- Design, engineering, manufacture, supply, erection, commissioning, and testing of complete Flue gas heat recovery system, associated piping, electrical, civil/ structural, control and instrumentation and other accessories required for completion of the pilot project.
- Design, engineering, manufacture, supply, erection, commissioning, and testing of complete system for Integration of the flue gas heat recovery system with the thermal power plant
- Ensuring that the complete plant shall be applicable emission norm compliant, having an aesthetic environment with noise level in permissible limits.
- Routine maintenance of the systems 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.
- Getting required statutory clearances for installation and operation of the system
- Sharing the stack and system level information for comprehensive understanding of the system
- Providing enough automation to prevent human exposure to hazardous areas during O&M of the plant.
- O&M of the entire plant for a period of 3 years from the date of commissioning
- Providing service air, instrument air and any other utility as per requirement of the proposed system
- Complete civil, structural, architectural works including survey, drainage, fencing/ boundary wall etc.

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Section - III

Instructions to the Applicants

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INSTRUCTIONS TO THE APPLICANTS

1.0 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 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 EOI may be sought to the following via e-mail:

To: sankardask@ntpc.co.in

CC to: dipankarhalder@ntpc.co.in

3.0 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,

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on account of the amendment, as a part of the EOI. NTPC may, at its discretion, extend the deadline for the submission of EOIs.

4.0 Preparation of the response to EOI

The application of EOI shall consist of Annexure-1, 2, 3 and 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 above-mentioned 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.

6.0 Submission of the response to EOI

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

To: sankardask@ntpc.co.in

CC to: dipankarhalder@ntpc.co.in

Ref. EOI No.

Dated

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. The responses to the EOI should be submitted within the deadline at the e-mail address provided in the Section-I of this EOI.

(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**7.0 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 and 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.

8.0 Disclaimer

This Expression of Interest (EOI) has been prepared by NTPC Ltd. for response from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up a Pilot Project for Recovery of flue gas waste heat and utilization in condensate cycle in coal fired thermal power plant for enhancing energy efficiency.

In submitting the response to the EOI, the Applicant 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.

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Section-IV

Consideration of Response

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CONSIDERATION OF RESPONSE

Responsiveness check

The responses submitted by Applicants shall be scrutinized and may be rejected in following conditions-to establish interest in setting up a Pilot Project for Recovery of flue gas waste heat and utilization in condensate cycle in coal fired thermal power plant for enhancing energy efficiency. Responses shall be deemed non-responsive for following reasons:

- 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.
- Responses not signed by authorized signatory and / or stamped in the manner indicated in this EOI.
- Material inconsistencies in the information/ documents submitted by the Applicant
- An Applicant submitting more than one response to this EOI either itself or through an affiliate or subsidiary company.
- Response validity being less than that required as per Clause 5 of section-III of this EOI.
- Response being conditional in nature.
- Response not received by the response Deadline.
- Response having Conflict of Interest.
- 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.

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Section-V
Application Form & Annexures

(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**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.: 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, as amended. 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 or 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 regarding EOI.

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4. Details of the contact person are furnished as below:

Name:

Designation:

Address:

Contact numbers:

email id:

5. We are enclosing herewith the entire response containing duly signed formats in electronic format sent via email to: sankardask@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.

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.

8. We confirm that we have not taken any deviation so as to be deemed "**Non-Responsive**" as stipulated in Section-IV of this EOI.

9. We understand that you are not bound to accept any response you receive.

10. We declare that our firm is neither put on Holiday or Black-listed by any Government / PSU / Private firm or Financial Institution.

11. We understand that you are not bound to accept any response you receive.

We remain,

Yours sincerely

(Name, Designation and Signature of Authorized Person)

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Annexure-2**APPLICANT'S ORGANIZATION DETAILS 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
- 2) Legal status of the Company
- 3) Brief description of the Company including details of its business groups/subsidiaries/ affiliates:
- 4) Existing Manufacturing facilities – Locations, Capacity
- 5) Date of Incorporation:
- 6) Date of Commencement of Business:
- 7) 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:
- 8) Collaborations/tie-ups with manufacturer (if applicable),
- 9) Details of Indian parties, if any, for installation, supply, services, and collaboration
- 10) Financial Data of Organization (Attach Relevant document in proof of same)

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.

	Financial year 2022-23	Financial year 2021-22	Financial year 2020-21
Turnover			
Net worth			
Profit			

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Annexure-3

TECHNICAL INFORMATION TO BE SUBMITTED BY APPLICANT

Applicant shall duly furnish following information.

1.0 About the Technology and Technology Provider

Applicant shall fill the required details and attach relevant documents as per Table-1, Clause-A and Clause-B, Annexure-4.

2.0 About the Reference Plant

Applicant shall fill the required details and attach relevant documents as per Table-1, Clause-C, Annexure-4.

3.0 About Proposed Pilot Project

Applicant shall fill the required details and attach relevant documents as per Table-1, Clause-D, Annexure-4.

4.0 Budgetary Cost:

4.1 Estimated total capital investment for the proposed pilot project with cost breakup of all major components preferably as listed below along with scope of supply and services, inclusions, exclusions, terminal points, facilities required at site, tentative project schedule:

- Flue gas waste heat recovery System and associated equipment
- Civil/Infrastructure requirement
- Control System
- Installation and Commissioning
- Miscellaneous Items
- Package BOP, as applicable (control systems etc. as required for completion of the pilot project)
- Safety and protection systems

4.2 Estimated Annual O&M cost with spares and consumables.

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Note:

- Applicant shall separately mention taxes, duties, freight, insurance applicable for above items/project.
- Applicant shall mention budgetary cost equipment supply for Indian item and imported item separately.
- Financial contribution by the party/ proposed mode of project execution

5.0 Project Timeline:

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

(Sign & Company Seal)

Authorized signatory

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Annexure-4**(Technical Data)****Note: Applicant to attach relevant/supporting documents**

Sl. No.	Description	Applicant to fill
(A) About the Technology Provider		
1.	Type of Flue gas heat recovery technology proposed by Applicant	
2.	Whether Technology is owned by Applicant	Yes/No
a)	If no, Name of Technology owner/ developer/ IP Owner	
b)	Registered office of Technology owner/ developer/ IP Owner	
c)	Whether Applicant has technology tie up/ collaboration with Technology owner/developer/ IP Owner	Yes/No (Attached copy of Technology tie up/ collaboration agreement)
d)	Validity period of agreement	
(B) About the Technology		
1.	Write up of the proposed technology detailing the working principle, major operating parameters/ conditions (Temperature & Pressure requirements of flue gas), specialty of technology from conventional heat exchanger, how it ensuring corrosion from condensing acid, any other input requirements, startup time etc.	
2.	Process flow diagram with write up	
3.	Process flow diagram with Write up for BOP system if any	
4.	Technology Readiness Level	
5.	Best use case, Merits and Demerits and limitations of the technology	
6.	Comparison with other heat exchanger technologies	
7.	Details of Maintenance Requirements	
8.	Scalability and Modularity aspect	
9.	Heat Recovery Efficiency and parameters affecting efficiency/ performance	
10.	Any other relevant details (as applicable)	
(C) Details of reference pilot/commercial Installations		
1.	Name of project where Applicant/ Its Collaborator/ associate installed / is installing the proposed Heat recovery technology	
2.	Name and address of owner of plant	
3.	Scale of plant	(Commercial/ pilot plant)
4.	Purpose of the installation	
5.	Design capacity (Heat transfer rate in KW)	
6.	Flow rate of the hot fluid and flow rate of cold fluid in m ³ /hr	
7.	Temperature difference between hot and cold fluid in Deg C	
8.	Type of hot fluid (e.g., Flue gas, Steam etc.) and cold fluid	

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9.	Date of award	
10.	Date of completion of plant	
11.	If installation not yet completed, Present status and date of expected completion	
12.	Scope of work of Applicant (Furnish copy of LOA)	
13.	P &ID of main system and BOP	
14.	Equipment wise Break up of Power consumption of main system and BOP	
15.	List of other utilities with quantity	
16.	Land footprint	
17.	Efficiency	

(D) Details of the Proposed Pilot Plant

		Flue gas composition as attached
1.	Detail Scheme of Pilot indicating parameters (Temp. Pressure, flow rate etc.) at inlet and outlet of each stage of process	
2.	Design Heat transfer rate from flue gas to condensate (Kcal/hour)	
3.	Heat and Mass Balance Diagram of complete pilot for design conditions (i.e for 125°C Flue gas temperature) and other condition for 100°C and 150°C	
4.	Flow rate of hot Flue gas in m ³ /hr at design condition (i.e Flue gas temperature of 125°C)	Approx. 120 TPH
5.	Outlet temperature of Flue gas for all conditions	65°C (Mximum)
6.	(i) Pressure Drop across Heat exchanger in flue gas path, both for clean and clogged condition with design flow (i.e corresponding to Flue gas temperature of 125°C)	
	(ii) Total pressure drops including pressure drops including ducting, gate / dampers etc. both for clean and clogged condition with design flow (i.e corresponding to Flue gas temperature of 125°C)	
7.	Flow rate of hot Flue gas in m ³ /hr for the cases of Flue gas temperature of 150°C and 100°C	
8.	(i) Pressure Drop across Heat exchanger in flue gas path, both for clean and clogged condition with flow corresponding to flue gas temperature of 150°C and 100°C	
	(ii) Total pressure drops including pressure drops including ducting, gate / dampers etc. both for clean and clogged condition with flow corresponding to flue gas temperature of 150°C and 100°C	
9.	Total heat transfer surface area in flue gas path required for design condition and other two conditions	

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10.	Minimum metal temperature, maximum metal temperature and average metal temperature of heat exchanger in contact with flue gas	
11.	Heat exchanger material in contact with flue gas.	
12.	Flue gas duct size and material of duct	
13.	Method of preventing corrosion due to condensing acid	
14.	Method of preventing ash particle accumulation on heat exchanger surface	
15.	Fan	
	(i) Design Capacity of fan(m ³ /hour)	
	(ii) Design Head of fan (Kg/cm ²)	
	(iii) Type of fan	
	(iv) Power Consumption & motor rating	
16.	Flow rate of cold fluid at design condition m ³ /hr. (i.e. corresponding to flue gas temperature of 125°C)	
17.	Flow rate of cold fluid for other conditions m ³ /hr (i.e. corresponding to flue gas temperature of 150°C and 100°C)	
18.	Outlet Temperature of Cold Fluid (Deg C)	68°C (minimum)
19.	i. Pressure drop of condensate across heat exchanger at clean condition and clogged condition for design condition (i.e. corresponding to Flue gas temperature of 125°C)	
	ii. Total pressure drop in condensate line from connection point of supply line at existing condensate line to connection point at return line at clean condition and clogged condition for design condition (i.e corresponding to Flue gas temperature of 125°C)	
20.	i. Pressure drop of condensate across heat exchanger at clean condition and clogged condition for other two conditions (i.e corresponding to Flue gas temperature of 150°C and 100°C)	
	ii. Total pressure drop in condensate line from connection point of supply line at existing condensate line to connection point at return line at clean condition and clogged condition for other two conditions (i.e corresponding to Flue gas temperature of 150°C and 100°C)	
21.	Heat transfer surface area required for condensate heating for all three conditions	

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22.	Condensate pipe size and maximum & minimum velocity of condensate for all conditions	
23.	Condensate Pumping Power requirement	
24.	Total water savings in FGD (normally water requirement shall be calculated for reduction of flue gas temperature from 125°C to 70°C)	
25.	Layout of Pilot plant indicating total area footprint	
26.	Terminal Temperature difference of heat exchanger system	
27.	Thermal efficiency and Overall Plant Efficiency (Net efficiency)	
28.	List of equipment with rated capacity	
29.	Electrical load list of each equipment	
30.	Utility	
(a)	Auxiliary Power consumption	
(b)	Instrument Air (Nm ³ /hr)	
(c)	Service Air (Nm ³ /hr)	
(d)	Others, if any. Please specify	
31.	P &ID of main system and BOP	
32.	Whether system is compatible for the Flue gas composition as provided in the EOI.	Yes/No (If no, please furnish type of waste with its analysis for which system is designed.)
33.	(i) Whether moisture present in flue gas will condense.	Yes/No
	(ii) If yes, whether same can be recovered and include write up describing detail process of condense water recovery system.	
34.	Land footprint	
35.	Expected life of entire project as a whole (Years)	
36.	Annual maintenance requirement Maintenance Activities with frequency.	
37.	No. of shutdown days per year	
38.	Terminal Points and Exclusions	
39.	O&M details	
40.	Safety Aspects	
41.	Spares and Consumables	
42.	Guarantee/Warranty offered for the proposed pilot plant	
43.	Previous experience in implementing the proposed technology	
44.	Engineering strength of Applicant	
45.	Any other technical details, applicant would like to highlight about the proposed technology	
46.	Input data (if any) required from NTPC	

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Other Data		
40.	% Of Indian content of equipment supply	
41.	% Of Imported content of equipment supply and source of country	
42.	Completion schedule of project (in month)	
43.	Financial contribution to be shared by Applicant (% of total Project cost)/proposed mode of execution	
44.	In case Applicant has technology tie up/collaboration with technology owner/ developer/IP Owner, detail scope of technology support from collaborator to be indicated	

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Annexure-5

(Reference Data for Flue Gas)

Ambient Condition	
Temperature	27 DegC
Relative Humidity	60%

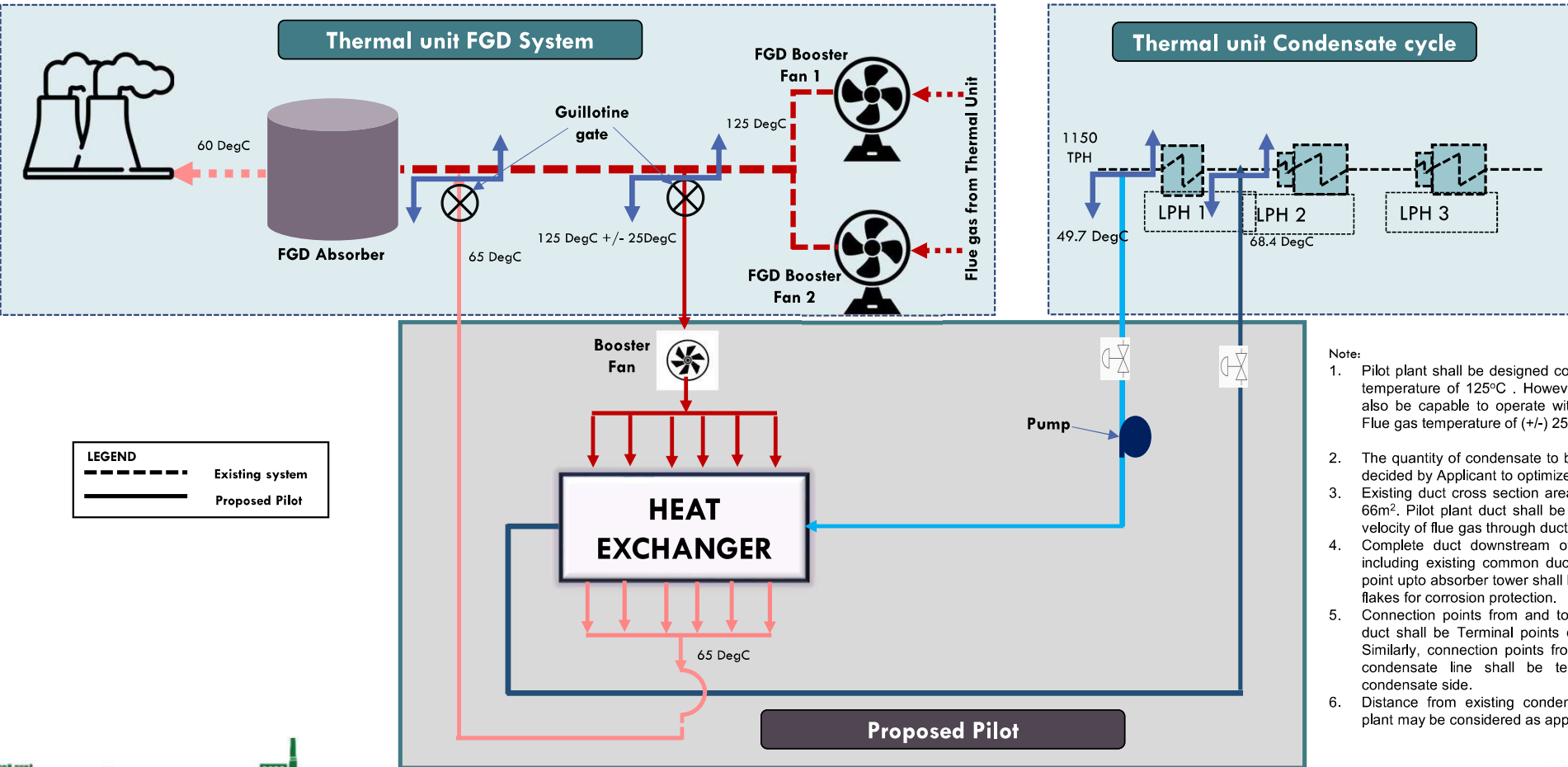
Flue Gas Composition (before FGD)		
CO ₂	% Vol	11.22
N ₂	% Vol	67.29
O ₂	% Vol	5.07
Moisture	%	16.41
SO ₂	mg/Nm ³	100
SO ₃	mg/Nm ³	15
NO _x	mg/Nm ³	350
Hg	micro g/Nm ³	0.03
SPM*	mg/Nm ³	50**
CO	mg/Nm ³	200

* Below P10 : 60-70%

** System shall be designed for SPM of 200mg/Nm3

Condensate Temperature at the inlet of Proposed recovery system	49.7 DegC
Condensate flow rate available at full load of unit	1152 TPH

Anneux-6 : Indicative Scheme of Pilot Plant



- Note:
1. Pilot plant shall be designed considering flue gas temperature of 125°C . However, system should also be capable to operate with the variation of Flue gas temperature of (+/-) 25°C.
 2. The quantity of condensate to be heated shall be decided by Applicant to optimize the system.
 3. Existing duct cross section area is approximately 66m². Pilot plant duct shall be sized considering velocity of flue gas through duct as 15m/s
 4. Complete duct downstream of heat exchanger including existing common duct from connection point upto absorber tower shall be lined with glass flakes for corrosion protection.
 5. Connection points from and to existing flue gas duct shall be Terminal points on Flue gas side. Similarly, connection points from and to existing condensate line shall be terminal points on condensate side.
 6. Distance from existing condensate line to pilot plant may be considered as approximately 500m

