NTPC Limited

(A Government of India Enterprise)

INVITATION FOR EXPRESSION OF INTEREST (EOI)

FOR

IDENTIFICATION OF VENDORS

FOR DESIGN, MANUFACTURE, SUPPLY, ERECTION, TESTING & COMMISSIONING

OF

SUB-CRITICAL THERMAL POWER UNITS (150 MW to 250 MW) SUITABLE FOR TWO-SHIFT OPERATION & MINIMUM TECHNICAL LOAD (MTL) AS 25%

(INVITATION FOR EXPRESSION OF INTEREST)

DETAILED NOTICE INVITING EXPRESSION OF INTEREST (EOI)

EOI No.: NTPC/EPC/EOI/SB-CR/2026 **Date: ....**

NTPC is Inviting an Expression of Interest for "Identification of Vendors for Design, Manufacture, Supply, Erection, Testing & Commissioning of Sub-Critical Thermal Power Units (150 MW to 250 MW) Suitable for Two shift operation & Minimum Technical Load (MTL) AS 25%.

1.0 **Objective:**

(i) NTPC Ltd., invites Expression of Interest from Companies in India for Design, Supply, Erection, Testing & Commissioning of coal fired (including biomass co-firing) sub-critical thermal power units suitable for two shift operation & Minimum Technical Load (MTL) AS 25% . ***This EOI is to identify such interested vendors who have adequate expertise & experience in Design, Supply, Erection, Testing & Commissioning of Sub-Critical Thermal Power Units*** **(mentioned at Annexure-A along with minimum eligibility criteria) suitable for Two Shift Operation & Minimum Technical Load (MTL) AS 25%.**

(ii) Based on EOI response, NTPC will prepare a database of such capable vendors and may explore the possibility of utilizing the services for design, engineering, procurement & construction of such thermal power units.

(iii) Ascertaining capabilities of vendors w.r.t. their Design, Engineering, manufacturing, Supply, Erection, Testing & Commissioning towards providing such sub-critical thermal power units having two shift operation & MTL capabilities.

(iv) As per NTPC decision & based on the EOI response, detailed discussions may be done with the applicants towards narrowing down on the 'technical and commercial' terms and conditions.

2.0 DOWNLOAD AND TIMELINES FOR SUBMISSION OF EOI

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

2. **Last date for EOI submission:** 03.05.2026 / 2 weeks from date of publishing, whichever is later.

3.0 NTPC encourages submission of EOI in soft copy. For consideration of EOI, Applicants are required to e-mail softcopy, completed in all respect, from its official e-mail ID to below mentioned e-mail IDs. If applicants also wish to submit hard copy of the EOI, the same can be submitted either in person or by registered/ speed post till the last date of submission of EOI to the following address: -

To: Deputy General Manager (PE-Mechanical/SG & Auxiliaries)
Email: vivekbharti@ntpc.co.in
CC to: achourasia@ntpc.co.in
Project Engineering (Mechanical/SG & Auxiliaries), 3rd Floor
NTPC Limited, SRHQ, NTPC Bhavan, Kavadiguda, Secunderabad-500080

4.0 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.

(INVITATION FOR EXPRESSION OF INTEREST)

SECTION-I

INFORMATION TO APPLICANT

1. NTPC Limited is a Govt. of India Enterprise. NTPC group produces electricity through its cluster of gas, coal, hydro and RE based power stations of more than 89 GW capacity spanning across the country.

2. INTENT OF THE EXPRESSION OF INTEREST (EOI)

This EOI is to identify interested vendors in India, for supply & installation of sub-critical thermal power units offering enhanced efficiency, environmentally compliant performance and suitability for two shift operation & Minimum Technical Load (MTL). As 25% to cater to the contemporary challenges posed by the operating regime. The applicant shall have proven experience, established technical capabilities, and sufficient organizational, financial, and execution capacities to meet the specified requirements. The minimum eligibility criteria for participation in the tender are mentioned at Annexure-A of this document.

3. 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, the Application Form and Annexures given in Section-II shall be duly filled out and sent to NTPC by the applicant in a soft copy.

c. Applicants should go through Section-I thoroughly before filling and submitting the application form, annexures and schedules in Section-II.

d. Applicants shall mention the name and contact details of two people, with their complete address, phone number and official 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.

f. Based on EOI response, NTPC will prepare a database of capable vendors for utilizing the services of design, engineering, procurement & construction of such thermal power units.

g. This EOI is indicative only and non-committal.

h. For the expression of interest, Applicant shall consider Coal and biomass characteristics as per the data provided in Appendix-'Fuel Characteristics'.

4. ENQUIRIES AND CLARIFICATIONS

Any clarifications on the EOI may be sought to the following via email:

To: Deputy General Manager (PE-Mech/SG & Aux.)
Email: vivekbharti@ntpc.co.in
CC to: achourasia@ntpc.co.in

5. 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 all 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.

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: vivekbharti@ntpc.co.in
CC to: achourasia@ntpc.co.in

Ref. EOI No. **NTPC/EPC/EOI/SB-CR/2026** **Dated: ....**

Submitted to:
To: Deputy General Manager (PE-Mechanical/SG & Auxiliaries)
Email: vivekbharti@ntpc.co.in
CC to: achourasia@ntpc.co.in
Project Engineering (Mechanical/SG & Auxiliaries), 3rd Floor
NTPC Limited, SRHQ, NTPC Bhavan, Kavadiguda, Secunderabad-500080

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 and the same should be reflected in the soft version also.

The responses to the EOI should be submitted within the deadline as mentioned in this document.

7. COSTS AND EXPENSES TOWARDS RESPONSE TO EOI

The applicants shall bear all the costs associated with the complete process including preparation of the response and participation in discussions and finalization & execution of the documents related with this EOI, regardless of the conduct or outcome of this process.

8. 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, financers, who need to have access to such information for the proper performance of their activities towards this EOI.

(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.

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SECTION-II

APPLICATION FORM, ANNEXURES & SCHEDULES

Annexure-1

FORMAT FOR COVERING LETTER CUM UNDERTAKING

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

Date: ________________
Place: ________________

To,
VIVEK BHARTI
Deputy General Manager (PE-Mechanical/SG & Auxiliaries)
Project Engineering (Mechanical/SG & Auxiliaries), 3rd Floor
NTPC Limited, SRHQ, NTPC Bhavan,
Kavadiguda, Secunderabad-500080

Subject: Identification Of Vendors for Design, Manufacture, Supply, Erection, Testing & Commissioning of Sub-Critical Thermal Power Units (150 MW to 250 MW) Suitable for Two Shift Operation & Minimum Technical Load (MTL) AS 25%.

Ref.: EOI No. NTPC/EPC/EOI/SUB-CR/2026, dated...............

Dear Sir,

We, the undersigned ……. [insert name of the “Applicant”] having read, examined and understood in detail the **(INVITATION FOR EXPRESSION OF INTEREST).**

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 the 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 LTD. 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 the 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 the EOI.

4. Details of the contact person are furnished as below:
   Name:
   Designation:
   Address:
   Contact numbers:
   Email Id:

We are enclosing herewith the entire response containing duly signed formats in electronic format sent *via email to* *vivekbharti@ntpc.co.in*
CC to:achourasia@ntpc.co.in as per the EOI for consideration.

5. 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.

6. 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 remain,

Yours sincerely

(Name, Designation and Signature of Authorized Person)

Annexure-A

<table>
<tr><th colspan="3">I: ESSENTIAL CRITERIA</th></tr>
<tr><th>S. N.</th><th>Intended System Description</th><th>Criteria for Participation</th></tr>
<tr><td>I-A</td><td rowspan="2">Supply of reheat type sub-critical coal fired Steam Generators in the range of 150 MWe to 250 MWe with following characteristics-
1. Main Steam outlet temperature range: 540 to 565 deg. C.
2. Reheat steam outlet temperature: 565 degC
3. Co-firing capability, coal [note-2] with 10 % to 30% of biomass[note-3]
4. Minimum Boiler & Cycle Efficiency: As per CERC requirements for such unit sizes [note-4].
5. Catering to CEA's flexibilization requirements for load ramping & minimum technical load criteria [note-5].</td><td>CATEGORY - 1
The applicant of EOI should have designed, engineered, manufactured/got manufactured, erected/supervised erection, & commissioned/supervised commissioning of at least one number of the coal fired reheat type sub-critical, balanced draft, natural circulation Steam Generator having rated capacity of 150 MWe or above which should have been in successful operation for a period not less than one (1) year prior to the date of publication of this EOI.

Remarks: In case of a non-Indian company, the applicant should have registered in India, either a subsidiary or as a Joint Venture (JV) company before the last date of EOI submission.</td></tr>
<tr><td>I-B</td><td>CATEGORY - 2
i) The applicant of EOI should be a regular Indian manufacturer of coal fired steam generators having technology collaboration/association with the applicant as per CATEGORY-1.
ii) The applicant of EOI (in technical collaboration with Category-I applicant) should have designed, engineered, manufactured/got manufactured, erected/supervised erection, & commissioned/supervised commissioning of at least one number of the coal fired reheat type sub-critical, balanced draft, natural circulation Steam Generator having rated capacity of 150 MWe or above which should have been in successful operation for a period not less than one (1) year prior to the date of publication of this EOI.

Remarks: The applicant should be an Indian company.</td></tr>
<tr><th colspan="3">II: ADDITIONAL CRITERIA</th></tr>
<tr><td>II</td><td>Flexibilization Capability</td><td>The following capabilities towards designing the steam generator for load flexibilization are additional for such smaller units -
1. for Two shift operation, & minimum technical load (MTL) as 25% [Note-A].
2. Capabilities to design pressure parts for creep, fatigue & creep-fatigue loading criteria as also per EN-12952-3.
3. Burners for part-load conditions.
4. Condensate Polishing Unit (CPU) for such smaller units.
5. Flue gas re-circulation system design.
6. Low Pressure Economizer to maximize efficiency gains.
Remarks:
1. Note-A: The applicants should propose a design collaborator/technology partner who should have successfully provided technical consultancy for minimum two (02) coal fired steam generators (of minimum 150 MWe) and those plants should have been in successful operation after execution of such design incorporation for a minimum period of one year.
2. Bidder may include furthermore proven design features towards improving the flexibilization & heat rate of the units.</td></tr>
<tr><td colspan="3">Note:
1. Subscript 'e' indicate electrical output in Mega Watts (MW).</td></tr>
</table>

2. Refer Annexure for coal properties.
3. As per CEA specified characteristics*.
4. Refer CERC (Terms and Conditions of Tariff) Regulations, 2024*
5. Refer CEA (Flexible Operation of Coal based Thermal Power Generating Units) Regulations, 2023*

*Revised from time to time

Note:

1. Applicants to submit all the necessary details to support the above criteria. Also, refer the relevant schedule appended with the EOI for data requirements.

Annexure-2

GENERAL INFORMATION TO BE SUBMITTED BY APPLICANT

1. Name of Applicant Company:
2. Legal status of the Applicant Company:
3. Brief description of the Company with details of its business groups/subsidiaries/ affiliates:
4. Date of Incorporation:
5. Date of Commencement of Business:
6. Shareholding details:
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. Existing Infrastructure & design facilities – locations, capacity, Complete address.
9. Documents to be enclosed:

    Technical Credentials –

    a) Supporting document for technology ownership/ licensing details.
    b) Details of Intellectual Property Rights (IPR) held, patent filed/held, and MOU/agreement signed.

    Financial Credentials –

    a) Copies of Audited Financial Statements (Annual Reports) for preceding five (5) financial years as on the date of EOI submission.
        i. Average Annual Turnover for preceding five (5) financial years.
        ii. Net worth for the preceding financial year.
        iii. Paid up Share capital for the preceding financial year.

    We confirm that we are interested in Design, Manufacture, Supply, Erection, Testing & Commissioning of efficient Sub-Critical Thermal Power Units (150 MW to 250 MW) suitable for two shift operation & Minimum Technical Load (MTL) AS 25%.

10. We agree that the reference units shall be considered successful based on minimum one-year completion criteria. We also agree that the successful completion of the project to establish performance shall be as stipulated by NTPC for respective system (s) / equipment(s).
11. We confirm that the Steam Generator design & further activities will follow specification requirements as well as Codes and Standard as applicable & specified.

(Sign & Company Seal)
Authorized signatory

Annexure-3

ESSENTIAL INFORMATION TO BE SUBMITTED BY APPLICANT FOR SYSTEM/ EQUIPMENT MENTIONED AT ANNEXURE-A

Essential Information:

		Write Yes/No & provide details with attachments.	
S.No.	**Information/ Details Head**	**Details**	**Additional Data**
A	**Information related to Essential Criteria**		Refer Annexure-A for Essential Criteria (I)
1	Application Category (Category-1/ 2 as per Annexure-A)		
2	Design & manufacturing capabilities & infrastructure owned by the applicant		
	a) Software Tools & Licenses (Name, License validity)		
	b) Whether the source-codes of the necessary design tools/softwares available for boiler, furnace & associated system design.		
	c) Experience in Pulverized Coal fired Steam Generators		
	d) Experience in Steam Generators other than the pulverized coal fired.		
	e) Experience in bio-mass co-firing with coal i. PC Type ii. Other Type		
3	Location of design capabilities/softwares & infrastructure facility		
4	Technical Expertise in the relevant field of essential & additional criteria as per Annexure-A		
	a) Experts/ Engineers (with Qualification)		
	b) Experience (in years) of Engineers at 4(a) above		
	c) Mention specific features for Two shift operation & MTL requirements.		
5	Data Security (Policy docs, compliance certificates etc)		
6	Areas/ Industrial Sectors of successfully completed projects		
7	Successfully delivered projects in pulverized coal (PC) fired thermal power plants (>=200MW units)		
	Successfully delivered projects in other than PC fired thermal power plants (>=200MW units)		
8	Name of Technology Collaborator/Licensor		
9	Manufacturing Details of coal fired steam generators as per Category-2		
10	Scope division between the applicant and Technology collaborator.		
11	Mention design collaborator/technology partner: for load cycling (Two shift operation & MTL) related design requirements (attach credentials of the technology company proposed with credentials)		
B	**Information related to additional criteria (Provide Yes/No with capability details)**		Refer Annexure-A for additional criteria (II)

	1. Mention & attach specific design features for Two shift operation		
	2. Mention & attach specific design features for MTL as 25%		
	a) Mention the number of cycles, considering 25 years of life for Two shift operation & MTL specified.		
	b) Mention Ramp-rates for the unit		
	3. Capabilities to design pressure parts for creep, fatigue & creep-fatigue loading criteria as also per EN-12952-3.		
	4. Burners for part-load conditions.		
	5. Condensate Polishing Unit (CPU) for such smaller units.		
	6. Flue gas re-circulation system design.		
	7. Low Pressure Economizer to maximize efficiency gains.		
	8. Additional proven design features towards improving the flexibilization & heat rate of the units		
	9. Details of the design features with Two shift operation & MTL as 25%		
	10. Proposed/ Existing tie-ups with collaborator/technology partner/ reputed expert organization for implementation of additional criteria (**II**) as per Annexure-A		
C	**Experience Details as per the Annexure-A**		
S.No.	**Information/ Details Head**	**Details**	**Additional Data**
1	Application Category (Category-1/ 2 as per Annexure-A)	Category-	
2	Technology Collaborator Name		Specify details in case of Category-2
3	The applicant has at least one no. of unit, which is-		Specify Name of Plant/ Unit
	a) Designed	Yes/ No	
	b) Engineered	Yes/ No	
	c) Manufactured	Yes/ No	
	d) Got Manufactured	Yes/ No	
	e) Erected	Yes/ No	
	f) Supervised Erection	Yes/ No	
	g) Commissioned	Yes/ No	
	h) Supervised Commissioned	Yes/ No	
	i) coal fired unit	Yes/ No	Specify coal type, Ash content, GCV
	j) Whether PC fired	Yes/ No	
	k) Type of Steam generator, if not PC fired	Yes/ No	
	l) having Reheat	Yes/ No	
	m) a sub-critical Unit	Yes/ No	
	n) having balanced draft	Yes/ No	
	o) having natural circulation	Yes/ No	

	p) of at least 150MW Capacity	Yes/ NO	Specify Unit capacity in MW & its Steaming Capacity
	q) in successful operation for period of at least one year prior to the date of EOI publication	Yes/ No	Specify Commissioning date, & successful operation years.
	r) Details as per regular Indian manufacturer of coal fired steam generators		
	i. No. of steam generators manufactured		
	ii. Type of steam generators manufactured		
	iii. Fuel Type		
	iv. Steam generators size & capacity		
	v. Other details		
3-A	Credentials for the design collaborator/technology partner as per Criteria-II at Annexure-A for 'for Two shift operation, & minimum technical load (MTL) as 25%''.	Attached details & Annexures	
	a) Technology/Design Company Name		
	b) Plant details wherein the above Two Shift operation & MTL interventions carried out		
	c) Year of interventions & Purchase Order details		
	d) Type of coal fired unit & type of coal details		
	e) Size of coal fired Steam Generator (in MWe)		
	f) No. of years in successful operation		
	g) Number of Cycles considered		
	h) Ramp rate designed & achieved		
	i) MTL designed & achieved		
4	Specify the following details of unit mentioned at sl.no, 2 above		
	a) Superheater Outlet Pr		In ksc-g
	b) SH Temp.		In deg-C
	c) RH Temp.		In deg-C
	d) Steam Generator Efficiency at 100% TMCR and 55% TMCR		
	e) Aux. Power Cons. %		
	f) Cycle efficiency %		
	g) Whether unit has Condensate Polishing Unit	Yes/ No	
5	Whether applicant has experience in providing sub-critical units with biomass cofiring capability with coal	Yes/ No	Specify type of biomass, max. % of cofiring by wt%, Name of plant/ Unit
6	Max. capacity of coal fired sub-critical Unit		Specify Capacity in MW, Steaming Capacity in TPH

	a) designed/ Engineered by self	Yes/ No	
	b) Designed/ Engineered in collaboration or under technology agreement	Yes/ No	Specify the Designer Name
	c) No. of sub-cr. Units supplied		Details with MW
7	Specify range of Steam Parameters (SHO Pr/ SH Temp/ RH Temp.) designed/ engineered, supplied by applicant		
8	Whether any coal fired unit supplied/ modified by applicant is capable meeting the CEA flexibilization ramping requirements	Yes/ No	
	a) Max. ramp rate achieved (%)		Specify plant/ unit details
	b) Minimum Technical Load achieved in %		Specify plant/ unit details
9	Specify design interventions by applicant (self or in technology agreement) for making the sub-critical units capable of meeting the CEA requirements of flexible units specifically the following but not limited to-		Specify details
	a) Header Thickness		
	b) Drum Thickness		
	c) Enhancing Creep-fatigue life of components		
	d) Firing system (mills, burners etc.)		
	e) Advanced Process control		
	f) Any other interventions		

Note: Add additional rows for requisite information.

SCHEDULES

(SCHEDULES ARE TO BE FILLED UP AND SUBMITTED IN MS WORD FORMAT. All CREDENTIALS/SUPPORTING DOCUMENTS RELEVANT TO THE SCHEDULES ARE TO BE SUBMITTED PREFERABLY IN SINGLE PDF FILE)

(All the documents are to be submitted on Company's Letter Head)

(INVITATION FOR EXPRESSION OF INTEREST)

(To be submitted on Company's Letter Head)

Schedule – 1

(Company Profile and Organization Structure)

Name of the Company:

Registered Address:

Contact Person & Designation:

Postal address for communication:

Telephone No.:

Fax No.:

E-mail address:

Document regarding Organization Structure and Ownership to be enclosed.

(INVITATION FOR EXPRESSION OF INTEREST)

(To be submitted on Company's Letter Head)

Schedule – 2

(TURNOVER OF THE COMPANY IN THE LAST FIVE FINANCIAL YEARS AND NETWORTH OF THE COMPANY)

A) We confirm that annual turnover of M/s............................ **[Applicant]** for the preceding five financial years is indicated below:-

Sl. No.	Financial Year	Turnover amount (In Million Rs.)
1.	25-26	
2.	24-25	
3.	23-24	
4.	22-23	
5.	21-22	
6.	19-20	

B) We confirm that Networth of M/s…**………….[Applicant]** for the preceding five financial years is indicated below:-

Sl. No.	Financial Year	Networth (In Million Rs.)
1.	25-26	
2.	24-25	
3.	23-24	
4.	22-23	
5.	21-22	
6.	19-20	

We have enclosed Balance Sheets and Profit & Loss account duly certified by Chartered Accountant

A) We hereby confirm that net worth of M/s --------- (Applicant) as on the last day of the preceding financial year on the date of publication of the EOI is given below:-

Sl. No.	Description	As on last day of the preceding financial year
1.	Paid-up Share Capital	
2.	Net worth	
3.	% age of Net worth to paid-up Share Capital	

(To be submitted on Company's Letter Head)

Schedule – 3

Relevant experience in Design, Engg., Manufacture, Supply, Testing & Commissioning of sub-critical units other than referred above in Annexure-3. Provide details of Major projects-

S.N.	Name of the project	Unit Capacity (MW), Steaming Capacity (TPH)	Location	Date of award of project	Date of Commissioning	Boiler & Net Cycle Efficiency	Attach relevant docs. In support of claim & a

I. Scope Description Sheet :

Name of the project [at least one project mentioned above]			
S.N.	**Scope**	**Whether Yes/ No**	Attach documents in support of the claim, provide details
A	**Scope of Applicant**		
i.	Design		
ii.	Engineering		
iii.	Manufacturer		

iv.	Got Manufactured		
v.	Erection		
vi.	Supervised Erection		
vii.	Type of Steam Generator		
viii.	Fuel Used (Type & Proximate Analysis - FC/ VM/ Moisture/ Ash %)		
ix.	Steam Parameters (SHO Pr./ SH Temp/ RH Temp.)		
x.	APC %		
xi.	Boiler & Net Cycle Efficiency (%)		
B	**Scope of Collaborator/ Technology Provider**		
i.	Design		
ii.	Engineering		
iii.	Manufacturer		
iv.	Got Manufactured		
v.	Erection		
vi.	Supervised Erection		
C	Contact detail of customer	Name: Address:	

		Email: Phone Number: Website address:	

Note: Applicant may add details of above & other projects as well, as Attachments.

II. Client certificates or any other certificates

All relevant certificates or documents shall be submitted in pdf. file format.

(To be submitted on Company's Letter Head)

Schedule – 4

1. Details of design interventions carried out towards meeting the 'additional criteria' as per Annexure-A. Also add the ctwo shift operation & MTL related design features in detail as per Category-II at Annexure-A.

Sl. No.	Name of Power Plant with location	No. of Units with MW Capacity in which intervention was implemented	Objective of intervention (Documentary evidence attached)	Area for which the intervention was implemented (Attach details)	Major Recommendations	No. of years since the intervention was implemented	Effect of Implementation of recommendations, if available.	Remarks

2. Details of Coal Properties & Bio-mass: Ultimate / Proximate Analysis

(To be submitted on Company's Letter Head)

Schedule - 5

Indicative typical layout drawing of coal fired steam generator & associated systems to be attached for reference.

(INVITATION FOR EXPRESSION OF INTEREST)

(To be submitted on Company's Letter Head)

Schedule - 6

Broad time schedule for executing the minimum 150 MWe steam generating unit-

S. No.	Activities/Milestone	Period in months	
		Start	Finish
1.	Design & Engineering		
2.	Manufacturing		
3.	Transportation/Supply		
4.	Erection		
5.	Commissioning & testing		
6.	Operational Start		
7.	Any other activity		

(INVITATION FOR EXPRESSION OF INTEREST)

(To be submitted on Company's Letter Head)

Schedule – 7

Additional Information relevant to the work / assignment to be enclosed:

1. Scope division with details between applicant & technology collaborator.
2. Prospective technology tie-ups, if willing, with any company as per CATEGORY-1 (Annexure-A).
3. Details of additional design features as per 'Additional Criteria'.
4. Suggestions for enhancing participation of technologically capable vendors.
5. Whether design simulation capabilities like FEM (finite element method analysis), CFD etc. exist with the applicants. Provide details.
6. Any other information

APPENDIX- FUEL CHARACTERISTICS

(Annexure-IV-2 Standard Coal Characteristics, Annexure-IV-7(A,B,C,D) Biomass Characteristics)

ANNEXURE-IV-2

STANDARD COAL CHARACTERISTICS

S.No.	Characteristics		Range of coal supplies 95%			Range of coal supplies 5%	
	(as received basis)		Column - 1	Column - 2	Column - 3	Range of Adequacy Coal	
1	PROXIMATE ANALYSIS		Design	Worst	Best	Worst	Best
1.1	Total Moisture (%)		14	15	12	16	11
1.2	Ash (%)		41	45	38	46	30
1.3	Volatile Matter (%)		21	19	24	19	26
1.4	Fixed Carbon (%)		24	21	26	19	33
1.5	Total (%)		100	100	100	100	100
2	ULTIMATE ANALYSIS						
2.1	Carbon (%)		34.75	30.5	37.84	29.23	44.7
2.2	Hydrogen (%)		2.32	2.25	2.8	2.1	2.98
2.3	Sulphur (%)		0.4	0.35	0.5	0.35	0.55
2.4	Nitrogen (%)		0.85	0.6	1.2	0.55	1.3
2.5	Oxygen (%)(By difference)		5.95	5.83	6.72	5.32	8.45
2.6	Total Moisture (%)		14	15	12	16	11
2.7	Ash (%)		41	45	38	46	30
2.8	Carbonates (%)		0.58	0.32	0.78	0.3	0.86
2.9	Phosphorus (%)		0.05	0.03	0.08	0.02	0.1
2.10	Chloride (%)		0.1	0.12	0.08	0.13	0.06
2.11	Trace Elements (ppm)						
	Arsenic	ppm	0.035	0.04	0.03	0.05	0.02
	Lead	ppm	25	30	10	35	10
	Mercury	ppm	0.06	0.1	0.02	0.15	0.01
	Selenium	ppm	0.3	0.5	0.03	0.6	0.02
	Total		100	100	100	100	100
2.12	GCV (Kcal/Kg)		3300	3000	3750	2900	4300
2.13	Hard Grove Index		55	50	60	50	70
2.14	YGP		75	80	70	85	65

3	ASH ANALYSIS						
3.1	Silica (%)		58.52	57.8	60.12	57.3	61.2
3.2	Alumina (%)		28.17	27.42	28.67	27.1	29.1
3.3	Iron Oxide (%)		7.2	7.6	6.03	8	5.5
3.4	Titania		1.68	1.78	1.56	1.86	1.32
3.5	Phosphoric Anhydride (%)		0.6	0.8	0.46	0.82	0.12
3.6	Lime (%)		1.36	1.7	1.32	1.84	1.05
3.7	Magnesia (%)		0.74	1.22	0.5	1.28	0.31
3.8	Sulphuric Anhydride (%)		0.2	0.08	0.3	0.08	0.32
3.9	Sodium Oxide (%)		0.3	0.26	0.5	0.12	0.65
3.1	Balance Alkalies (by difference)		1.23	1.34	0.54	1.6	0.43
	Total		100	100	100	100	100
4	ASH FUSION RANGE						
	REDUCING ATMOSPHERE						
4.1	Initial Deformation Temp.(°C)		1150	1100	1200	1100	1200
4.2	Hemispherical Temp. (°C)		1300	1250	1350	1250	1350
4.3	Fusion Temperature (°C)		1400	1400	1400	1400	1400

Annexure-IV-7(A)

S.N.	Technical Data	Unit	Specifications for Torrefied Pellet
1	Base Material		**Agro residue:** Which means the leftover portion of the agriculture produce such as stubble/straw/stalk/husk of those agro residue which are surplus and not being used as animal fodder such as paddy, soya, arhar, gwar, cotton, gram, jawar, bajara, moong, mustard, seasam, til, maize, sunflower, jute, coffee etc., groundnut shell, coconut shell, castor seed shell etc., pine needle, elephant grass, sarkanda and horticulture waste such as dry leaves and trimmings generated during the maintenance and pruning of trees and plants. Wood obtained from tree cutting shall not be treated as agro residue and shall be not to be used as base material or mixing purpose whatsoever.
2	Diameter	mm	In case of cylindrical shape: Diameter: Not more than 35 mm Length: Random For other shapes: No dimension should exceed 35 mm.
3	Fines % (<3 mm) (ARB*)	Wt%	fines ≤ 5%
4	Gross Calorific Value (GCVARB*)	Kcal/Kg	**Refer below**
5	Moisture (ARB*)	Wt%	<= 15% (not more than 15%)
6	Bulk density	Kg^3	600

*ARB – As Received Basis

Annexure-IV-7(B)

The sample was prepared by torrefying rice straw at 300 deg C with a holding time of one hour. Following analysis are carried out at NETRA using the powdered torrefied rice straw samples and the results of various testing for the specific sample is tabulated below:

a. Proximate Analysis (wt %, Air Dried Basis)

M	Ash	VM	FC
6.68	21.66	47.68	23.98

b. Ultimate Analysis (wt %, Air Dried Basis)

C	H	N	S	O
46.65	3.93	1.13	0.14	19.81

c. GCV : 4201 kcal/kg

d. Ash Fusion Temperature under reducing conditions: ^0C

IDT	ST	HT	FT
1134	1357	1374	1422

e. Ash Elemental Analysis (Elements expressed as Oxides in %w/w)

Na2O	MgO	Al2O3	SiO2	P2O5	SO3	K2O	CaO	TiO2	MnO	Fe2O3
2.423	7.783	4.623	67.48	1.9	1.9	6.15	4.21	0.39	0.03	2.83

Annexure-IV-7(C)

For the Torrefied Rice Straw Pellets (Prepared by torrefaction of rice straw at 300 deg C with holding time of 1 hr) tested at NETRA, the test results are as follows:

A. For Anion (ISO 16994:2016 E-Solid Biofuels- Determination of total content of sulphur and chlorine)-reported as wt % dry basis

a. Chlorine (Cl): 0.32%

b. Fluorine (F) : 0.09%

B. For Cation (ISO 16967:2015 E-Solid Biofuels- Determination of major elements …)- Reported as wt % dry basis

a. Sodium (Na): 0.31%

b. Potassium (K): 2.04%

Note: The above details as at Annexure-IV-7(A), IV-7(B & IV-7(C) are indicative only and shall vary based on the exact raw material and its subsequent processing.

Annexure-IV-7(D)

SPECIFICATIONS FOR NON-TORREFIED BIOMASS PELLETS

S. N.	Technical data	Unit	Specifications of Non-Torrefied Biomass pellets
1	Base Material	-	Agro residue
2	Shape and Size	mm	Cylindrical shape: Diameter: Not more than 25 mm Length: should not exceed 35 mm.
3	Fines% (length<3 mm) (ARB*)	Wt %	fines ≤ 5% [Less than 5% by weight]
4	Gross Calorific Value (GCV-ARB*)	kCal/kg	Acceptable range 2800 kCal/Kg to 4000 kCal/kg [both inclusive]
5	Moisture (ARB*)	Wt %	Not more than 14%
Raw Material for pellet Manufacturing		• Base material for pellet manufacturing shall be agro residue, which means the leftover portion of the agriculture produce, such as stubble/straw/stalk/husk of those agro residues which are surplus and not being used as animal fodder, such as paddy, soya, arhar, gwar, cotton, gram, jawar, bajara, moong, mustard, sesame, til, maize, sunflower, jute, coffee etc., groundnut shell, coconut shell, castor seed shell etc., pine needle, elephant grass, sarkanda, bamboo and its by product (e.g. Bamboo chips, Cuttings, Bamboo Dust etc.) and horticulture waste such as dry leaves and trimmings generated during the maintenance and pruning of trees and plants. • Agro residue-based biomass pellets can be manufactured by single base material or mixing multiple base materials together. • Mixing materials such as by product of woodwork factory such as wood chips, saw dust, furniture waste etc., bagasse, press mud, molasses or natural additives/binder such as lignin, starch, and animal dung may also be used with agro residue in limited proportion to enhance material properties and same shall be explicitly mentioned by supplier in consignment details.	

*ARB – As Received Basis

NON-TORREFIED BIOMASS CHARACTERISTICS

(A) BIOMASS PELLET CHARACTERISTICS

S.N.	Test Parameters	Observed Results	Test Method
1	**Proximate analysis**		
	Moisture (ADB), % by mass	5.62	IS: 1350 (P-1) 1984
	Ash content, % by mass	18.90	IS: 1350 (P-1) 1984
	Volatile matter, % by mass	65.95	IS: 1350 (P-1) 1984
	Fixed Carbon, % by mass	9.53	IS: 1350 (P-1) 1984
	Gross calorific value, kcal/kg	3855	IS: 1350 (P-2) 1970
	Net calorific value, kcal/kg	3601	IS: 1350 (P-2) 1970
	Ignition temperature, ºC	240	ASTM E1491
	Chlorine, % by mass	0.61	ASTM D4208-13
2	**Ultimate analysis**		
	Carbon, %	42.08	IS: 1350 (P-4/sec 1) 1974
	Hydrogen, %	4.79	IS: 1350 (P-4/sec 1) 1974
	Nitrogen, %	0.65	IS: 1350 (P-4/sec 2) 1999
	Sulphur, %	0.02	IS: 1350 (P-3) 1969
	Ash, %	18.90	IS: 1350 (P-1) 1984
	Moisture (ADB),, %	5.62	IS: 1350 (P-1) 1984
	Oxygen, %	27.94	By difference

(B) ASH ANALYSIS

S. N.	Test Parameters	Observed Results	Test Method
1	**Chemical composition of ash**		**IS: 1355- 1984/XRF**
	Silica (as SiO_2), % by mass	56.41	
	Alumina (as Al_2O_3), % by mass	1.94	
	Iron Oxide (as Fe_2O_3), % by mass	2.05	
	Calcium Oxide (as CaO), % by mass	5.68	
	Magnesium Oxide (as MgO), % by mass	5.28	
	Sodium Oxide (as Na_2O), % by mass	0.11	
	Potassium Oxide (as K_2O), % by mass	16.58	
	Sulphate (as SO_3), by mass	2.42	
	Chloride (as Cl), % by mass	6.73	
	Zinc Oxide (as ZnO), % by mass	0.07	
	Manganese Oxide (as MnO), % by mass	0.59	
	Phosphate (as P_2O_5), % by mass	2.04	
2	**Ash fusion profile (Oxidizing medium)** Initial deformation temperature Softening temperature Hemispherical temperature Fusion temperature	 1111 1164 1184 1208	ASTM D1857-16
3	**Ash fusion profile (Reducing medium)** Initial deformation temperature Softening temperature Hemispherical temperature Fusion temperature	 1074 1022 1051 1074	ASTM D1857-16

Note: The above are typical specifications and characteristics of biomass pellet, however, same shall vary based on the exact raw material and its subsequent processing.