
TECHNICAL SPECIFICATION

FOR

LIMESTONE GRINDING SYSTEM

CONFIDENTIAL

CUSTOMER	: NTPC
PROJECT	: NORTH KARANPURA 3x660MW TPS
APPLICATION	: FLUE GAS DESULPHURIZATION SYSTEM



BHARAT HEAVY ELECTRICALS LIMITED
(A GOVT OF INDIA UNDERTAKING)
Flue Gas Desulphurization Group
Ranipet



TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH
KARANPURA 3X660 MW

NTPC:NK:FGD:LGS:R00

TECHNICAL SPECIFICATION FOR WET BALL MILL SYSTEM

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Quality			
EC&I			
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NTPC:NK:FGD:LGS:R00

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1.0 PROJECT INFORMATION:

a.	Owner	NTPC
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization

A) SITE CONDITIONS

1.	Ambient Temperature and Relative Humidity		
a.	Average Site Condition ASC		
	Ambient Temperature	:	27 deg C
	Ambient Temperature (Design)	:	45 deg C
	Relative Humidity	:	60 %

B) PROJECT LOCATION AND APPROACH

a.	Country	India
b.	State/Division	Jharkand
c.	District	Chatra

2.0 APPLICABLE CODES & REGULATIONS

The design and materials shall conform to the requirements of applicable codes and regulations of the latest edition. The design, manufacture, installation and testing of the WBM shall follow the latest applicable Indian/International (AISI / ASME/EN/Japanese) Standards.

3.0 INTENT OF SPECIFICATION

This specification covers the minimum requirements for the complete design, material, manufacturing, shop inspection, testing at the manufacturer's works, supervision of erection & commissioning and performance guarantee testing of Limestone Grinding System along with accessories which is furnished in the Flue Gas Desulphurization plant of North Karanpura 3 x 660 MW FGDF systems. The following points may be noted.

- There are 3 units of each 660 MW and each unit is envisaged with one FGD system. The FGD system will be provided with common limestone grinding system (LGS). 2 numbers of Wet Ball Mill (1 working + 1 standby) shall be provided. This WBM system shall be located inside the Ball Mill Building. Building is in BHEL scope.
- Bidder shall assume full unit responsibility for the entire equipment assembly and make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.
- The Bidder shall offer only proven design which meets the Provenness criteria indicated in the **Annexure-I**. Necessary document evidences as per **Annexure-3K for qualification** shall be submitted along with the bid. If bidder doesn't meet the specified provenness criteria, they are denied to participate in this tender.



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- d. In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), the same shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (**Annexure-IV**)".
- e. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable.
- f. No deviation or exception shall be permitted without the written approval of the purchaser.
- g. Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.
- h. In case, the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, the same shall be recommended along with reasons in a separate section and include the same in scope of supply.
- i. All accessories, items of work, though not indicated but required to make the system complete for its safe, efficient, reliable and trouble free operation and maintenance shall also be in supplier's scope unless specifically excluded.

4.0 PROVENNESS CRITERIA:

The Bidders are required to meet the Qualification Requirement (QR) for Wet Ball Mill system as per **Annexure-I & submit the Annexure to qualification requirement (Annexure-3K)**

5.0 TECHNICAL INFORMATION

S.No	Description	Requirement
1.	Quantity	
	Quantity of Wet Ball Mill system	2 No's (1 working + 1 standby)- common system
2.	Parameters	
	WBM Design capacity	50 TPH
	Medium to be handled	Limestone
	Limestone Analysis	Refer Clause 5.1
	Type of WBM system	Horizontal
	Duty	Continuous
	Location	Inside Building
3.	POWER SUPPLY	
	The following voltage levels shall apply:	
	3.3 kV $\pm 6\%$, 50 Hz	: Voltage for motors equal to / bigger than 200KW and for power distribution within the plant.
	415 V $\pm 10\%$, 50Hz	Standard voltage for power supplies to small electric power consumers and motors below 200 KW lighting and domestic
	Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition.	



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5.1 LIMESTONE ANALYSIS/CHARACTERISTICS

S.No	Description	Unit	Parameters
1.	CaCO ₃	Wt%	>90
2.	MgCO ₃	Wt%	<3
3.	Fe ₂ O ₃	Wt%	<0.3
4.	Al ₂ O ₃	Wt%	<0.3
5.	SiO ₂	Wt%	<2
6.	Mn ₂ O ₃	Wt%	<0.3
7.	P ₂ O ₅	Wt%	<0.05
8.	Cl ₂	Wt%	<0.02
9.	Na ₂ O	Wt%	<0.05
10.	K ₂ O	Wt%	<0.02
11.	Sulphur	Wt%	<0.03
12.	Moisture	Wt%	<0.5
13.	Bond index	KWh/t	13.0
14.	Lump size	mm	10 to 120

5.2 WATER ANALYSIS

The following water to be used during the grinding process of limestone in Wet Ball Mill (WBM) system.

S.No	Constituents	Unit	Water quality
1.	Total Cations as CaCO ₃	ppm	209
2.	Total Anions as CaCO ₃	ppm	209
3.	Calcium as CaCO ₃	ppm	65
4.	Magnesium as CaCO ₃	ppm	41
5.	Sodium as CaCO ₃	ppm	98
6.	Potassium as CaCO ₃	ppm	5
7.	Iron as Fe	ppm	1.2
8.	Total Alkalinity as CaCO ₃	ppm	150
9.	Chlorides as CaCO ₃	ppm	25
10.	Sulphate as CaCO ₃	ppm	34
11.	Silica	ppm	9
12.	pH		7.6 – 8.2
13.	Turbidity	NTU	200



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6.0 SCOPE OF SUPPLY

Scope for the bidders shall include Design, Engineering, Manufacturing, Packing, Supply, Supervision of Erection & Commissioning, Performance Guarantee Test and handing over of final Customer (NTPC).

Design: Includes basic engineering, detail engineering, preparation and submission of engineering drawings/calculations/datasheets/quality assurance documents/field quality plans, storage instructions, commissioning procedures, Erection & assembly Drawings, operation & maintenance manuals, performance guarantee test procedures and assisting BHEL in obtaining time bound approval from NTPC.

Supply: Includes manufacturing/fabrication, shop floor testing, stage inspections, final inspections, painting & packing.

Supervision of Erection & commissioning: Includes supervision of erection & commissioning, supervision of trial operation, PG test, training of customer's O&M Personnel and handing over to customer.

Each mill system shall be supplied by separate distribution box such that it can feed back to ball mill, HP LP trunnion pumps, Agitators & pumps separately. The scope of supply for **Limestone Grinding System** shall include but not limited to the following:

Sl no	Item Description	Qty/Mill	Vendor to confirm
1.	Duct form lime stone silo hopper bottom to feeder knife gate valve with electric actuator	1	
2.	Inlet with rod valve	1	
3.	Knife gate valve with electric actuator.	1	
4.	Gravimetric feeder along with its drives and other accessories (complete assembly)	1	
5.	Knife gate valve (KGV) below the feeder outlet chute with integral starter.	1	
6.	chute form gravimetric feeder to ball mill inlet	1	
7.	Wet ball mill (with all accessories), with full set of balls	1	
8.	Mill separator tank with IE3 all nozzles as per P&ID	1	
9.	Mill tank agitator with motor and gear box	1	
10.	Mill circuit pump with IE3 motor	2	
11.	Mill hydro cyclone and complete accessories	1	
12.	Distribution box with pneumatic actuator	1	
13.	Inching/auxiliary motor with speed reducer (IE3 motor)	1	
14.	Main drain reducer	1	
15.	Clutch system	1	



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16.	All coupling for connecting main motor to reducer, inching motor to clutch and reducer, and reducer to pinion.	1	
17.	Bearing lubrication system including motor to clutch LP/HP (pump 2x100%) with oil tank with 2x100% duplex filter	1	
18.	Jet lubrication to ring gear & pinion	1	
19.	Foundation bolt for entire system	1	
20.	Complete base frame including drive motor base frame including drive motor base frame	1	
21.	All butterfly valves as per P&ID with integral starter electrical actuator	12	
22.	Pneumatic regulating valves as per P&ID	4	
23.	Pressure transmitter(PT) as per P&ID	4	
24.	Pressure indicator (PT)	7	
25.	Pressure gauge	1	
26.	Flow transmitter	2	
27.	Level transmitter	2	
28.	Complete pipping: a. Water line b. Slurry line c. Instrument airline As per P&ID	1	
29.	Complete erection and assembly drawing	2	



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5.1 LIMESTONE ANALYSIS/CHARACTERISTICS

S.No	Description	Vendor to confirm
1.	All connecting pipes / chutes, pipe supports, trestles, valves, motor (other drives) etc. along with necessary valves from chute to mill and from hydro-cyclone to common slurry storage tanks and wherever required within the system shall be in the scope of the supplier.	
2.	Descriptions in the drawings, in the documents, and in the displays shall be in English	
3.	Any item not included above but necessary for safe and reliable operation of the milling system proposed by the supplier shall also be in the suppliers' scope.	
4.	The equipment shall be designed to withstand the corrosive and moist environment in which these are proposed to operate.	
5.	Noise level produced by any rotating equipment individually or collectively shall not exceed 85 dB measured at a distance of 1.0 meters from the source in any direction and 1.5m above operating floor. Predicted sound pressure levels for the WBM drive assemblies shall be submitted as part of the proposal data.	
6.	The overall vibration level shall be as per ISO 10816.	
7.	Suitable drain connections shall be provided.	
8.	The equipment shall be suitable for stable operation continuously.	
9.	Suppliers shall suitable specify their delivery schedule along with the offer and Standard code specified shall be strictly adhered.	
10.	All instruments such as pressure transmitters, density transmitters (especially at hydro-cyclone outlet), and other necessary transmitters wherever necessary shall be supplied by the suppliers	
11.	Supplier shall provide the loading of item and other factors which shall be required for effective civil construction.	
12.	Tanks, pumps, hydro-cyclone etc. are to be designed by vendor based on their experience considering the required milling capacity of each Ball Mill System	
13.	CHUTES: Minimum clear cross section of chute: 600 mm x 500 mm (inside both ways). Minimum clear cross section of Discharge debris chute: 500mm X 500mm (inside both ways)	
14.	Limit of connection: The buyer (BHEL) has an intention to minimize interface for utilities as much as possible. The bidder shall consider this requirement in the	



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S.No	Description	Vendor to confirm
	planning stage of layout for the equipment. The bidder shall provide the header piping for WBM and branch piping to each nozzle. Terminal points for all utilities shall be located at skid edge. The bidder shall specify all terminal points with tie-in number in the P&ID and submit it in the proposal to confirm the scope of supply.	
15.	Service life: Entire equipment except wearing parts shall be designed and fabricated for a minimum service life of 30 years of operation or 200,000 full load operating hours whichever is longer.	
16.	Corrosion allowance: Corrosion allowance for entire equipment shall be in accordance with latest applicable Indian / International standard.	
17.	Unless otherwise specified , flanges shall be in accordance with ANSI B16.5 Class 150	
18.	Name plate: All equipment shall be provided with nameplates indicating the item number and service name. Name plates shall be of 304 Stainless steel plate and placed at a readily visible location. Nameplate of main equipment shall have enough information, which will be confirmed during engineering phase. Stainless steel nameplates for all instruments and valves shall be provided.	
19.	Rotation arrows shall be cast in or attached with stainless steel plate on each item of rotation equipment at a readily visible location.	
20.	Unless otherwise specified, all equipment items where the weight exceeds 15 kg shall be provided with suitable lifting lugs, ears or ring bolts or tapped holes for lifting rings. Minimum shock factor for lifting lugs shall be minimum 2.0. The position of lifting lugs and reference dimension shall be shown on GA and/or outline drawings. NDT shall be conducted for lifting lugs. When any spreader bars are required for lifting and laydown, the bidder shall provide spreader bar with equipment.	
21.	Skid Mount/Transportation: Equipment shall be fabricated as skid mount design as much as practical to minimize erection at the site.	
22.	Two pieces of stainless steel earth lugs shall be provided with equipment diagonally. The position of earth lugs shall be shown on each GA and/or outline drawing.	
23.	Provide double nuts for anchor bolts	
24.	Bidder shall provide allowable vibration level on foundation in foundation drawings and/or general arrangement drawings.	
25.	If the driver/driven equipment train is in the resonance condition or any vibration problems occur, the bidder shall solve the problems in a timely manner.	
26.	Bidder shall provide the mating flanges with the necessary gaskets.	
27.	All the surfaces of the carbon steel should be rust prevented before shipment for the period of at least 12 months for storage and construction.	
28.	Bidder to provide capacity of crane or hoist required for material handling and the details of heaviest component to be handled.	



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S.No	Description	Vendor to confirm
29.	The list of all Bought out items with makes and country of origin to be mentioned along with offer to be submitted.	
30.	Quality Plan to be submitted along with the offer.	
31.	Cost towards the participation in discussions/meetings, providing technical assistance during technical discussions/meetings with customer for approval of drawing/documents etc. TA/DA, boarding and lodging to attend these meetings shall be borne by the bidder and shall be inclusive in supply portion.	
32.	Material of construction for all equipment/components shall be subject to NTPC/ BHEL approval during detail engineering. Accordingly bidder shall consider MOC for all equipment/component as per best engineering practice, global standard and global references. material of construction Indian and international standards (ASTM/ANSI/EN/JIG/ISO/AISI) only	
33.	Bidder to provide sub vendor list and Bidder shall strictly adhere to NTPC approved vendor list. In case bidder proposes an additional vendor for an item or vendor approval is required for any new item, acceptance shall be subject to approval by NTPC/ BHEL before placing order and bidder shall submit relevant documents as per Attachment-XX-sub-supplier questionnaire attach.	
34.	It shall be the complete responsibility of the successful bidders to obtain "Sub Vendor Approval" from BHEL / NTPC for all equipments & components. Any delay in sub vendor's approval should not affect the project schedule. If any of the sub vendors does not have the approval of NTPC/ BHEL, the same may be replaced with another NTPC/BHEL approved sub-vendor only, without any price implications to BHEL.	
35.	The modalities of inspection (Stage, Final, In-process) shall be finalized during detail engineering after submission of quality assurance plan (QAP). It shall be reviewed by the NTPC/ BHEL. Bidder shall follow the procedures of inspection as per the approved QAP. Bidder has to submit the following documents along with inspection call and if any other documents required as per approved QAP. - Raw material inspection certificate - Internal test reports - Statutory certificates as required. - All inspection & testing shall be carried out based on the following documents: a. Relevant Standards b. Specifications c. Approved drawings d. Data Sheets e. Calibration certificate for all the measuring instruments	



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	f. Bidder should also coordinate in getting the MDCC's (Material Dispatch clearance certificate) and all types of IC's (Inspection Certificates) from the NTPC along with BHEL.	
36.	Minor Chipping i.e. up to 50 mm thk, micro leveling and providing shim plates for erection of equipment / item at site shall be in the scope of bidder.	
37.	During detail engineering, bidder to strictly adhere to BHEL/NTPC drawing formats, document numbering, quality plan & FQP formats	
38.	The identification and numbering of equipment, systems, items, etc. of supply, as well as of all documents and drawings shall be in accordance with reference Designation System for Power Plants - KKS system.	
39.	Complete detail engineering drawings, calculations, selection of components etc. shall be reviewed & subject to approval of BHEL/NTPC during detail engineering	
40.	Bidder shall furnish necessary inputs & drawings of all equipment in editable Auto CAD/ MS-Word /Excel format.	
41.	During detail engineering, successful bidder shall ensure flow of drawings/documents as per schedule. Any comments from BHEL/NTPC should be addressed timely by the bidder.	
42.	Bidder to note that list above is not exhaustive and any work /items required for completing the smooth operation and ensuring satisfactory running of the machines till final hand over to the end user (NTPC) shall also be in the scope of the bidder.	
43.	Bidder shall submit the signed and stamped copy of all the pages which constitutes this technical enquiry specification signed by authorized signatory and clearly mentioning each clause under following two categories to avoid any ambiguity in scope understanding & the scope division along with technical offer. a. "Accepted without deviation and considered in scope of work" b. "Not considered in scope of work"	
8.0	DESIGN AND CONSTRUCTION	
a.	The minimum valley angle of chutes shall be 60 degrees from horizontal. Transfer chutes shall be adequately sized and sloped to ensure smooth flow of Lime without any accumulation anywhere.	
b.	Chutes shall be made of minimum 20 mm thick TISCRA / SAILHARD/ LSLAS07 or equivalent or lined with SS304 material. All chutes should have one inspection door at every floor and for the ones in between the floors (more than 1.5 meter above the operating floor level) suitable access for trouble free maintenance shall be provided. For sealing of inspection doors labyrinth type arrangement to be provided.	
c.	Complete chute work in the region of flap gates shall be fabricated from 20 thk TISCRA or equivalent. In case of vertical chute (valley angle more than 80 degree)	



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S.No	Description	Vendor to confirm
	complete chute, work shall be of 20 mm thick TISCRAI or equivalent material. While finalizing the chute work inside the building, arrangement for shifting and replacing chute legs, proper handling arrangement/wall openings, trolleys, hoists shall also be provided. While fabricating the chute, no welds in between shall be allowed.	
8.1	CHUTE BLOCKAGE SWITCHES	
a.	One no. chute blockage switch of proven type (subject to approval of the employer) shall be provided	
b.	Chute blockage switch shall trip the feeding conveyor in case of Chute blockage and protect the feeding conveyor equipment.	
8.2	SILO SHUT OFF GATE VALVE	
a.	A bunker outlet chute shall be provided for feeding limestone from bunker to the feeder. The size of the opening chute shall be sufficient to ensure proper flow of the limestone. There shall be no reduction of section in the bunker outlet chute from bunker to feeder. The inlet chute shall be provided with suitable poke doors/holes in order to remove jamming/blockage. A motorized bunker shut-off gate shall be provided at the inlet to each feeder	
b.	All parts of the gate in contact with limestone shall be of stainless steel construction.	
c.	The shut-off gates and its actuator shall ensure 100% closing of the gate even with 'bunker full of limestone'.	
d.	Facility shall be provided to open/close the bunker outlet gate, through actuator, from remote as well as local (integral starter)	
e.	In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of limestone.	
f.	For each bunker facilities shall be provided for unloading the bunker, through feeder, to a truck at ground level, along with all necessary chutes and diversion chutes.	
8.3	GRAVIMETRIC FEEDER	
	a. Gravimetric feeders shall be sized to meet 110% of the maximum mill capacity. b. The limestone feeder belt shall be of seamless rubber construction. It should be possible to adjust the belt tension from outside without opening the feeder body. c. All parts in contact with limestone except belt shall be of stainless steel construction. d. The feeder shall have adequate instrumentation to detect 'loss of flow'. e. The feeder shall have a motor/pneumatic operated gate at the outlet	f.



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8.4	WET BALL MILL																									
a.	There shall be two numbers wet Ball mills for grinding of limestone, each mill shall be sized to meet 110% of the maximum limestone requirement of all the units in a project operating under the following conditions, all occurring together. <table><tr><td>i.</td><td>Load</td><td>Design point flow – 50 Tones Per Hour (TPH)</td><td></td></tr><tr><td>ii.</td><td>Flow</td><td>110% of limestone requirement of all the absorbers at Design point</td><td></td></tr><tr><td>iii.</td><td>Input Limestone Size</td><td>1” (max.) – 25 mm</td><td></td></tr><tr><td>iv.</td><td>Output Fineness</td><td>Output Fineness 90% or higher (as per the requirement of absorber) through 325 mesh (for spray tower process) OR 90% or higher (as per the requirement of the absorber) through 200 mesh (for bubbling process)</td><td></td></tr><tr><td>v.</td><td>Mill Wear Part</td><td>Conditions Near Guaranteed Wear Part Life.</td><td></td></tr><tr><td>vi.</td><td>Limestone bond index</td><td>13 (min) kWh/sh.T)</td><td></td></tr></table>	i.	Load	Design point flow – 50 Tones Per Hour (TPH)		ii.	Flow	110% of limestone requirement of all the absorbers at Design point		iii.	Input Limestone Size	1” (max.) – 25 mm		iv.	Output Fineness	Output Fineness 90% or higher (as per the requirement of absorber) through 325 mesh (for spray tower process) OR 90% or higher (as per the requirement of the absorber) through 200 mesh (for bubbling process)		v.	Mill Wear Part	Conditions Near Guaranteed Wear Part Life.		vi.	Limestone bond index	13 (min) kWh/sh.T)		
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b.	All integral auxiliaries of the mills like hydro-cyclones, separator tank & mill circuit pumps shall be sized to meet the above conditions (a). A 100% stand-by pump shall be provided for the mill circuit pump.																									
c.	The mill hydro-cyclone set shall have sufficient redundancy. A minimum 10% spare Hydro-cyclone shall be provided in each set of hydro-cyclone. Hydro-cyclones shall be of modular construction. It shall be possible to remove and replace individual hydro-cyclone with the set in service. Individual isolation valve shall be provided for each hydro-cyclone for this purpose. The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining. The hydro-cyclone shall be provided with replaceable rubber lining of thickness 12 mm for the feed chamber and 12 mm for the overflow launder.. The liners shall have a minimum wear life of not less than 8000 hrs.																									
d.	All parts of the mill including mill body, trunnion, hydro-cyclones, integral pipes, mill circuit pumps and other parts in contact with limestone slurry shall be provided with replaceable rubber wear liners. The wear liners or wear parts shall have a minimum guaranteed wear life of not less than 8000 hrs without reversal of the liners. The guaranteed capacity and fineness of the mill shall not be affected within the guaranteed life of the mil wear parts.																									



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e.	The material of the balls shall be chosen to ensure that the balls do not lose their original shape and to ensure minimum ball consumption. The contractor shall also guarantee ball consumption per ton of limestone throughput. The contractor shall furnish the minimum ball diameter below which the balls shall be replaced.	
f.	Facility shall be provided for on-load loading of steel balls to the mill.	
g.	The ball mill shall be driven by a motor through a peripheral gear/ central drive system. An auxiliary motor shall also be provided for inching of mills after trip and during maintenance.	
h.	The lube oil system shall have 100% stand-by arrangement for lube oil pumps and oil coolers of each circuit with independent pump / cooler and tank. Wherever required duplex oil filters shall be provided.	
i.	The mill auxiliaries like separator tanks, mill circuit pump, hydro-cyclones and all connecting pipes handling limestone slurry shall have replaceable rubber linings.	
8.5	WET BALL MILL WEAR PARTS GUARANTEE	
a.	All parts of the mill including mill body, HP & LP trunnion, hydro-cyclones, integral pipes, mill circuit pumps and other parts in contact with limestone slurry shall be provided with replaceable rubber wear liners. The wear liners or wear parts shall have a minimum guaranteed wear life of not less than 8000 hrs. Without reversal of the liners. The guaranteed capacity and fineness of the mill shall not be affected within the guaranteed life of the mil wear parts.	
b.	The material of the balls shall be chosen to ensure that the balls do not lose their original shape and to ensure minimum ball consumption. The supplier shall also guarantee ball consumption per ton of limestone throughput. The supplier shall furnish the minimum ball diameter below which the balls shall be replaced	
8.6	WET BALL MILL BALL CONSUMPTION	
a.	Supplier shall furnish the minimum ball diameter below which the balls shall be replaced. Each mill shall be sized to meet the following conditions, all occurring together.	
8.7	MILL CIRCUIT PUMPS	
a.	Quantity: 2 No's for <u>each</u> limestone grinding system (Total 4 numbers)	
b.	Margins Flow 5% (minimum) Head 10% (minimum)	



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S.No	Description	Vendor to confirm
c.	Solids Concentration Max. 30% by weight or actual as per suppliers practice, whichever is maximum.	
8.7.1	The limestone slurry pipes shall be sized to minimize erosion and avoid settling of the limestone at part load operation. The slurry pipes shall be lined with replaceable rubber lining. Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The supplier may provide a recirculation line with motorized isolation valve for the above purpose.	
8.7.2	All the pipes handling slurry shall be provided with replaceable rubber lining or FRP of proven quality. The Supplier can provide slurry pipes of size lower than 3" made up of FRP material only.	
8.7.3	The isolation valves provided in all the slurry lines shall be of knife gate type/butterfly type. Motorized actuators shall be provided for valves requiring frequent operation as indicated in the relevant scheme.	
8.7.4	The valves shall be of proven type and the supplier shall submit a detailed valve schedule for employer's approval. Reference list for previous installations for similar application shall also be furnished to the employer	
8.7.5	The isolation valves shall be of knife gate type with rubber seats designed to prevent accumulation of solids on the valve seat.	
8.7.6	Supplier shall provide all necessary arrangements for purging & flushing of all the process pipelines, equipments etc.	
8.7.7	All the wear parts of the pump shall be guaranteed for a minimum wear life of not less than 14000 hrs.	
8.8	AGITATOR	
a.	The design of the agitators shall be of proven type. The shaft of the agitators shall be of Carbon steel with rubber lining with a minimum life of 2 years. Blades shall be of Alloy 926 or better material	
8.9	TANK	
a.	The slurry preparation tank shall be CS construction with replaceable rubber lining. The storage tanks shall be equipped with sufficient number of agitators, to avoid settling.	
8.10	HYDROCYCLONE	
a.	Total no. hydro-cyclone – 2 No's; 1 no (100%) per grinding system.	
b.	Hydro-cyclone shall be of modular construction and designed for 100% of inlet feed. It shall be possible to remove and replace individual hydro-cyclone with the set in	



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	service. Individual isolation valve shall be provided for each hydro-cyclone for this purpose. The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining of thickness 12 mm for the feed chamber and 12 mm for the overflow launder. The liner shall have a minimum wear life of not less than 8000 hours	
c.	The mill hydro-cyclone set shall have sufficient redundancy. A minimum 10% spare hydro-cyclone shall be provided in each set of hydrocyclone.	
d.	All parts of the hydro-cyclones, integral pipes, mill circuit pumps and other parts in contact with limestone slurry shall be provided with replaceable rubber wear liners.	
e.	Note: The mill circuit pump pH value has been provided based on which, with his previous experience, hydro-cyclone to be suitably designed	
8.11	MOTOR	
	▪ Above 0.2 kW and upto 200 kW: 3 phase 415 V AC-VENDOR SCOPE ▪ Above 200 kW and upto 1500 kW: 3.3 Kv- BHEL SCOPE ▪ Above 1500 kW: 11 KW-BHEL SCOPE	▪
9.0	PACKING AND FORWARDING	
1.	Proper packing to be ensured. Indigenous Supply: WBM & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the WBM internals during storage in the outer yard of power plant. Imported Supply: All imported supply should be packed as per Sea worthy packing standards Annexure - VI. All imported items should have Sea worthy packing. Liberal packing materials and struts shall be provided to arrest rolling and to protect from transit damages.	
2.	Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect bearings and other machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather while in transit and while awaiting erection at the site.	
3.	Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation preventive compounds. All parts subject to damage when in	



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	contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.	
4.	Crates and packing material used for shipping will become the property of owner (NTPC)	
5.	Packaging or shipping units shall be designed within the limitations of the unloading facilities of the receiving ports and the ship will be used. It shall be the bidder's responsibility to investigate these limitations and to provide suitable packaging and shipping to permit transportation to site.	
6.	Packing (tare) shall be part of the equipment cost and shall not be subject to return. The packing should ensure integrity and cohesiveness of each delivery batch of equipment during transportation. In case of equipment assemblies and unit's delivery in the packing of glass, plastics or paper the specification of packing with the material and weight characteristics are to be indicated.	
7.	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: a. Destination b. Package Number c. Gross and Net Weight d. Dimensions e. Lifting places f. Handling marks and the following delivery marking	
8.	Each package or shipping units shall be clearly marked or stenciled on at least two sides as follows. NTPC NORTH KARANPURA, 3 X 660 MW. JHARKHAND INDIA EPC CONTRACTOR:BHARAT HEAVY ELECTRICALS LIMITED, INDIA" In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.	
9.	Each part of the equipment which is to be shipped as a separate piece or smaller parts packed within the same case shall be legibly marked to show the unit of which it is part, and match marked to show its relative position in the unit, to facilitate assembly in the field. Unit marks and match marks shall be made with steel stamps and with paint.	
10.	Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials no single package shall contain more than one set of such documents. Shipping	



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	papers shall clearly indicate in which packages the technical documents are contained.	
11.	The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.	
12.	Wherever necessary besides usual inscriptions the cases shall bear special indication such as “Top”, “Do not turn over”, “Care” , “Keep Dry” etc. as well as indication of the center of gravity (with red vertical lines) and places for attaching slings (with chain marks)	
13.	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: a. Upright position b. Sling position and center of Gravity position c. Storage category d. Fragile components (to be marked properly with a clear warning for safe handling)	
14.	Each crate or package is to contain a packing list in a waterproof envelope. All items are to be clearly marked for easy identification against the packing List. All cases, packages etc. are to be clearly marked on the outside to indicate the total weight where the weight is bearing and the correct position of the slings are to bear an identification mark relating them to the appropriate shipping documents. All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.	
15.	The packing slip shall contain the following information:- Customer name, Name of the equipment, Purchase Order number with Date, Address of the delivery site, Name and Address of the Sender, Serial Number of WBM & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.	
16.	Prior to transport from manufacturer’s work to destination, components of the unit shall be completely cleaned to remove any foreign particles. Flange faces and other machined surfaces shall be protected by an easily removable rust preventive coating followed by suitable wrapping.	
17.	All necessary painting, corrosion protection & preservation measures shall be taken as specified in painting schedule. Supplier shall consider the coastal environment zone which is defined as “very severe” during final finishing/shipping.	
18.	Successful bidder shall furnish the detail packing /shipment box details with information like packing box size, type of packing, weight of each consignment, sequence no. of dispatch, no. of consignment for each deliverable item against each billing break up units/ billable blocks. Without these details the BBU shall not be approved during detail engineering.	



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	Also, complete billing break-up with above mentioned details shall be submitted within 10days of LOI.	
19.	All items/equipment shall be dispatched in properly packed condition (i.e. no item shall be dispatched in loose condition such that it becomes difficult to store/identify its location at site at a later stage).	
20.	Cases which cannot be marked as above shall have metal tags with the necessary markings on them. The metal tags shall be securely attached to the packages with strong steel binding wire. Each piece, Skid, Case or package shipped separately shall be labelled or tagged properly.	
10.0	SUPERVISION OF ERECTION, TESTING AND COMMISSIONING	
1.	The erection of Limestone Grinding System (WBM) will be done by owner as per Erection Manual and check List. However, the bidder shall make one visit per boiler for the supervision of erection, pre-commissioning & post- commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply.	
2.	There will be one visit per boiler and totally there will be 3 visits for 3 boilers. The bidder will be informed well in advance for the visit. Bidder shall include 15 working days per visit in the offer with minimum 3 visits.	
3.	TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in supply portion.	
11.0	EXCLUSION	
	The following work associated with the WBM will be by others: a. Supply of main drive HT motor b. Civil foundations c. Walkways, platforms and ladders d. Element handling hoists	
12.0	INSPECTION AND TESTING	
A)	Minimum Testing requirements to be considered are as below:	
1.	Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions.	
2.	List of Non-Destructive test over and above the material test are as follows: a. Mechanical Seal- Manufacturer's recommendation. b. Base Plate- Stress relieving of weld.	



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	c. Replaceable Rubber liner- Shore Hardness, Class and Type certificate	
3.	Once mounting is finished and operation test will be conducted on each WBM to determine the characteristic curves. to determine the parameters at the design point, mechanical running & performance testing shall be performed & witnessed.	
4.	Vibration test and Noise level test shall be witnessed at site.	
5.	For surfaces with rubber lining Welding shall be visually inspected to verify the absence of rough area and unacceptable transition between surfaces which prevent the adequate adherence of rubber. The acceptance criteria shall be as per latest standard.	
6.	For surfaces with rubber lining, degree of cleaning shall be visually checked before the application of the coating. There must be no area with oxidation, dirt or partially or generalized corrosion defects.	
7.	Test certificates shall be issued for each lot of raw material used in the coating, corresponding to specific weight and traction resistance.	
8.	For surfaces with rubber lining, adherence test shall be conducted on production samples. Adherence test shall be conducted on the actual surface through hammering. In order to verify the absence of air packets (or) surface without adherence.	
9.	For surfaces with rubber lining, Coating thickness shall be checked at 100%.A High voltage porosity test will be conducted on 100 % of the coated surface.	
B)	General Inspection requirements to be considered are as below:	
1.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used for review by BHEL / NTPC prior to manufacture. Inspection of above mentioned tests by BHEL/ NTPC representative at bidder's works is envisaged.	
2.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL/NTPC.	
3.	Out of 2 WBM, One Number of WBM will be inspected at the Bidder's works before dispatch or where the test facilities are available.	
4.	The Bidder shall conduct performance test for the remaining WBM and submit the reports.	
5.	Acceptance tolerance of actual versus guaranteed performance for capacity, head, efficiency and power absorbed shall be as per applicable standard.	
6.	Vibration levels shall be measured during shop running/performance tests.	



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7.	Contract shaft seals shall be used during shop tests, unless the seal design is unsuitable for the shop-test condition.	
8.	WBM shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.	
9.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipments.	
10.	BHEL shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.	
11.	Bidder to arrange all calibrated gauges, Instruments during inspection.	
12.	Mechanical running and the performance test shall be carried out. Bidder to arrange Motor of same / higher rating for the shop test and inspection.	
13.	The performance test may be carried out using water at shop and shall be converted to the design condition.	
13.0	PAINTING	
1.	Surface Preparation : Blast Cleaning SA 2.5	
2.	PRIMER COAT: - Zinc Epoxy - DFT= 80micron per coat - No of coats = 1. - Primer coat thickness 80 micron.	
3.	FINISH COAT: - Epoxy High Solid - DFT= 50micron per coat - No of coats = 2. - Intermediate coat thickness 100 micron. - Total DFT : 180 micron.	
4.	COLOUR CODE (based on DIN 2403:2007-05 & DIN 5381) - Base: To be informed later - Lettering: To be informed later.	
5.	Rust preventive paint after inspection at shop floor before dispatch shall be in bidder's scope	
6.	Corrosion protection, coating and galvanizing, painting shall be taken care by the bidder. Bidder shall submit the painting scheme during detail Engg in line with the specification and shall be subject to approval of BHEL / NTPC.	



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14.0	SPARES,TOOLS & TACKLES	
14.1	START UP & COMMISSIONING SPARES	
	Start-up & Commissioning Spares shall be part of the main supply of the WBM. Start-up & commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares required for successful operation till commissioning of WBM shall come under this category. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipment's are energized.	
14.2	O&M Spare for 3 year operation	
	MANDATORY SPARES a) The list of mandatory spares considered essential by the Employer is indicated in the list enclosed to this Sub-Section. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms & Price Schedules. Whenever the quantity is Mentioned in "sets" the bidder has to give the item details and prices of each item. b) Whenever the quantity is indicated as a percentage, it shall mean percentage of total population of that item in the station (project), unless specified otherwise, and the fraction will be rounded off to the next higher whole number. Wherever the requirement has been specified as a 'set' (marked by **) it will include the total requirement of the item for a unit, module or the station as specified. Where it is specified as 'set' (marked by*) it would mean the requirement for the single equipment / system as the case may be. Also one set for the particular equipment. e.g. 'set' of bearings for a pump would include the total number of Bearings in a pump. Also the 'set' would include all components required to replace the item; for example, a set of bearings shall include all hardware normally required while replacing the bearings. c) The assembly / sub assembly which have different orientation (like left hand, right hand, top or bottom), different direction of rotation or mirror image positioning or any other regions which result in maintaining two different sets of spares to be used for subject assembly / sub-assembly shall be considered as different type of assembly/sub-assembly. d) The Employer reserves the right to buy any or all the mandatory spare parts. e) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes. f) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit.	



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	Bidder to carry out maintenance of LGS & accessories supplied for a period of 3 years. The contract shall cover preventive maintenance and Minor / Major Overhauls. All services call shall be attended on the same day. All spare parts required for the upkeep of the equipment's (LGS & it's accessories) to be stocked in advance or arranged within 2 days' time to ensure trouble free operation & to meet the 90 % availability as per specification. Maintenance charges will be paid quarterly at the end of every three months. All spares to be used during AMC under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements.																												
	The spare parts to be stocked by the bidder should include the following,																												
14.2.1	Hydro Cyclone																												
	Hydro-cyclone isolation valve : 10% of each type OR 1 no. whichever is higher Hydro-cyclone : 10% of each type OR 1 no. whichever is higher Hydro-cyclone rubber lining : 10% of each type OR 1 no. whichever is higher																												
14.2.2	Feeders																												
	<table border="1"> <tr> <td>1</td><td>Belt</td><td>3 sets*</td></tr> <tr> <td>2</td><td>Belt drive motors</td><td>1 no</td></tr> <tr> <td>3</td><td>Belt drive reducer</td><td>2 no</td></tr> <tr> <td>4</td><td>Speed reducer assembly</td><td>2 set*</td></tr> <tr> <td>5</td><td>Weighing instruments</td><td>1 set*</td></tr> <tr> <td>6</td><td>Feeder weighing roll</td><td>1 no</td></tr> <tr> <td>7</td><td>Gravimetric feeder gate actuator assembly</td><td>1 no</td></tr> <tr> <td>8</td><td>Counter assembly of feeder complete</td><td>1 no</td></tr> <tr> <td>9</td><td>Feeder head pulley assembly</td><td>2 no</td></tr> </table>	1	Belt	3 sets*	2	Belt drive motors	1 no	3	Belt drive reducer	2 no	4	Speed reducer assembly	2 set*	5	Weighing instruments	1 set*	6	Feeder weighing roll	1 no	7	Gravimetric feeder gate actuator assembly	1 no	8	Counter assembly of feeder complete	1 no	9	Feeder head pulley assembly	2 no	
1	Belt	3 sets*																											
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S.No	Description			Vendor to confirm
14.2.3	LIMESTONE MILLS			
	1.	Mill wear parts (liners) & grinding element Note: One set of mill wear parts (liners) above is defined 1 SET = (Grinding elements needed for complete replacement of one mill) X (8000x1) / GWL, rounded off to nearest higher whole number. Where: GWL=Guaranteed wear life of mill wear	3 sets	
	2.	Auxiliary motor	1 no	
	3.	Gear box internals (including bearing and seals)	2 sets*	
	4.	Complete gear box	3 set*	
	5.	Mill motor bearings	1 set*	
	6.	Pump assembly	3 no of each type	
	7.	Motor pump	1 no of each type	
	8.	Pressure regulator	3 no of each type	
	9.	Filters	6 no of each type	
	10.	Pump & motor coupling	3 no of each type	
	11.	Slurry valves	3 no of each type and size	
	12.	Slurry line bends	3 no of each type and size	
14.2.4	AGITATOR			
	1.	Impeller assembly	2 no of each type	
	2.	Bearing assembly	3 no of each type	



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	3.	Motor	1 no of each type	
	4.	Belt and pulley (if applicable)	3 no of each type	
	5.	Gear box assembly (if applicable)	2 no of each type	
14.2.5	START-UP & COMMISSIONING SPARES			
	Start-up & commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system shall be included in the offer			
14.2.6	SPECIAL TOOLS & TACKLES:			
	Any special tools & tackles required for the entire equipment to disassemble, assemble or maintain the units, they shall be included in the quotation and furnished as part of the initial supply of the machine. List of special tools & tackles shall be decided by bidder as per his proven practice. When special tools are provided, they shall be packaged in separate, boxes with lugs and marked as "Special Tools for (tag / item number)." Each tool shall be stamped or tagged to indicate its intended usage. Levers and eye bolts for the removal of parts to be serviced shall be submitted with special tools.			
15.0	PERFORMANCE GUARANTEE			
	All performance tests for WBM shall be carried out in accordance with any latest international codes/standards. 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the WBM and its accessories 2) Capacity of the WBM to be guaranteed 50 TPH. 3) The Bidder shall ensure a design of the equipment to achieve an average target availability of 90%. 4) All the wear parts of the WBM shall be guaranteed for a minimum wear life of not less than 8000hrs. 5) Scheduled Maintenance (Minor Overhauls): Recommended intervals between maintenance outages shall be >25000 hours operation. 6) Scheduled Maintenance (Major Overhauls): Recommended intervals between maintenance outages shall be >75000 hours operation. 7) Noise level ≤ 85Db at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed excluding motor. 8) Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions. 9) Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ NTPC approval.			



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	10) In the event that the performance test is unsuccessful, bidder shall take necessary remedial action at his cost and the performance test shall be repeated. 11) Product size : 30 wt% slurry 325 mesh 90% passing limestone	
16.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:	
1.	POWER GUARANTEE Bidder to specify the guaranteed Shaft power per WBM operating at the duty point in their offer	
2.	BID EVALUATION CRITERIA FOR POWER CONSUMPTION: Power consumption quoted by bidder shall be limited to the ceiling value specified below. Ceiling value for Shaft power for the designated WBM =1750 KW In case, Guaranteed Shaft power offered by the bidder exceeds the ceiling value specified above, his bid price will be loaded for excess power consumption as per the formula given below. Adjustment factor for excess power consumption in USD = (GPC-CV) X PL X 1 No. of Working WBM GPC- Guaranteed Shaft Power Consumption quoted by bidder in KW CV- Ceiling Value for Shaft Power Consumption i.e. 1750 KW PL- Power Loading @ 2230 USD/KW No Price advantage apart from NIL Power Loading will be given if Guaranteed Power consumption offered is less than the ceiling value.	
17.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION	
	If actual shaft Power Consumption during prove out (or) PG Test operating at the duty point exceeds the value guaranteed by the bidder, liquidated damages for shortfall in performance shall be deducted from contract price as per the formula given below Liquidated damage deductible in INR per WBM = (GPC-APC) X P X 1 No. of Working WBM Where - GPC- Guaranteed Shaft Power Consumption quoted by bidder in KW - APC- Actual Shaft Power Consumption in KW - P- Penalty @ 3275 USD per KW	



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18.0	WARRANTY	
1.	The warranty period shall begin on the date of taking over by NTPC or date of issuance of the provisional acceptance certificate for the unit (whichever occurs first) and shall end after twenty-four (24) months. Provided that the successful bidder shall extend the provisions of this warranty to cover all repaired and replacement parts furnished under the warranty obligations hereunder, subject to the warranty period for the same being for a period of 24 months from the date on which replacement or renewal work is completed.	
2.	In case of failure of the equipment to meet the guarantee, NTPC/BHEL reserves the right to reject the equipment. However, NTPC/BHEL reserves the right to use the equipment until new equipment supplied by bidder meets the guaranteed requirement .	
19.0	FIRST FILL OF CONSUMABLES:	
1.	Bidder's scope shall also include supply and filling of all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to commissioning including top up requirements. All lubricants proposed for the plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals.	
2.	Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals including items qualities and quantities required per month of the plant operation for the NTPC/BHEL's approval herein shall be furnished within 2 months of placement of Order. On completion of erection complete list of bearings/equipment giving their location and identification marks shall be furnished to BHEL along with lubrication requirements. All types of chemicals, consumables, lubricants and grease shall be readily obtainable locally and the number of different types shall be kept to a minimum. For each type and grade of lubricant recommended, bidder shall list at least three equivalent lubricants manufactured by alternative companies.	
20.0	TRAINING	
	Successful bidder shall provide comprehensive training for NTPC/BHEL Engineering, O&M, Erection & Commissioning staffs at site covering all aspects of the WBM system - Operation & Maintenance, Troubleshooting etc.	
21.0	CONFLICT	
	Bidder's equipment shall be designed for and shall meet the service, performance and minimum level of quality requirements specified. Bidder shall be solely responsible for advising NTPC in writing of any conflicts between the specifications and Bidder's design, including performance and levels of quality. Bidder agrees that its obligations,	



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S.No	Description	Vendor to confirm
	liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of the Specification.	
22.0	DOCUMENTATION	
A	DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER	
	The Bidder shall submit all documents, drawings, diagrams and all such information, which are necessary to fully understand the offer for techno – commercial evaluation. As a minimum requirement, the following information shall be furnished to fully describe the scope of work and services offered. Duly filled-in Technical Data sheets (Annexure II) and guarantee schedule furnished under Annexure-III. - PID diagram - Performance curve - Terminal point details. - General Arrangement drawings indicating dimensional data with civil loads and pocket details. - Rotor GD^2 (kg-m²) - Torque Vs Speed curve - Calculation of Motor rating, Bearing capacity and selection of coupling - Bill of material along with material and code - Overall space and headroom requirement with details of handling during Erection, operation & maintenance of the equipment. - Erection, Operation & Maintenance manual with lubrication schedule - Procedure for shop / site performance tests - Time schedule for delivery. - Quality Assurance Plan. - Make of all bought out items. - Deviation list - Spares list. - Hoist / Crane requirement. - Reference list of similar projects executed. - List of proposed makes and vendors - Training program and schedule for BHEL/NTPC personnel	



TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH KARANPURA 3X660 MW

NTPC:NK:FGD:LGS:R00

S.No	Description	Vendor to confirm
	u. Equipment maintenance schedules The above documents are required for proper evaluation purpose and vendors are requested to comply with above in all respect.	
B	DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT	
	The Successful bidder shall submit necessary data, documents and drawings for review, approval with requirements specified here under. However as minimum the following shall be submitted. - Duly filled technical datasheet. - Warranted performance curves. - General arrangement drawings indicating dimension and civil loading details. - Motor Data - Recommended repair procedure etc. - Operation and maintenance manuals - Any unique installation instructions shall be noted on the submitted drawings or be provided as a separate document prior to the submission of the Operation and Maintenance Manual. - Erection schedule and component list. - Successful Bidder shall submit Calculation for HT Motor power requirement for sizing HT Motor within 2 weeks from the date of ordering. Drawings that are reviewed by the NTPC/ BHEL will be returned to bidder with a transmittal letter with any comments and / or questions marked on the drawings or noted in the letter. All comments and questions must be resolved before a resubmission of drawings / documents. If the design has not developed enough to resolve some of the comments or questions, bidder shall place a “hold” on those items or areas of design. NTPC/ BHEL reserves the right to return drawings unprocessed to bidder if there exists any evidence that bidder has not acknowledged all comments and questions. All necessary GA drawings, sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation & maintenance manual as asked by NTPC must be furnished by bidder in soft and hard copy forms. For all documents softcopy format shall be searchable pdf, however in addition all drawings, diagrams like P&IDS shall be supplied in ACAD or other editable format and all lists in Excel format. Further break up of technical documents will be discussed during finalization of the purchase contract. Unless agreed otherwise, Ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language. Electronic Copies shall be submitted in primary original data format (e.g. DOC, XLS, DWG) as well as in a	



**TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH
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S.No	Description	Vendor to confirm
	printable non-proprietary document format (e.g. PDF). Especially P&IDs shall be submitted as DWG files and PDF files. Bidder to ensure submission of hard copies as per NTPC requirement for all engineering drg/doc and for all subsequent revisions along with a soft copy through email to concerned project team. However all the engineering related information shall be furnished in soft form to BHEL.	



TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH KARANPURA 3X660 MW

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23.0 ANNEXURES

ANNEXURE – I- QUALIFICATION REQUIREMENT



TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH KARANPURA 3X660 MW

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ANNEXURE – II- TECHNICAL DATA SHEET

Sl. No	Description	Data
1.0	GENERAL	
	a. Client	BHEL- Ranipet
	b. Project	NORTH KARANPURA
	c. Ultimate Customer	NTPC
	d. Location	Charta district ,Jharkhand , India
	e. Service	Continuous
	f. Installation	inside the Building
	g. Qty —common for both units	1 Working + 1 Standby
2.0	MANUFACTURER DETAILS	
	a. Model	MST2970
	b. Type	Horizontal
	c. Type of Driver	Motor
3.0	OPERATING CONDITION	
	Medium to be handled	Limestone(size Diameter<25mm)
4.0	PERFORMANCE DATA	
	a. Capacity TPH	50
	b. WBM Dimensions WmXLmM	
	c. Effective volume m ³	
	d. BkW Normal /Maximum KW	
	e. Motor rating KW	
	f. Motor Speed RPM	
	g. Ball Mill Speed RPM	
	h. Noise level dB(A)	(less than __dB when measured at a distance of 1 meter)
	i. Performance curve	Enclosed herewith
4.0	CONSTRUCTION DATA	
	a. Manufacturer	
	b. Model No.	
	c. Journal bearing: Type / Size: (GA drawing to be enclosed.)	
	d. Thrust bearing: Type / Size:	
	e. Bearing cooling requirement	
	f. Cooling water requirement	
	g. Type of drive	
	h. Shaft seal	
	i. Size / Code	
	j. Type of coupling (GA to be furnished)	Gear coupling with elastic pin (gear box & pinion side)



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Sl. No	Description	Data
	k. Service factor	
	l. Shaft size at coupling location	
	m. clutch system GA	
	n. Rotation (viewed from mill outlet)	Clock-wise
	o. Coupling type	
	p. Coupling make	
	q. Base plate details to be provided for a. Inching motor b. WBM c. Pinion bearing housing gear box & main motor.	
	r. Total weight of ball mill system	
	s. Maximum Erection weight tons (shell and corner)	
5.0	MATERIALS OF CONSTRUCTION	
a.	Thickness of shell construction	
b.	Liner material & hardness	
c.	Discharge cover	
d.	Feed unit material of construction	
	Feed part	
e.	Discharge unit	
f.	WBM Ring Gear guard cover	
g.	Air clutch	
h.	Pinion drive material of construction	
i.	Shaft Seal	
j.	Base frame material of construction	
6.0	Technical Data	
7.1	Bunker/Silo shut off gates	
a.	Manufacturer	
b.	Type	
c.	Material of the gates & frame	
d.	Motor rating (KW)	
7.0	Down spout	
a.	Manufacturer	
b.	inside diameter (mm)	
c.	Thickness in mm+ linear thickness in mm if applicable	
d.	Height (mm)	
e.	Material	
f.	Off set between feeder outlet and center line of limestone bunker, if any	



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Sl. No	Description	Data
8.0	Gravimetric feeder	
	Manufacturer	
	Type	
	Feeder size (l x w x h)	
	Normal capacity (tones/h)	
	Maximum capacity (tones/h)	
	Method of output control	
	Speed pulser allowable VA burden	
	Feeder belt width (mm)	
	Auxiliary power consumption (KW)	
	Type of Drive	
9.0	Limestone Feeders	NA
a.	Manufacturer	
b.	Model Number	
c.	Method of measurement	
d.	Range of measurement (kg/hr).	
10.0	Downspout from feeder outlet to Pulverize.	
a.	Manufacturer	
b.	inside diameter (mm)	
c.	Thickness (mm)	
d.	Material	
e.	Height (mm)	
f.	Off set between feeder outlet. and center line of limestone ball mill inlet between, if any	
11.0	Limestone Pulverizer's	
A.	Design Data :	
	a. Manufacturer	
	b. Type and model	
	c. Total Number of mills	
	d. Mill maximum capacity (kg/hr)	
	e. Size of raw limestone at mill inlet (mm)	
	f. Bond Index of Limestone	13 kwh/ton
	g. Fineness of pulverized coal through 325 mesh (%)	
	h. Pulverizer Speed (rpm)	
	i. Number of mills working	



TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH KARANPURA 3X660 MW

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Sl. No	Description	Data																											
	j. Mill loading of working mills (% of maximum capacity) when no of mills as per (I) are operating																												
	k. Mill Power Consumption																												
	l. Mill Main Motor Rating (KW)																												
	m. Main Motor (Voltage/H2/rpm)																												
	n. Overall dimensions of mill																												
	o. Total weight excluding motor																												
	p. Solid Concentration (w/w %) in mill																												
	q. Method of Classification																												
	r. Ball Consumption (kg per ton of limestone) (0.7 kg/ton)																												
	s. Minimum ball diameter below which ball shall be replaced																												
B.	Constructional Features																												
	a. Material / Thickness of Mill Wear Liners	Vendor to specify																											
	b. Shell thickness_____																												
	c. Liner thickness_____																												
	d. Guaranteed Wear Life of Wear Liners (8000hours) minimum																												
	e. Estimated labor (in man hours) for replacement of wear liners)																												
	f. Material / Diameter (mm) of Ball																												
	g. Hardness of Ball mill _____																												
	h. Refilling Ball size diameter _____																												
	Details of quantity & weight																												
	<table><tr><th>Material grade</th><th>Ball size</th><th>Qty no</th><th>Weight in kg</th></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>		Material grade	Ball size	Qty no	Weight in kg																							
Material grade	Ball size	Qty no	Weight in kg																										



TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH KARANPURA 3X660 MW

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Sl. No	Description	Data
C	Type of drive transmission	
	i) Make / Model of Gearbox ii) Speed Ratio	
D	Type of coupling	
E	Pulverizer lube oil system	
	a) No. of lube oil pumps per pulverizer b) No. of lube oil pumps working c) No. of oil coolers per pulverizer	
F	Auxiliary Motor Rating (KW) inching	
G	Mill speed with Auxiliary Motor (rpm)	
H	Mill Separator Tank	
	i) Capacity (m3) ii) Material/Thickness (mm) iii) Lining Material/Thickness (mm) iv) No. of Agitators	
I	Mill circuit Pump	
	I) Number of pump 2(1W+1S) ii) Make/Model centrifugal iii) Impeller Type iv) Material/Thickness (mm) of Impeller and lining v) Casing Type vi) Material/Thickness (mm) of Casing/Lining duplex? vii) Rated Flow Head (m3/hr/ m) viii) Slurry Solid concentration (w/w %) Wear Life of Pump components ix) Power Consumption x) Motor Rating (KW) IE3	
J	Agitators	
	i) No./Make/Model ii) Type (Top entry) iii) Speed (rpm) iv) Drive Mechanism (b/w motor & impeller) v) Shaft Material carbon steel with rubber lining vi) Material / Thickness (mm) of Impeller / Lining vii) Power Consumption(shaft power) viii) Motor Rating (KW) IE3 ix) Motor Speed (rpm)	



**TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH
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Sl. No	Description	Data
1.	Rated capacity of Wet Ball Mill (WBM) TPH	50
2.	Limestone output fineness at rated % thro capacity 325 mesh	90
3.	Guaranteed power consumption at kW rated capacity	
4.	Life of wet ball Mill wear parts Hours	
5.	Guarantee ball consumption per ton g/Ton of limestone throughput	
6.	Noise level at a distance of 1.0 meter dB(A) horizontally from the equipment and 1.5 m above operating floor at site	
7.	Maximum vibration (peak to peak microns amplitude at site)	
8.	Equipment Availability (%) Equipment Availability for 120 days Equipment Availability for 1 year	Vendor to specify Vendor to specify

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



**TECHNICAL SPECIFICATION OF LIME STONE GRINDING SYSTEM –NTPC NORTH
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ANNEXURE III- SCHEDULE OF GUARANTEES :

Sl. No	Description	Data
1.	Rated capacity of Wet Ball Mill (WBM) TPH	: 50
2.	Guaranteed power consumption at rated capacity kW	: Bidder to Provide
3.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor dB(A)	: Bidder to Provide
4.	Maximum vibration (peak to peak amplitude at site) microns	: Bidder to Provide
5.	Equipment Availability (%)	: Bidder to Provide
6.	Efficiency (%)	: Bidder to Provide
7.	Life of WBM wear parts Hours	: ≥8000 hours operation
8.	Scheduled Maintenance (Minor Overhauls): Recommended intervals between maintenance outages hours	: >25000 hours operation.
9.	Scheduled Maintenance (Major Overhauls): Recommended intervals between maintenance outages shall be hours	: >75000 hours operation.

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ANNEXURE – IV- LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT

Sl No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



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ANNEXURE -V

A) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	No of copies With	Vendor to comply
1.	Specification each pages signed and stamped by vendor.	1	
2.	Deviation list to be furnished in annexure-IV	1	
3.	scope of supply(as per BHEL scope)		
4.	Annexure to qualification requirement Annexure-3K. details.	1	
5.	Reference plant details of similar or higher capacity mill size supplied.		
6.	GA& Cross section drawing of ball mill	1	
7.	P & ID diagram of ball mill system	1	
8.	P&ID diagram of lubrication oil system		
9.	Data sheet		
10.	T-S curve /and performance curve	1	
11.	Operation logic of ball mill system	1	
12.	Ball mill Sizing Calculation & motor sizing calculation ball mill	1	
13.	Required Electric power for complete Ball mill system	1	
14.	Total weight maximum weight maximum weight of single component to be handled during maintenance (required for hoist sizing)	1	
15.	Shortest Manufacturing Time	1	
16.	Sub-Vendor items list & vendor Name	1	
17.	Quality Plan	1	
18.	List of mandatory & recommended spares with price list (To be submitted along with offer)	1	
19.	List of Start-up & Commissioning to be provided (vendor scope)	1	
20.	List of Special Tools to be provided (vendor scope)	1	
21.	List of test to be demonstrate/performed at vendor work & at site vendor specify clearly.	1	
22.	Total price of the system with break up price sheet for major & miner items to be provided in main offer.	1	
23.	Catalogue	1	



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B) DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

Sl. No.	Description	No of copies After award of contract	Delivery Time
1.	Utility Consumption	1	2 weeks after contract
2.	Foundation Data including Anchor plan	1	2 weeks after contract
3.	Performance curve	2	2 weeks after contract
4.	Assembly drawings of each equipment	1	1 month after contract
5.	Cross section detail drawing	1	1 month after contract
6.	Data Sheet	1	2 weeks after contract
7.	Annexure to qualification requirement- Annexure 3K.	1	2 weeks after contract
8.	Lubricating oil list	1	2 months after contract
9.	Special tools list	1	2 months after contract
10.	Installation and assembly procedure	1	4 months after contract
11.	Inspection and Test Procedure	1	1 month after contract
12.	Inspection & Test record	1	In 2 weeks after test
13.	Inspection Certificate	1	In 2 weeks after test
14.	Sub vendors List	1	2 weeks after contract
15.	Manufacturing Schedule	1	2 weeks after contract
16.	Progress report	1	Every month
17.	Proforma Packing List	1	2 months prior to shipping
18.	Approximate weight of each skid	1	2 months after contract
19.	Required Electric power	2	2 weeks after contract
20.	WBM and Motor Sizing Calculation	1	2 weeks after contract
21.	Material Test Certificates	2	In 2 weeks after test
22.	Pre Commissioning Check List	2	4 months after contract
23.	Scope of Supply	2	2 weeks after contract
24.	Quality Plan	4	1 month after contract
25.	Operation and Maintenance Manual	• 10 hardcopies and 5 electronic copies in English • 1 hardcopy and 1 electronic copy	4 months after contract
26.	Spare List (Mandatory, Recommended)	1	1 month after contract



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Sl. No.	Description	No of copies After award of contract	Delivery Time
27.	Start-up & Commissioning Spares	2	1 month after contract
28.	List of Special Tools	1	1 month after contract
29.	Delivery Schedule	1	2 weeks after contract
30.	Test Arrangement & Test procedure	2	1 month after contract
31.	T-S curve	2	2 weeks after contract
32.	P & I Diagram	2	2 weeks after contract
33.	Catalogue	2	2 weeks after contract

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



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ANNEXURE-VI

TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING

Refer to Specification No: PE-TS-888-100-A001 for detailed specification on Seaworthy packing.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



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ANNEXURE-VII

INSPECTION & TESTING

Refer to all clauses for Inspection & testing requirements.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



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ANNEXURE-VIII

HEALTH & SAFETY MANAGEMENT MANUAL

Refer to all clauses for Health & Safety requirements.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----