SUB-SECTION–I-B

PROJECT INFORMATION

CLAUSE NO.	PROJECT INFORMATION

1.00.00 BACKGROUND

KTPC PH-I (2X500 MW) units are in operation near Benjhidih Village of Koderma District in Jharkhand. The Present proposal is for KTPS PH-II (2x800 MW) as an extension of the existing Phase-I.

2.00.00 LOCATION AND APPROACH

The Koderma Thermal Power Station project is located near Benjhidih Village of Koderma District in Jharkhand. National Highway NH-19, which is referred to Delhi–Kolkata highway is about 25 Km from the Site. The nearest National Highway NH- 20 is about 8 Km from the site.

The Site is located at latitudes of 24°23'00" N and longitudes of 85°33'15" E respectively.

The Site can be approached from District Head Quarters through National Highway NH-20 and thereafter the internal road of the town. The nearest airport is Gaya Airport at Bodh Gaya at about 108 Km from the project site. The project is situated about 150 Km from Ranchi, the capital of Jharkhand.

Town/City

Nearest Town	Koderma About	7 Km
District Head Quarters	Koderma Collectorate	About 16 Km
Nearest Major Town	Hazaribagh	About 60 Km
Nearest Major	City Gaya	About 115 Km

2.01.00 RAIL LINK

Nearest Railway Station	Koderma	About 2 Km
Other Nearby Important Stations	Gomo Junction	About 124 Km
Other Major Stations	Gaya Junction	About 114 Km

2.02.00 AIRPORT

Nearest Commercial Airport	Gaya Airport, Gaya	About 108 Km
Other Important Commercial Airport	Birsa Muda International Airport, Ranchi	About 170 Km

The vicinity Plan is placed in **Annexure-I.**

3.00.00 CAPACITY

Phase-I	:	1000 MW (2x500 MW) – Under Operation
Phase-II	:	1600 MW (2x800 MW) - Present proposal

4.00.00 LAND

About 1879 Acres of Land has been acquired for the Koderma Thermal Power station. The expansion project is envisaged to be accommodated within the land already acquired during Phase-I.

5.00.00 WATER

The water requirement of Koderma TPS is being met from the Barakar River above Tilaiya Reservoir, which is about 8 Km from the Site.

As per MOEF&CC vide notification dated 07.12.2015 and its amendment dated 28.06.2018, the water requirement for the Ph-II project is limited to 48 Cusecs. The project shall be provided with Water Cooled Condenser (WCC) and accordingly, the consumptive make-up water requirement would be about 48 Cusecs.

A total water allocation of 18.50 MGD (29 Cusecs) is available with DVC for 2x500 MW units of KTPS. The water requirement for the Ph-II project (2x800 MW) is about 48 Cusecs (with ash water recovery) and about 68 Cusecs (without ash water recovery). Damodar Valley Reservoirs Regulating Committee (DVRRC) vide its minutes of the 145th meeting held on 24.11.2022 has consented to allocate additional water of 44.30 MGD (70 Cusecs) to the Ph-II project (2x800 MW) on a provisional basis for a period of 4 years (30.11.2026) and thereafter water allocation would be as per actual requirements of the project..

A closed cycle cooling water system using cooling towers is envisaged for Ph-II of the project.

6.00.00 COAL

6.01.00 The coal requirement for the project is estimated at about 7.43 MTPA corresponding to 85% PLF considering GCV of 3500 Kcal/Kg. The likely coal source for the project is from the Central Coalfields Ltd (CCL). The coal linkage for the project is yet to be tied up/ to be established.

6.02.00 Coal Transportation

The transportation of Coal from Coal Mines to Koderma Ph-II is proposed through Rail mode.

6.03.00 Coal Quality

The primary fuel for the main steam generator shall be coal. The coal quality parameters indicated in **Annexure-IV-2** are to be considered for steam generator design.

7.00.00 Fuel Oil

The fuel oils to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel Oils having the characteristics given in **Annexure-IV-1**.

8.00.00 MODE OF OPERATION : Middle load (two shifting and load cycling)

9.00.00 STEAM GENERATOR TECHNOLOGY

The steam generators shall be super critical, once through, water tube type, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.

10.00.00 **FLUE GAS DESULPHURIZATION SYSTEM (FGD) & DeNOx ready System:**

The project is envisaged with environmental emission control devices and steam generator design towards compliance with the applicable emission norms. The secondary NOx control system (SCR/SNCR or a hybrid of both) is not included in the scope of this contract. Necessary provisioning as detailed in specifications shall however be in the scope of the Contractor. The limestone to be used for the design of the FGD system shall be as per the characteristic given in **Annexure-IV-5**.

11.00.00 **CONSTRUCTION POWER**

The requirements of the construction power supply for the project would be met from already existing 50MVA 132/11kV Construction power transformer under Ph-I. Necessary 11 KV ring main/LT sub-stations shall be provided for Ph-II.

12.00.00 **POWER EVACUATION SYSTEM**

It is proposed to consider 400kV step up voltage for the Ph-II project in line with all the existing units of Koderma TPS. Two (2) numbers of 315 MVA, 400/220/33kV ICT exist at KTPS switchyard. These shall be replaced with new two (2) numbers 500 MVA, 400/220/33kV ICTs. Along with this, a new 500 MVA, 400/220/33kV ICT is proposed for power evacuation at 220kV voltage level. For this 3rd ICT, new 400kV switchyard Bay has been envisaged.

The issue of power evacuation of the proposed project shall be taken up by Damodar Valley Corporation with the appropriate Transmission Utility (CTU) as per regulatory provisions. The above scheme considered presently shall be reviewed based on the finalized ATS of the project.

13.00.00 **PLANT WATER SCHEME**

13.01.00 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

All plant auxiliaries and station auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit.

It is proposed to provide independent primary cooling water circuit for TG & its auxiliaries and Steam Generator & auxiliaries (including FGD & station auxiliaries) on Unit basis.

13.02.00 **Other Miscellaneous Water Systems**

CW system blow down water shall be used in Ash Handling System, FGD process water and CHP dust suppression, service water etc. (Refer Plant Water Scheme). Further, the plant service water requirement, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water system, APH wash & FGD system (gypsum cake wash) make up shall be met from PT plant of CW system (PT-CW). The

waste service water collected from various areas and coal-laden water from coal handling plant shall be treated as per requirement and reused.

The quality of Raw water, & DM water is given in this sub-section at **Annexure-III-A, and IIIB**.

13.03.00 Condenser Cooling (CW) Water System

It is proposed to adopt a recirculating type cooling water system with Induced Draft type cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from Cooling Tower will be led to CW pump house through the cold water channel by gravity.

Plant water scheme is included in **Part-E** of the technical specification.

14.00.00 ENVIRONMENTAL ASPECTS

Koderma TPS, Phase-II is proposed to be constructed on the land already acquired for ultimate capacity of KTPS, which conforms to the siting criteria for thermal power plants. Environment and Forest Clearances for KTPS Ph-I have already been accorded by MoEF&CC.

16.00.00 METEOROLOGICAL DATA

The meteorological data from nearest observatory is placed at **Annexure-II.**

17.00.00 CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Part-B Civil Works D-1-12(E) of this section.

18.00.00 CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part-B Civil Works D-1-12(D) of this section

19.00.00 Vulnerability Atlas of India(VAI), prepared by Building Materials, Training and Promotion Council (BMTPC) under Ministry of Housing and Urban Affairs, is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT-wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation and construction stage. The VAI provides necessary information for risk analysis and hazard assessment and is available at website www.bmtpc.org.

As per Government's directive, it is mandatory for the bidders to refer VAI for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning, designing and execution of the project in terms of following details:

i) Seismic zone (II to V) for earthquakes
ii) Wind velocity
iii) Area liable to floods and Probable max. surge height
iv) Thunderstorms history
v) Number of cyclone storms/sever cyclone storms and max sustained wind specific to coastal region
vi) Landslides incidences with Annual rainfall normal
vii) District wise Probable Max. Precipitation

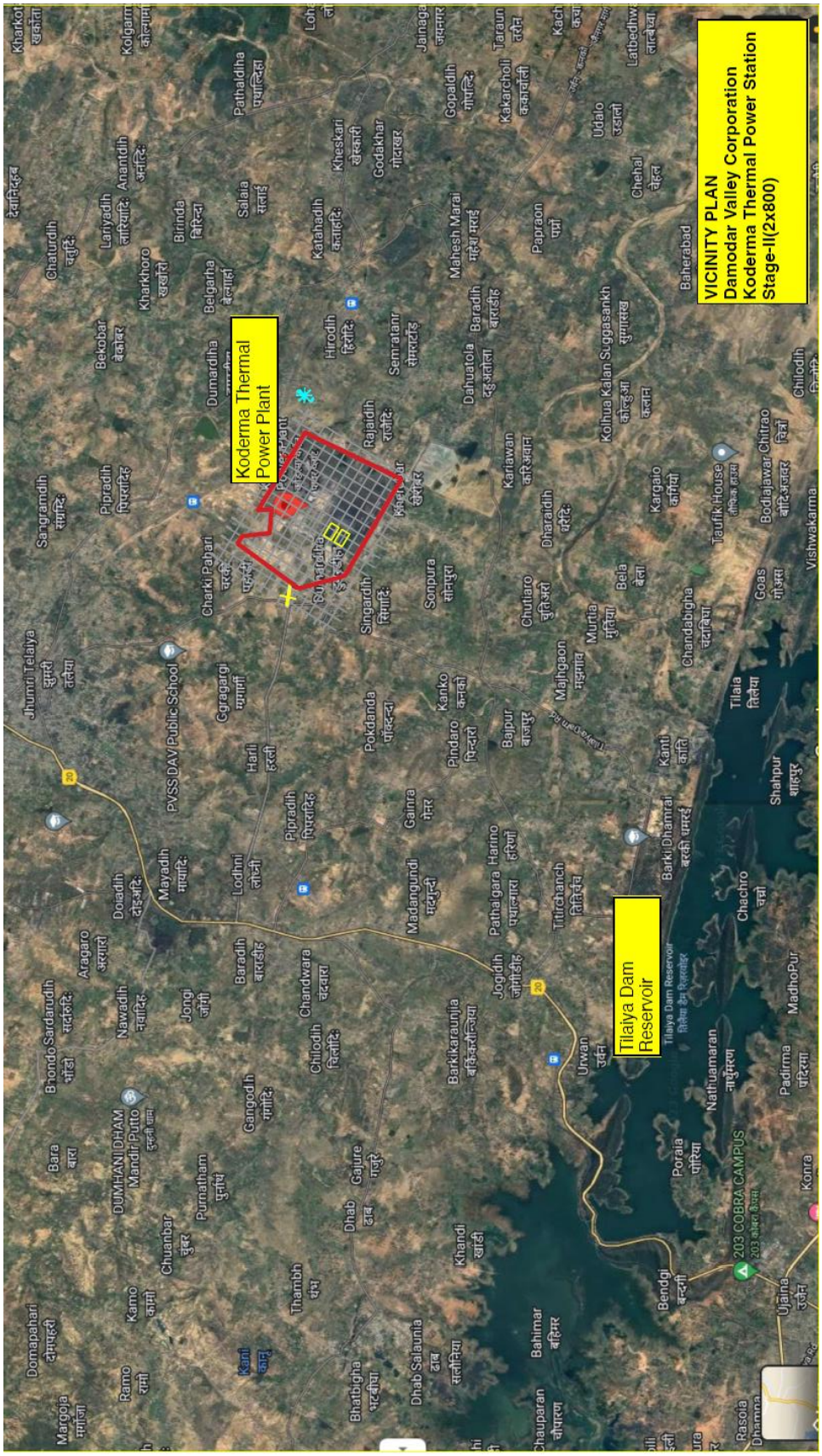
Accordingly, bidder should refer VAI while planning, designing and execution of the project.

However, for design of structures/facilities and equipment, the criteria for earthquake resistant design of structures and equipment, the criteria for Wind Resistant Design of Structures and Equipment and design parameters for drainage facilities, stipulated in the Technical Specification shall be followed.

For other information like area liable to floods, probable max. surge height, landslide, thunderstorm, cyclone etc. agencies are required to refer the VAI.

CLAUSE NO.	PROJECT INFORMATION

Annexure-I



Annexure-II

Table
Climatological Data

Month	Temperature (°C)		Rel.Humidity(%)		Vapour (hpa)	Pressure	Mean Wind Speed (km/hr)	Rainfall (mm)	Cloud Amount (Oktas)	
	Min	Max	Morning	Evening	Morning	Evening			Morning	Evening
Jan	9.1	22.8	62	49	11.0	10.8	4.0	20.1	1.2	1.3
Feb	11.9	25.9	53	38	11.3	10.1	5.6	16.6	1.0	1.0
March	17.0	31.7	39	27	11.8	10.1	5.8	12.8	1.1	1.2
April	22.7	37.0	33	23	13.6	11.6	7.5	18.8	1.2	1.5
May	25.7	38.6	41	28	19.0	15.7	7.6	27.2	1.3	1.4
June	26.5	35.8	61	50	26.0	24.6	8.1	159.2	4.0	4.6
July	24.7	31.5	81	74	29.8	30.0	7.9	270.7	5.8	5.8
Aug	24.4	30.7	82	76	29.8	30.0	7.1	279.6	5.7	5.9
Sep	23.8	30.6	80	73	28.3	28.0	6.9	203.8	4.3	5.0
Oct	20.8	29.9	69	62	22.9	22.4	4.5	110.5	2.3	2.4
Nov	14.0	26.8	58	52	15.4	15.0	3.3	4.0	1.3	0.9
Dec	9.6	23.2	60	48	11.7	11.2	3.8	1.7	1.0	1.0

Source: IMD Station at
Tilaya (1956 to 1978)

Annexure-IIIA

RAW WATER ANALYSIS

Sl. No.	Constituent	As	Value
1.	Calcium	$CaCO_3$, ppm	60
2.	Magnesium	$CaCO_3$, ppm	29
3.	Sodium	$CaCO_3$, ppm	37
4.	Potassium	$CaCO_3$, ppm	2
5.	Total Cat ions	$CaCO_3$, ppm	128
6.	Bicarbonates	$CaCO_3$, ppm	105
7. .	Carbonates	$CaCO_3$, ppm	--
8.	Nitrate	$CaCO_3$, ppm	--
9.	Chloride	$CaCO_3$, ppm	17
10.	Sulphate	$CaCO_3$, ppm	6
11.	Total Anions	$CaCO_3$, ppm	128
12.	Silica	SiO_2	15
13.	Iron	Fe	0.3
14.	pH Value	-	7.4
15.	Turbidity	NTU	300
16.	BOD	mg/l	3

ANNEXURE-IIIB

ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER		
Sl.No.	**Characteristics**	**Value**
1.	Silica (Max.)	0.02 ppm as Sio2
2.	Iron as Fe	Nil
3.	Total hardness	Nil
4.	pH value	6.8 to 7.2
5.	Conductivity	Not more than 0.1 micro mhos / cm excluding the effects of free CO2

ANNEXURE-IV-1

LIGHT DIESEL OIL CHARACTERISTICS

AS PER IS 15770-2008

	Characteristics	LDO
1.	Pour Point (max)	21 °C & 12°C for Summer and Winter respectively
2.	Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0
3.	Sediment percent by mass (max)	0.10
4.	Total sulphur percent by mass (max)	1.5
5.	Ash percentage by mass (max)	0.02
6.	Carbon residue (Rams bottom) percent by pass (max.)	1.50
7.	Acidity inorganic	Nil
8.	Flash point (Min.) - Pensky Martens	66 deg.C
9.	Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2
10.	Water content, % by volume (max)	0.25
11.	GCV(kcal/kg)	10,000

ANNNEXURE-IV-2

Sl. No.	Characteristics	Unit	Design Coal	Worst Coal	Best Coal	Range of Adequacy Coal
A	Proximate Analysis (As received basis):-					
1	Total Moisture	%	14.50	18.00	12.00	12.00-18.00
2	Ash	%	40.00	46.00	36.00	33.00-46.00
3	Volatile matter	%	18.50	18.00	22.00	23.00-18.00
4	Fixed Carbon	%	27.00	18.00	30.00	31.00-18.00
B	Ultimate Analysis (As received basis):-					
1	Carbon	%	34.50	23.08	37.32	40.6-23.08
2	Hydrogen (H_2)	%	2.95	3.54	3.92	4.02-2.95
3	Nitrogen (N_2)	%	1.40	1.45	1.60	1.40 - 1.68
4	Oxygen (by difference) (O_2)	%	5.59	6.70	8.32	8.12 – 5.59
5	Sulphur (S)	%	0.46	0.60	0.40	0.40 - 0.60
6	Carbonates (CO_3)	%	0.57	0.60	0.40	0.40 – 0.60
7	Phosphorus (P_2)	%	0.03	0.03	0.04	0.04-0.03
8	Total Moisture (H_2O)	%	14.50	18	12	12.00 - 18.00
9	Ash	%	40.00	46	36	33.00 - 46.00
10	Gross Calorific Value (As recived basis)	Kcal/kg	3550	2800	4000	4300 - 2800
	Hard groove index		55	50	60	50-65
	YGP (mg/kg)		80	80	80	80

For FGD design, following shall be considered additionally:

1. Sulphur 0.6%

For FGD design and guarantee condition-HCL (ppm), wet-45 & HF (ppm) wet-12 may be considered respectively.

C. Ash Analysis

Sl. No.	Characteristics	Unit	Design Coal	Worst Coal	Best Coal	Range of Adequacy Coal
1.	Silica (SiO_2)	%	59.79	61.30	56.70	62.00-56.00
2.	Alumina (Al_2O_3)	%	25.36	28.00	23.00	28.00-23.00
3.	Iron Oxide (Fe_2O_3)	%	7.20	6.00	10.00	6.00-10.00
4.	Titania (TiO_2)	%	1.20	1.00	1.50	1.00-1.70
5.	Phosphoric Anhydride (P_2O_5)	%	2.60	1.50	3.00	1.00-3.00
6.	Lime (CaO)	%	0.88	0.50	1.50	0.50-1.70
7.	Magnesia (MgO)	%	0.55	0.40	1.00	0.4-1.10
8.	Sulphuric Anhydride (SO_3)	%	1.20	0.50	1.40	0.50-1.70
9.	Balance Alkalies (by difference) (Na_2O + K_2O)	%	1.22	0.80	1.40	0.60-1.80

D. Ash Fusion Range (Reducing Atmosphere)

1	Initial Deformation Temperature (IDT)	°C	1100	1100	1100	1150-1100
2	Hemispherical Temperature	°C	1300	1250	1350	1400-1250
3	Flow Temperature	°C	1400	1400	1400	1450-1400

ANNEXURE-IV-3

HIGH SPEED DIESEL OIL CHARACTERISTICS

[AS PER IS 1460-2005 (BS-II)]

S. No.	Particulars	Unit	Value
1.	PHYSICAL PROPERTIES		
	a. Distillation volume recovery @ 350°C	% vol. (min)	85
	b. Distillation volume recovery @ 370°C		
	c. Kinematic Viscosity @ 40 °C	% vol. (min)	95
	d. Density @ 15 Degree C		
	e. Pour Point	cSt	2.0 – 5.0
	- Summer	kg/m^3	820 – 860
	- Winter		
	f. Cold Filter Plugging Point	°C (max)	15
	- Summer	°C (max)	03
	- Winter		
	g. Flash Point (Abal)	°C (max)	18
	h. Lubricity WSD 1.4 @ 60 °C	°C (max)	06
		°C (max)	35
		Microns (max)	460
2.	HEATING VALUE		
	a. Higher Heating Value (HHV)	Kcal/Kg	11,000
	b. Lower Heating Value (LHV)	Kcal/Kg	10,300
3.	ACIDITY		
	a. Inorganic	mg KOH/g	Nil
	b. Total	mg KOH/g	0.2 (max.)
4.	Copper Strip Corrosion 3 hours @100^0C	No.	1 (max)
5.	RCR on 10% residue	% wt.	0.3 (max)
6.	CONTAMINANTS		
	a. Ash	ppm (wt.)	100 (max)
	b. Sediments	% wt	0.05(max)
	c. Total Sulphur	% wt	0.05(max)
	d. Water Content	% volume	0.05(max)
	e. Trace Metals		

	- Na + K	ppm (wt)	0.30(max)
	- Vanadium	ppm (wt)	0.50(max)
	- Lead	ppm (wt)	0.50(max)
	- Calcium	ppm (wt)	2.0
	- Ni + Zn	ppm (wt)	Nil
7.	Nitrogen content (FBN)	% wt.	0.015

ANNEXURE-IV-4

TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS			
Sl.No.	**Characteristics**	**Imported Coal**	
	(as received basis)		
		Worst	**Best**
1.0	**Proximate Analysis**		
1.1	Total Moisture (%)	20	16
1.2	Ash (%)	10	10
1.3	Volatile Matter (%)	30	45
1.4	Fixed Carbon (%)	40	29
1.5	Total (%)	100	100
2.0	**Ultimate Analysis**		
2.1	Carbon (%)	56.4	62.4
2.2	Hydrogen (%)	4.5	4.9
2.3	Sulphur (%)	0.9	0.8
2.4	Nitrogen (%)	0.9	0.5
2.5	Oxygen (%) (By difference)	7.3	5.4
2.6	Carbonates (%)	0	0
2.7	Phosphorous (%)	0	0
2.8	Total Moisture (%)	20	16
2.9	Ash (%)	10	10
	Total	100	100
2.10	GCV (Kcal/Kg)	5800	6500
2.11	Hard Grove Index	45	60
2.12	YGP (mg/kg)	100	70
3.0	**Ash Analysis**		
3.1	Silica (SiO2) (%)	32.74	34.94
3.2	Alumina(Al2O3) (%)	30.5	28.43
3.3	Iron Oxides(Fe2O3) (%)	18.2	15.2
3.4	Titania (TiO2)	1.56	1.76

3.5	Phosphoric Anhydride(P2O5) (%)	0.44	0.54
3.6	Lime (CaO) (%)	6.12	7.62
3.7	Magnesia (MgO) (%)	1.83	1.93
3.8	Sulphuric Anhydride (%)	6.95	7.65
3.9	Sodium Oxide (Na2O) (%)	0.3	0.4
3.10	Balance alkalies (by difference)	1.36	1.56
	Total	100	100
4.0	**Ash Fusion Temperature**		
	reducing temperature		
4.1	Initial deformation Temp (ºC)	1100	1250
4.2	Hemispherical Temp. (ºC)	1300	1350
4.3	Flow Temp. (ºC)	1400	1400

ANNEXURE-IV-5

LIMESTONE CHARACTERISTICS

Chemical Analysis (% by mass)			
1.	CaO	%	47-51.0*
2.	MgO	%	0.9-2.0
3.	Fe_2O_3	%	0.45-1.0
4.	Al_2O_3	%	1.19-2.1
5.	Si_2O_3	%	2.1-4.5
6.	Mn_2O_3	%	<0.12
7.	P_2O_5	%	Traces
8.	Cl_2	%	<0.015
9.	Na_2O	%	<0.16
10.	K_2O	%	<0.01
11.	TiO_2	%	<0.02
12.	Total Sulphur	%	<0.1
13.	LOI	%	39.0-41.3
Physical Properties			
1.	Bond Index	kWh/sh.T	13
2.	Granule Size		Medium

Notes:

1. *Guaranteed parameters (guarantee on limestone consumption, auxiliary power consumption & gypsum purity) shall be based on available (reactive) $CaCO_3$ content of 89%. The design of Flue Gas Desulphurisation (FGD) system & auxiliaries shall be based on available (reactive) $CaCO_3$ content of 79%.

2. For the purpose of volumetric computations of limestone handling & storage system the bulk density of limestone shall be taken as 1400 kg/m^3. However for torque, drive & structural load requirements the density of lime stone shall be taken as 1700 kg/m^3.

For density calculation of Limestone slurry, density of limestone shall be taken as 2700 Kg/m^3.For gypsum, the bulk density shall be taken as 900 kg/m^3 for volumetric computation and 1250 kg/m^3 for torque, drive & structural load requirements. For density calculation of Gypsum slurry, density of Gypsum shall be taken as 2500 Kg/m^3.

3. For the purpose of sizing of equipments and guarantee, $MgCO_3$ shall be considered as unreactive dolomitic form.

4. The above represent limestone quality to be considered for basic sizing and guarantees. Further the bidder is required to collect limestone samples from site for analysing is characteristic including reactivity. Bidder shall indicate in its bid the quantity of limestone required for such testing.

Annexure-IV-6

METHANOL CHARACTERSTICS

SN	Fuel Property	Unit	Methanol
1	Chemical Formula		CH3-OH
2	Fuel Carbon	Wt%	38
3	Fuel Oxygen	Wt%	12
4	Density at 20 deg C	kg/m3	792
5	LHV	Kcal/kg	4800
6	Boiling Temp	^{0}C at 1 bar	65
7	Vapour Pressure	bar at 20^{0}C	0.13
8	Kinematic viscosity	cSt at 20^{0}C	0.74
11	Auto Ignition	^{0}C	470
12	Heat of Vapourization	kcal/kg	260
15	Flammability limit	vol %	6-36
16	Flash Point	^{0}C	12

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: ^{0}C

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.