TECHNICAL SPECIFICATION

FOR

GYPSUM DEWATERING SYSTEM(GDS)

CONFIDENTIAL

CUSTOMER :NATIONAL THERMAL POWER CORPORATION (NTPC)

PROJECT : NORTH KARANPURA 3x660 MW TPS

APPLICATION : FLUE GAS DESULPHURIZATION SYSTEM

Flue Gas Desulphurization Group
Air Quality Control Systems
BAP: BHEL: Ranipet

TECHNICAL SPECIFICATION FOR GYPSUM DEWATERING SYSTEM

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CLAUSE NO.	DESCRIPTION		
1.0.00	**PROJECT INFORMATION**		
a)	Address	:	Near Tandwa town
b)	Districts	:	Chatra
c)	State	:	Jharkhand
d)	Country	:	India
	Site Condition		
a)	Ambient Temperature(Guarantee)	:	27 Deg C
b)	Ambient Temperature (Design)	:	45 Deg C
c)	Relative Humidity	:	60%
d)	Project Owner	:	NTPC
e)	Buyer	:	BHEL-Ranipet
	Note: 1) Guarantee point conditions shall apply for the Guarantee Values as well as for the Guarantee test/Performance test 2) Equipment and Material must be suitable for the range of ambient site conditions.		
2.0.0	**APPLICABLE CODES AND REGULATIONS**		
	The design and materials shall confirm to the requirements of applicable codes and regulations of the latest edition. The design, manufacture, installation and testing of the gypsum dewatering system shall follow the latest applicable Indian/International (ASME/EN/Japanese) Standards. GB standards are not acceptable.		
3.0.0	**INTENT OF SPECIFICATION**		
a)	This specification covers the minimum requirements for the complete design, material, manufacturing, shop inspection, testing at the manufacturer's works, delivery at site, supervision of erection & commissioning and performance testing of Gypsum Dewatering System along with accessories which is to furnished in the Flue Gas Desulphurization plant of North karanpura 3x660MW project in Jharkhand. The following points may be noted.		
b)	Bidder shall make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.		
c)	There are three (3) units of each 660 MW and each unit is envisaged with one (1) FGD system. Two (02) Sets of Gypsum Dewatering system (1 working + 1 standby) common for all three units shall be provided.		
d)	The Bidder shall offer only proven design, which meets the Provenness criteria indicated in the clause no: 4.0. Necessary document evidences as per **Annexure-I** shall be submitted along with the bid. If bidder doesn't meet the specified provenness criteria, they are denied to participate in this tender.		
e)	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-V) . Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable. No deviation or exception shall be permitted without the written approval of the purchaser.		

f)	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 system, he shall recommend the same along with reasons in a separate section along with his proposal and include the same in his scope of supply.	
g)	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.	
4.0.0	**QUALIFICATION REQUIREMENT (QR)**	
	Bidder should have previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured at least one vacuum belt filter of minimum 80% of offered capacity and which are in satisfactory operation for a period of not less than one year as on 30-JAN-2019 in Wet Limestone based FGD application in Coal fired power plant. Refer to Annexure-I for detail on Qualification Requirement (QR).	
5.0.0	**TECHNICAL INFORMATION**	
1.	Quantity of gypsum dewatering system	Two (2) Numbers (one working +one standby)
2.	Capacity of gypsum dewatering system	80 tones per hour (wet cake) for each belt filter
3.	Moisture content	10%
4.	Gypsum purity	90%
6.0.0	**BIDDER'S SCOPE OF WORK**	
	Scope for the bidders shall include Design, Engineering, Manufacturing, Packing, Supply, Supervision of Erection & Commissioning, Performance Guarantee Test, handing over of the system to 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. The scope of supply for **Gypsum Dewatering System** shall include but not limited to the following.	
1)	**Primary hydro cyclone**	Two (2) sets
	i. Hydrocyclone clusters	
	ii. Anchor bolts, nuts and washers	
	iii. Flanges for inlet and overflow	
	iv. A variety size of vortex finders for all the hydro cyclone	

	v. Accessory piping within the skid	
2)	**Secondary hydrocyclone**	Two (2) sets
	i. Hydrocyclone clusters	
	ii. Anchor bolts, nuts and washers	
	iii. Companion flanges for inlet and overflow	
	iv. A variety size of vortex finders for all the hydro cyclone	
	v. Accessory piping within the skid	
3)	Vacuum belt filters complete with Accessories including discharge chute, Drivers (VFD with LCP) and driving motors(IE3) with inverter panel	Two (2) numbers
4)	Vacuum receivers with Anchor bolts, nuts and washers	Two (2) numbers
5)	Vacuum pumps with driver(IE3 motor), All connection bolts/nuts/washers for installation, Required instruments and any safety device	Two (2) numbers
6)	Vent fan including enclosure and its arrangement	Two (2) numbers
7)	All Interconnected piping (slurry, air and water pipes)	One (1) set *
8)	Complete valves required for the system along with wash water line wherever necessary as per P&ID	One (1) set *
9)	Arrangement for cloth and cake washing, including , spray nozzles	One (1) set*
10)	Clarified Water(cake wash) pump with motor	4 Nos
11)	Belt filter wash pump with motor	2 Nos
12)	Companion flanges with gaskets and fasteners	One (1) set*
13)	Coupling with guards	One (1) set*
14)	INSTRUMENTS for the entire Gypsum Dewatering System((Minimum Requirement for each gypsum dewatering system is given in the P&ID)	One (1) set*
15)	Electric common including but not limited to	
	i. Local control panel	
	ii. LV Motors	
	iii. Junction Box	
	iv. Instruments	
	v. Push buttons	

16)	Expansion Joints at suction & discharge of each pump and also for other equipment wherever applicable	One (1) set*
17)	All motors shall be provided with suitable double compression cable gland Bidder shall provide cable glands and lugs for all equipment in his scope. Cables shall be terminated using double compression type cable glands and solder less crimping type tinned copper cable lugs. Bidder shall provide junction box. The Junction box shall have provision for installing glands of suitable size on the bottom of the box.	
18)	**System control:** Each equipment shall be furnished with required instrumentation and electrical accessory devices mounted and connected in a control cabinet. Provisions shall be made for the interface between the local cabinet and the DCS such that the operation of the equipment's can be controlled from the control console in the FGD Control room.	
19)	**Alarm Signal:** a) Bearing temperature high b) Bearing Cooling water flow Low (As applicable) **Interlock signal:** a) Belt filter wash tank level low Bearing Temperature Transmitter for initiating alarm during when "Bearing temperature high" shall be supplied by Bidder. Bearing temperature transmitter shall be provided with local display also. Bearing temperature transmitter(with 2V3 logic) shall be provided for HT motors(> 200 KW) at both the driving and Non-Driving ends. Similarly, Vibration transmitters (with 2V3 logic) for measuring vibration in X&Y axis have to be provided for at the driving and Non-driving end for HT Motors. Bearing Cooling Water Flow switch for initiating alarm during when "Cooling water flow Low" shall be supplied by Bidder for each system. In addition, sight glass also shall also be provided to view the cooling water flow. Bearing cooling water Flow switch shall take the signal to PLC / DCS system.	
20)	**First fill lubricants**: All the first fill and one year's toppings requirements of consumables such as grease, oil, lubricants, servo fluids etc. which will be required to put the equipment covered under the scope of specifications into successful commissioning/initial operation and to establish completion to facilities should be provided by contractor/supplier.	
21)	Supervision of erection / commissioning of both the gypsum dewatering system. 15 Days per system and 30 Days for Two Systems.	
22)	Mandatory spares with breakup price	
23)	Painting and rust prevention during shipment and construction	
24)	Seaworthy packing & forwarding to project site-refer clause 1.0.0 for project information	
25)	Recommended spare parts (for 3 years operation) with break up price.	
26)	Any other items required not covered above but required for the completeness of the system; same shall be included in the offer and shall be supplied by the Bidder/supplier.	

	*** One set means complete requirement for both the gypsum dewatering system** Bidder shall refer to the P&ID enclosed in Annexure- VII for the items under the bidder's scope. All the items indicated in the P&ID are minimal requirements.
6.1.0	**TERMINAL POINTS**
1.	Primary hydro cyclone feed slurry will be provided by BHEL at the inlet flange of Primary hydro cyclone.
2.	Primary hydro cyclone overflow shall be terminated by bidder at overflow outlet flange
3.	Secondary hydro cyclone feed slurry will be provided by BHEL at the inlet flange of secondary hydro cyclone
4.	Secondary hydro cyclone overflow shall be terminated by bidder at overflow outlet flange.
5.	Filtrate water from vacuum belt filter, wash water after belt filter cloth/cake washing and secondary hydro cyclone underflow shall be terminated by bidder in filtrate water tank.
6.	Process water , clarified water, Service & instrument air will be provided at one location near plant boundary (i.e near the building boundary). Further piping from terminal point to GDS system utilities are in bidder's scope.
7.	Discharge of gypsum through discharge chute onto the gypsum belt conveyer is in bidder's scope. Please refer enclosed PFD, P&ID typical layout & elevation drawing of GDS for the details in the scope
7.0.0	**PROCESS DESCRIPTION**
1.	Common gypsum dewatering system is envisaged for all three FGD units. The dewatering system shall receive the gypsum slurry from Primary Hydro cyclone feed pumps. Gypsum dewatering system shall be suitable for handling slurry from all three FGD units. Two sets of primary hydrocyclone (1W+1S) with accessories shall be in vendor scope. Primary hydrocyclone underflow shall be taken to VBF inlet.
2.	The overflow from the primary sets of hydro-cyclone shall be taken to a secondary hydro-cyclone feed tank (BHEL Scope). Secondary Hydro cyclone feed pumps (BHEL Scope) shall transfer the slurry from tanks to secondary hydro cyclone. Two sets of Secondary hydro cyclones (1 working+1 stand by) and its accessories shall be in vendor scope.
3.	The underflow from the secondary hydro-cyclone shall be taken to the filtrate water tank . The over flow from the secondary hydro-cyclone shall be taken to a waste water storage tank.
4.	One no. of belt filter washing tank is envisaged for both the belt filters. Each belt filter washing tank shall be provided with 2 nos (1W+1S) of belt filter wash pump. Belt filter wash pump supply water for cloth washing/belt washing. Tanks are in BHEL scope and pumps are in vendor scope.
5.	One no. of Clarified water tank is envisaged for each belt filter. Each clarified water tank shall be provided with 2 nos (1W+1S) of Cake wash pumps. Cake wash pump supply clarified water for cake washing and also for vacuum pump sealing. There are 2 clarified water tank and 4 nos. cake wash pump. Tanks are in BHEL scope and pumps are in vendor scope.

8.0.0	DETAILED SPECIFICATION
1.	Bidder/Contractor shall supply two stage gypsum dewatering system consisting of primary hydro cyclones, vacuum belt filters and secondary hydro cyclones for dewatering of gypsum from absorber to less than 10% moisture.
2.	Bidder/Contractor shall supply 2x100% gypsum dewatering system with each stream sized to dewater 80 TPH (Wet cake) produced by the all three FGD units operating at design point. All other stipulations with respect to sizing and design of the dewatering system, auxiliaries and other systems shall be in line with this specification.
8.1.0	**Hydro-cyclones**
1.	Two (2) sets of primary hydro cyclones are envisaged, each set shall be sized to dewater the gypsum slurry produced by the unit operating at design point.
2.	Each set of primary hydro-cyclone shall be provided with 10% spare hydro-cyclones. The capacity defined in the previous clause shall be met with spare hydro-cyclones out of service
3.	The primary hydro-cyclone shall be installed directly above the belt filters. The overflow of the primary hydro-cyclones shall be taken to secondary hydro-cyclone feed.
4.	Two (2) sets of secondary hydro cyclones are to be installed, each sets shall be sized to dewater the gypsum slurry produced by all three FGD units operating at design point .
5.	Both primary and secondary 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.
6.	The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining. The feed chamber, overflow and underflow chamber shall be made of carbon steel of adequate thickness with a rubber lining of minimum **25 mm** thickness. Liners shall have a minimum wear life of not less than **7000 hrs.**
7.	All Hydro Cyclones clusters shall be made of polyurethane or urethane material only.
8.2.0	**Vacuum Belt Filters**
1.	Two (2) numbers of vacuum belters each of capacity **80 TPH (Wet cake)** is envisaged. Each vacuum belt filter shall be sized to meet the following requirements, all occurring together, with an inlet solid concentration of not more than 45% or outlet of hydro-cyclones whichever is minimum: ▪ Outlet Moisture 10% max. ▪ Gypsum Purity 90% (minimum) Chloride content < 100 ppm
2.	The Vacuum Belt Filters shall have the following characteristics: a) Very rigid frame and rolls, no deformation whatsoever may occur. b) All rolls shall be installed perfectly horizontally c) There shall be no vacuum under the slurry deposition zone. d) Deposit thickness control and directional stability control e) The slurry shall be put on the belt in counter current relative to the rotation of the band.

	f) The vacuum chambers shall be easily opened for inspection and cleaning.
3.	The vacuum belt filter shall be proven design in operation for similar capacities. The filter cloth shall be polyester or polypropylene as per the proven design of the supplier and shall be guaranteed for a minimum life of not less than 7000 hrs.
4.	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material or shall be provided with corrosion resistant liners of proven design.
5.	In case, the contractor offers a design with an underlying belt for carrying the filter cloth, the same shall be endless, factory vulcanized rubber belts. The belt shrouds and the sealing belts shall provide a leak tight arrangement to prevent overflow of gypsum slurry. The sealing belt shall have minimum life of not less than 7000 hrs.
6.	The vacuum box shall ensure tight sealing with the belt/cloth and shall be of proven design.
7.	The belt filter shall have an automatic cloth tracking mechanism and shall be provided with all required instrumentation as per the bidder's proven practice. The belt filter shall have an automatic cloth tensioning mechanism. Pull chord switches shall be provided for each vacuum belt filter. Four (04) no's of Belt sway switches shall be provided for each vacuum belt filter. Cake thickness sensors with double redundancy shall be provided for each vacuum belt filter which shall control the speed of the vacuum belt filter in turn.
8.	Differential Pressure indicator shall be provided at the discharge line of Belt filter wash Pump for each vacuum Belt filter. Flow indicator shall be provided for cloth washing line of each vacuum belt filter. Flow indicator shall be provided for cake washing line of each vacuum belt filter as per P&ID attached.
9.	The filter shall be provided with minimum 2 stages of cake washing for removing impurities in the gypsum. One stage of cloth washing arrangement shall also be provided.
10.	The filtrate from gypsum slurry and from cake washing shall be taken to a separate vacuum receiver tank(s) as per the proven practice of the supplier. Each belt filter shall have an independent vacuum pump.
11.	Gypsum cake from each belt filter shall be discharged through a hopper onto belt conveyor being provided by the Employer. The elevation of discharge point of vacuum belt filter shall be at least 10.0 m above GL.
12.	A 2 m (min.) wide platform shall be provided around each belt filter for easy approach & maintenance. Handling facilities for replacement of heavy components of the belt shall also be provided. The elevation of discharge point of vacuum belt filter shall be as per Annexure-XIII-GA Drawing of Gypsum Dewatering Building. Any changes shall be suggested by Bidder accordingly.
13.	Local control panel shall have display on the front panel and necessary electrical parts.
14.	The service factor of the gear unit (if any) shall be minimum 1.5.
15.	Piping and wiring within the skid should be in the vendor's scope.
16.	All client end connection flanges shall be ANSI B 16.5/AWWA

8.3.0	Vacuum System
1.	The filtrate from each belt filter, cake washing & cloth washing shall be taken to a separate receiver tanks as per the supplier's proven practice. Each belt filter shall be provided with an independent vacuum pump sized to meet the requirements of the belt filter operating at its maximum capacity. An additional 10% margin over the above shall be provided each vacuum pump.
2.	For each vacuum belt filter the vacuum pump shall be installed close to the vacuum belt filter. Each Vacuum pump shall have its own piping system, which connects the pump with the associated vacuum belt filter. Bidder to provide Equipment layout and GA of Gypsum dewatering building along with the offer
3.	The vacuum pump shall be of low speed liquid ring type of proven design. The design of the vacuum pumps shall avoid cavitation under all operating conditions.
4.	The seals shall be of proven design.
5.	Silencers shall be provided, if required, to limit the noise level to values stipulated elsewhere in this specification.
6.	The vacuum receiver and pump internals shall be suitably lined to protect against the corrosive environment. The material selected for vacuum pumps & vacuum receivers shall be proven for similar application.
7.	Each vacuum receiver tank(s) shall be provided with slide plate type pneumatic vacuum breaker. The plate shall be stainless steel with a min. thickness of 3 mm.
8.3.1	**COMMON REQUIREMENTS FOR PUMPS (VACUUM PUMP , BELT FILTER WASH PUMPS , CLARIFIED WATER PUMPS)**
1.	All the pump wear parts in contact with the slurry shall be provided with replaceable rubber/elastomer liners suitable for the fluid handled. The Bidder can also offer an hi chrome alloy line pump if the Bidder has previous experience of the same for similar applications. The material used by the contractor shall be proven in previous installations.
2.	The pump shall be provided with seals of proven type and shall be designed for minimization of seal water consumption. The shaft shall be supported on heavy-duty ball/roller bearings.
3.	All pumps shall be designed to withstand a test pressure of 1.5 times the maximum possible pump shut off pressure under maximum suction pressure conditions.
4.	Product water flushing lines and drains are to be supplied for each pump handling the prevailing water to avoid corrosion if the pump is out of operation for extended periods.
5.	Pumps must be carefully set to ensure that the net positive suction head available under all operating conditions will be adequate. The NPSH Values are to be referred to the least favorable operating conditions- lowest atmospheric pressure, lowest level of water on the suction side of the pump and highest temperature of the pumped fluid. An adequate safety margin of normally greater than 1m to the max NPSH required shall be provided.

6.	All pumps shall be fitted with suction and discharge pressure gauges. Pressure gauges shall be with diaphragm seal for slurry application. Pressure gauges for other medium shall be with gate valves. All the wetted parts shall be SS316 or equivalent
7.	Venting valve shall be fitted to all pumps at suitable points on the pump casing unless the pump is self-venting due to the arrangement of the suction and discharge nozzles. Drainage facilities shall be provided on the pump casing or adjacent pipe work to facilitate the dismantling of pumps.
8.	Design pumps not to be damaged during reverse rotation at up to 150% of design RPM, at full discharge head in the event that a pump trips while the other operating pump remain on line.
9.	Pumps shall have stable head-capacity characteristics curve from run-off to shut-off. Shut-off head should be minimum 125% of Best Efficiency Point (BEP).
10.	Selection of Duty point should preferably be at BEP (Best Efficiency Point) or slightly at the left of BEP. Selection of Duty point beyond 115% of BEP will not be acceptable. It should be noted that head variation is due to level variation in tank. Pump has to run in the system without compromising its NPSH requirement at lowest water level in tank. Hence, when tanks are filled-up and are at normal water level, pump will operate at the right of BEP, pump's operating zone should be considered accordingly.
11.	External flushing is required to remove the accumulated particles and all related information should be mentioned in data sheet.
12.	Pump should have adjustment provision of axial clearance between casing and impeller for maintenance of performance at best efficiency when there is wear in between impeller and casing.
13.	In case rubber or nonmetallic linings are used, these will be two piece molded under pressure and adjusted to the screwed metallic clamping which have been welded to the casting.
14.	Each pump will have a coupling of adequate size, designed for full load and capable of supporting start –up on overload moments. Each half of the coupling will be factory mounted and locked to its shaft. The coupling must be able to accept the adjustment of the impeller.
15.	The pumps shall have mechanical seals of cartridge type with self-lubrication sliding ring cartridges. The static part will be mounted on the seal plate with circumferential ring (O-ring) or another flexible sealing ring. Built in seal design will not be accepted.
16.	The sealing areas shall be designed in such a way so that solids do not precipitate in them or affect the cooling or affect the adjustment and mechanical functioning of the seals. Seals which do not need jet cleaning are preferred.

17.	Pump induced vibration due to flow pulsations shall be avoided through suitable design.
18.	Each rotating equipment shall be first statically balanced and then dynamically balanced according to ISO 1940 (in the case of impellers this shall be done before and after mounting of the service rotor shaft).
19.	All the wear parts of the pump shall be guaranteed for a minimum wear life of not less than 25000 hrs.
20.	Coupling halves shall be machine matched to ensure accurate alignment. Couplings must have a rated capacity of at least 120% of the maximum potential power transmission requirement.
21.	All rotating parts such as coupling shall be covered with suitable protective guards. Guards shall be easily removable type. Coupling shall be of flexible type made of cast steel. The bidder shall furnish both halves of the coupling. Both the Coupling halves shall be bored and keyed to fit shafts of the pump and the motor by bidder. The coupling between shafts shall be so designed that they become tight during pump operation.
22.	A common base plate shall be provided for pump assembly & Motor and the same shall be rigidly constructed, adequately braced and provided with finish pads for mounting pump.
23.	Pump manufacturer is to supply base plate along with Foundation bolt & Nut, “Taper wedge” and the necessary fastener for Pump and Motor with Base plate. Even if Motor is excluded from their scope, necessary fastener for motor foot with base plate will remain in pump scope of supply in order to avoid any problem.
24.	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 planning stage of layout for the equipment. The bidder shall provide the header piping for utilities and branch piping to each location. 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.
25.	Nameplate: All equipment shall be provided with name plates indicating the item number and service name. Nameplates 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.
26.	Rotation arrows shall be cast in or attached with stainless steel plate on each item of rotation equipment at a readily visible location.

27.	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 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.	
28.	Skid Mount/Transportation: Equipment shall be fabricated as skid mount design as much as practical to minimize erection at the site.	
29.	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.	
30.	Provide double nuts for anchor bolts.	
31.	Bidder shall provide allowable vibration level on foundation in foundation drawings and/or general arrangement drawings.	
32.	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.	
33.	Bidder shall provide the mating flanges with the necessary gaskets.	
34.	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.	
35.	Bidder to provide capacity of crane or hoist required for material handling and the details of heaviest component to be handled.	
36.	The list of all Bought out items with makes and country of origin to be mentioned along with offer to be submitted.	
9.0.0	**TECHNICAL REQUIREMENTS**	
I	**DESIGN CONSTRUCTION –VACUUM BELT FILTERS**	**Bidder To Confirm**
1.	The vacuum belt filter shall be proven design in operation for similar capacities. The filter cloth shall be polyester or polypropylene as per the proven design of the supplier and shall be guaranteed for a minimum life of not less than 7000 hrs.	
2.	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material.	
3.	In case, the contractor offers a design with an underlying belt for carrying the filter cloth, the same shall be endless, factory vulcanized rubber belts. The belt shrouds and the sealing belts shall provide a leak tight arrangement to prevent overflow of gypsum slurry. The sealing belt shall have minimum life of not less than 7000 hrs.	
4.	The vacuum box shall ensure tight sealing with the belt/cloth and shall be of proven design.	
5.	The belt filter shall have an automatic cloth tracking mechanism and shall be provided with all required instrumentation as per the supplier's proven practice. The belt filter shall have an automatic cloth tensioning mechanism.	
6.	The filter shall be provided with minimum 2 stages of cake washing for removing impurities in the gypsum. One stage of cloth washing arrangement shall also be provided.	

7.	Local control panel shall have display on the front panel, inverter, PLC controller and necessary electrical parts.	
8.	The service factor of the gear unit (if any) shall be minimum 1.5.	
9.	Piping and wiring within the skid should be in the vendor's scope.	
10.	Nozzles and connections The suction and discharge pipes will be flanged and will have the same nominal test procedure as the body of the pump. Threaded connections are not admitted in these pipes.	
11.	The flanges shall comply with the following standards: - Steel flanges as per ANSI B16.5 (raised face type, at least class 150) - Cast iron flanges as per ANSI 16.1 (flat face type, at least class 125) The pipe shall be designed according to API676 with regards to the force.	
II	**DESIGN AND CONSTRUCTION OF VACUUM PUMPS**	
	Design and construction of various components of the pumps shall conform to the following general specifications. For material of construction of the components, data sheets shall be referred to.	
a)	**Pump Casing**	
	Pumps shall be radial split casing, close/semi-open, over-hang, end suction type back pull-out design, vertical discharge type for horizontal centrifugal pump. The casing shall be designed to withstand the maximum shut-off pressure developed by the pump at the pumping temperature. Pump casing shall be provided with a vent connection and piping with fittings & valves. Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and discharge pressure gauge as standard feature. It shall be structurally sound to provide housing for the pump assembly and shall be designed hydraulically to minimum radial load at part load operation.	
b)	**Impeller**	
	Impeller shall be closed, semi-closed or open type as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled. The impeller shall be secured to the shaft, and shall be retained against circumferential movement by keying, pinning or lock rings. On pumps with overhung shaft, impellers shall be secured to the shaft by a lockout or cap screw which tightness in the direction of normal rotation.	
c)	**Impeller/Casing Wearing Rings**	
	Replaceable type wearing rings shall be provided at suitable locations of pumps. Suitable method of locking the wearing ring shall be used. Wearing rings shall be provided in pump casing and/or impeller as per manufacturer's standard practice.	
d)	**Shaft**	
	The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed. The shaft shall be ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight, hydraulic loads, vibration and torques coming in during operation.	
e)	**Shaft Sleeves**	
	Renewable type fine finished shaft sleeves shall be provided at mechanical seals. Shaft sleeves shall be fastened to the shaft to prevent any leakage or	

	loosening. Shaft and shaft sleeve assembly should ensure concentric rotation.	
f)	**Bearings**	
	Heavy duty bearings, adequately designed for the type of service specified in the enclosed pump data sheet and for long, trouble free operation shall be furnished. The bearings offered shall be capable of taking both the radial and axial thrust coming into play during operation. In case, sleeve bearings are offered additional thrust bearings shall be provided. Antifriction bearings of standard type, if provided, shall be selected for a minimum life 20,000 hrs. of continuous operation at maximum axial and radial loads and rated speed. Proper lubricating arrangement for the bearings shall be provided. The design shall be such that the bearing lubricating element does not contaminate the liquid pumped. Where there is a possibility of liquid entering the bearings suitable arrangement in the form of deflectors or any other suitable arrangement must be provided ahead of bearings assembly. Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearings housing.	
g)	**Mechanical Seals**	
	Mechanical seals shall be of single type with either sliding gasket or bellows between the axially moving face and shaft sleeves or any other suitable type. The sealing faces should be highly lapped surfaces of materials known for their low frictional coefficient and resistance to corrosion against the liquid being pumped.	
	The pump supplier shall coordinate with the seal maker in establishing the seal chamber of circulation rate for maintaining a stable film at the seal face. The seal piping system shall form an integral part of the pump assembly. For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure even when the pumps are not operating. Necessary provision for seal water supply along with complete piping fittings and valves as required shall form integral part of pump supply.	
h)	**Pump Shaft Motor Shaft Coupling**	
	The pump and motor shafts shall be connected with an adequately sized flexible coupling of proven design with a spacer to facilitate dismantling of the pump without disturbing the motor. Necessary coupling guards shall also be provided.	
i)	**Base Plate**	
	A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be fabricated steel and of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the piping unit so mounted as to minimize misalignment caused by mechanical forces such as normal piping strain, internal differential thermal expansion and hydraulic piping thrust. Suitable drain troughs and drip lip shall be provided.	

j)	**Drive Motor (Prime Mover)**	
	The kW rating of the drive shall be based on continuously driving the connected equipment for the conditions specified.	
III	**GYPSUM DISCHARGE CHUTE**	
a.	The minimum valley angle of chutes shall be 60 degrees at the feeding point to guide the material in the direction of belt travel. Transfer chutes shall be adequately sized and sloped to ensure smooth flow of Gypsum without any accumulation anywhere.	
b.	Chutes shall be made of minimum 20 mm thick TISCRAL / SAILHARD/ LSLAS07 or equivalent 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 TISCRAL or equivalent. In case of vertical chute (valley angle more than 80 degree) complete chute, work shall be of 20 mm thick TISCRAL 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.	
	CHUTE BLOCKAGE SWITCHES One no. chute blockage switch for each belt filter of proven type (subject to approval of the employer) shall be provided. Chute blockage switch shall trip the feeding conveyor in case of Chute blockage and protect the feeding conveyor equipment.	
IV	**PIPING**	
a.	The slurry pipes shall be sized to minimize erosion and avoid settling of the gypsum at all load operation. Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The bidder may provide a recirculation line with motorized isolation valve for the above purpose. All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 6 mm thickness.Additional thickness of 2 mm in rubber lining shall be provided at bendsThe bidder can provide slurry pipes of size lower than 3” made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same.. All the rubber-lined pipes shall be of flanged connection.	
b.	The isolation valves provided in all the slurry lines shall be of knife gate type/butterfly type unless specifically mentioned. Motorized actuators shall be provided for valves requiring frequent operation as indicated in the relevant scheme.	

c.	The valves shall be of proven type and the contractor shall submit a detailed valve schedule for employer's approval. Reference list for previous installations for similar application shall also be furnished to BHEL	
d.	Bidder shall provide all necessary arrangements for purging & flushing of all the process pipelines, equipments etc	
e.	Belt filter washing pumps shall have a minimum flow line to tank with a restriction orifice to control.	
f.	All Lube oil , Instrument Air piping shall be made up of Gr.304 Stainless Steel material	
g.	All process water & Cooling water piping shall be made up of Carbon Steel Pressure Piping	
h.	For details on Pipe schedule bidder shall refer to P&ID. For piping specification, bidder shall refer to the Annexure-XII-Pipe & valve material specification	
V	**VALVES**	
	For details on Valve schedule bidder shall refer to P&ID. For valve specification, bidder shall refer to the Annexure-XII-Pipe & valve material specification	
VI	**ACCESSORIES:**	
1)	**Expansion Joints:**	
i.	Expansion Joints shall be provided at suction and discharge of each pump and also for other equipments wherever applicable.'''	
2)	**System control:**	
i.	Each equipment shall be furnished with required instrumentation and electrical accessory devices mounted and connected in a control cabinet.	
ii.	Provisions shall be made for the interface between the local cabinet and the DCS such that the operation of the equipment's can be controlled from the control console in the FGD Control room.	
VII	**ELECTRICALS**	
i.	The Gypsum Dewatering system consisting of Primary hydro cyclones, Vacuum belt filter associated with washing & Conveying system Secondary hydro cyclones in closed circuit shall be operated automatically and sequentially. The provision should also be provided to start and stop the equipment by means of the push button switches located on - Local Control Panel - Local Push Button Station	
ii.	All the Rotating machines such as pumps shall be started and stopped manually by means of local push button station.	

iii.	Bidder shall provide cable glands and lugs for all equipment in his scope. Cables shall be terminated using double compression type cable glands and solder less crimping type tinned copper cable lugs	
iv.	**MOTORS** The following voltage levels shall apply: ▪ Above 0.2 kW and upto 200 kW: 3 phase, 415 V AC ▪ Above 200 kW and upto 1500 kW: 3.3 KV ▪ Above 1500 kW: 11 KW All the S1 continuous duty motor shall be of premium Efficiency class (IE3). For motor specification , bidder shall refer to Annexure-XI Bidder to submit the motor datasheet as per format given in the specification. Motors shall be sourced only from NTPC approved sources.	
v.	**JUNCTION BOX** Bidder to refer to the specification given in Annexure- XI	
vi.	**INSTRUMENTS** Bidder shall refer to the P&ID for the details on the instruments to be supplied. The instruments indicated are minimum requirements. All instruments & actuators shall be connected to DDCMIS through fieldbus i.e. FOUNDATION Fieldbus/PROFIBUS PA protocol complying to IEC 61158 . All instruments shall be as per specification enclosed in Annexure- XI. Vendor to supply all the instruments as given in the P&ID. All electrical actuators shall be with integral starters (non-intrusive with SIL2 certificate)	
vii.	**POWER, CONTROL CABLE & INSTRUMENTATION CABLE:** All the control cables and instrumentation cable shall be as per specification enclosed in Annexure- XI.	
viii.	**LOCAL CONTROL PANEL:** A PLC based local control panel for the entire Gypsum Dewatering System shall be supplied by the bidder. Bidder shall provide the control logic for the entire system.	
10.0.0	**PACKING AND FORWARDING**	
1.	Proper packing to be ensured. Indigenous Supply: Gypsum Dewatering System & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the pump 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 - VIII. 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 contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.	
4.	The entire system have to be supplied in containers and it should be suitable for storing in the outer yard of the plant for a minimum period of 12 months. 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. **BHEL SITE OFFICE, NTPC LIMITED,** **NORTH KARANPURA, 3x660.** **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 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 f 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 pump & 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. 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.	
11.0.0	**SUPERVISION OF ERECTION, TESTING AND COMMISSIONING**	
1.	The erection of Gyspusm Dewatering System will be done by owner as per Erection Manual and check List. However, the bidder shall make one visit per GDS 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 for each system and totally 2 visits. The bidder will be informed well in advance for the visit. Bidder shall include 15 working days per visit in the offer with minimum 2 visits.	
3.	TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in supply portion.	

12.0.0	INSPECTION REQUIREMENT	
1.	**Hydro cyclones** visual, dimensional etc.	
2.	**Pumps :**	
a.	All pressure parts shall be hydraulically tested at 150% of the shut-off head or 200% of rated head, whichever is higher for 30 minutes. No leakage is allowed	
b.	Impeller and rotor shall be first statically balanced and then dynamically balanced according to ISO 1940 (in the case of impellers this shall be done before and after mounting of the service rotor shaft).	
c.	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. (as already stated above.)	
d.	List of Non-Destructive test over and above the material test are as follows: Casing: Material test, Magnetic particle (MPI), DP and Hydro test as applicable Impeller- DPT and MPI as applicable Shaft- Ultrasonic (UT), DPT and MPI Sleeve- DP and Hardness test/ Manufacturer’s recommendation Mechanical Seal- Manufacturer’s recommendation. Base Plate- Stress relieving of weld. Replaceable Rubber liner- Shore Hardness, Class and Type certificate	
e.	Vibration test and Noise level test shall be witnessed at shop. (as already stated above.)	
f.	Mechanical running and the performance test shall be conducted for Pump at the Bidder’s works before dispatch or where the test facilities are available. All pumps to be performance tested as per Hydraulic Institute Standard/Indian Standard. Performance test to include check for noise, vibration level and temperature rise.	
g.	The Bidder shall conduct performance test for the remaining pump and submit the reports.	
3.	**Vacuum Belt Filters:**	
a.	Impeller, casing and shaft of vacuum pumps shall be tested for chemical and mechanical properties as per relevant standard. All plates above 40mm shall be 100% Ultrasonically tested.	
b.	UT on shaft (if greater or equal to 40mm) and impeller shall be carried out.	
c.	All vacuum pumps shall be tested at shop for capacity, power, pressure, efficiency,noise and vibration etc.	
d.	Filter cloths and belts shall be tested for physical properties as per relevant Standard.	

4.	**General Inspection requirements to be considered are as below:**				
1.	S.No	Item	Inspection & Test item	Remarks	
	1.	Hydrocyclones	Material certificate check		
			Dimensional Inspection		
	2.	Pumps	Material certificate check	Shaft & impeller only	
			Dimensional inspection		
			Non destructive testing	DPT on shaft & impellar	
			Hydrostatic test		
			Balancing Test	Static & dynamic	
			Performance test	Incl. Noise & Vibration	
	3.	Motors	Material certificate check		
			Non Destructive Testing		
			Dimensional inspection		
			Balancing Test	Static & dynamic	
			Function test		
	4.	Vacuum Belt filter (with Accessories)	Material certificate check		
			Dimensional inspection		

				Function test	Short time no load test	
	5.	Vacuum Receiver	Material certificate check			
			Dimensional inspection			
			Hydrostatic Test			
	6.	Belt Filter Vent Fan	Material certificate check			
			Dimensional inspection			
			Performance Test			
	7.	Conveyor & Silo Extraction Device	Material certificate check			
			Dimensional inspection			
			Function Test		Short time no load test	
	8.	Rubber lining Pipe	Dimensional inspection			
			Visual Inspection			
			Spark Test			
	9.	Butterfly Valve	Material certificate check			
			Non destructive testing			
			Hydrostatic test			
			Operation test		Motorized valve only	
	10.	Control Panel	Insulation Resistance Test			
			Dielectric Strength Test			
			Function Test			

			Dimensional Inspection		
	11.	Control valve & valves	Material certificate check		
			Hydrostatic test		
			Seat leak test		
			Function test		
			Dimensional Inspection		
	12.	RTD	Material certificate check		
			Performance test		
			Hydrostatic test		
	13.	Shut off valve	Material certificate check		
			Hydrostatic test		
			Seat Leak test		
			Function Test		
			Dimensional Inspection		
	14.	Flow meter	Material certificate check		
			Calibration Test		
			Dimensional Inspection		
			Hydrostatic test		
	15.	Flow Nozzles	Material Certificate check		
			Dimensional Inspection		
2.	Valves and Specialities shall be tested as per relevant standards / codes. Seat Leakage and hydraulic test to be carried out as per relevant standards /codes.				

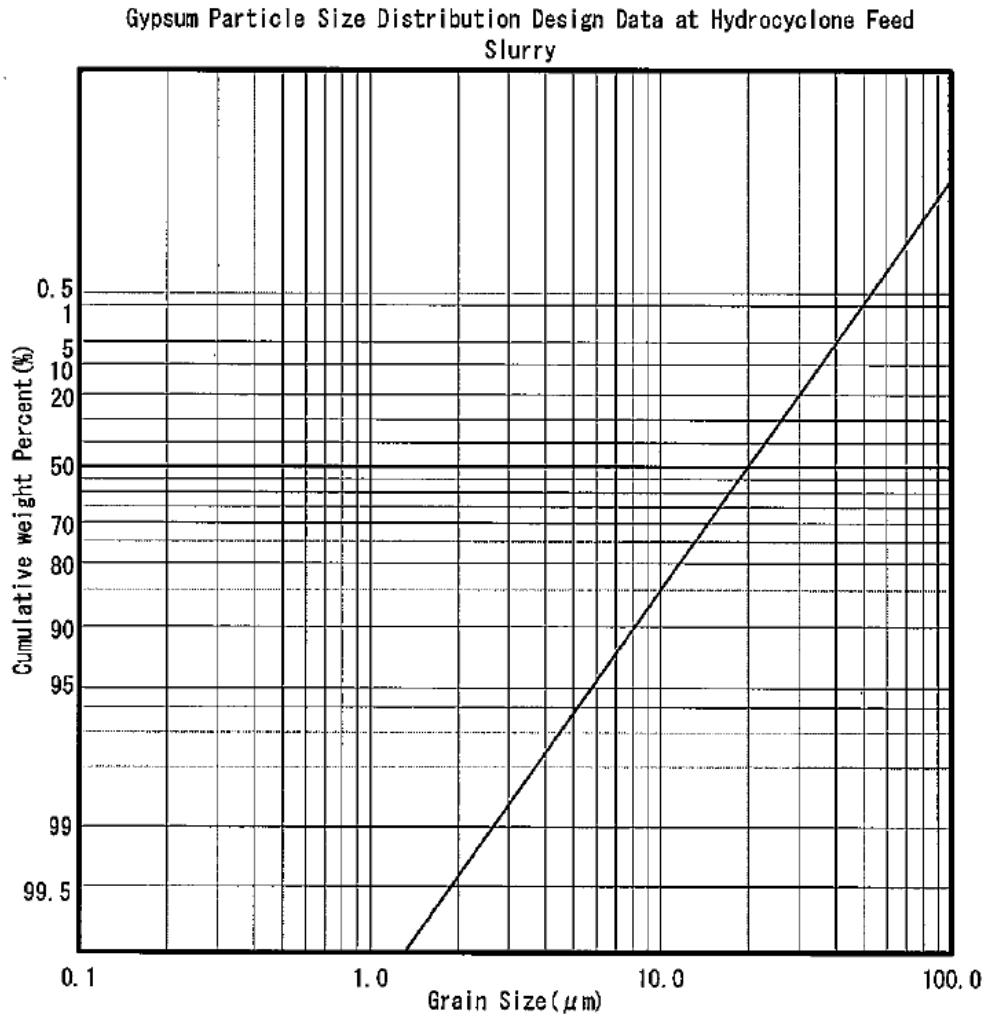
3.	Pipes and fittings shall be tested as per relevant standards/ codes	
4.	MQP (Manufacturing Quality plan) shall be submitted by the bidder along with the technical offer. Above mentioned item-wise inspection requirement is tentative only and shall be mutually discussed and finalized during detail engineering.	
5.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used for review by BHEL / BIFPCL prior to manufacture. Inspection of above mentioned tests by BHEL/ BIFPCL representative at bidder's works is envisaged	
6.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL/BIFPCL.	
7.	A dynamic balancing certificates stating that the rotating assembly has been balanced dynamically shall be sent to BHEL/BIFPCL within one (1) week of the successful completion of balancing.	
8.	Vibration levels shall be measured during shop running/performance tests.	
9.	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.	
10.	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.	
11.	Test certificates shall be issued for each lot of raw material used in the coating, corresponding to specific weight and traction resistance.	
12.	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.	
13.	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.	
14.	Equipment shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.	
15.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipment's.	
16.	BHEL shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.	

17.	Bidder to arrange all calibrated gauges, Instruments during inspection at works and also during performance test at site. All inspection, measuring and test equipment used by Bidder shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Bidder shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by the Owner. Wherever asked specifically, the Bidder shall re-calibrate the measuring/test equipment in the presence of Project Manager/Inspector.	
18.	Mechanical running test shall be carried out for Vacuum Belt Filter, Vacuum Pump & Belt Filter wash Pump. Bidder to arrange Motor for the shop test and inspection.	
19.	In case of order placed on foreign vendors(i.e. supplies from outside India), vendor has to finalize Inspection agency from the List enclosed in Annexure IX at their own cost and carry out inspection asper the approved Quality plan. Vendor has to furnish BHEL the inspection reports and other documents required as per approved Quality plan duly signed by the Inspection Agency after their witness for our review and acceptance.	
13.0.0	**BID EVALUATION CRITERIA FOR POWER CONSUMPTION**	
I.	**POWER GUARANTEE** Bidder to specify the guaranteed power consumption of per Gypsum Dewatering system as well as individual equipment in their offer. The following equipment's shall be considered for Guaranteed Power consumption calculation (GPC). a. Belt Filter Wash Pump -1 No. b. Vacuum Belt Filter - 1 No. c. Vacuum Pump - 1 No. d. Belt Filter Vent Fan- 1 No e. Cake wash pump – 1 No.	
II.	**BID EVALUATION CRITERIA FOR POWER CONSUMPTION:** The best of the parameter for auxiliary power consumption quoted by any qualified bidder shall be taken as the base or Ceiling Value(CV). Adjustment factor for excess power consumption in USD = (GPC-CV) X PL X 1 set of working system GPC- Guaranteed Power Consumption quoted by bidder in KW CV- Ceiling Value for Guaranteed Power Consumption in KW PL- Power Loading @ 2230 USD/KW Exchange rate as applicable on bid opening date will be considered.	

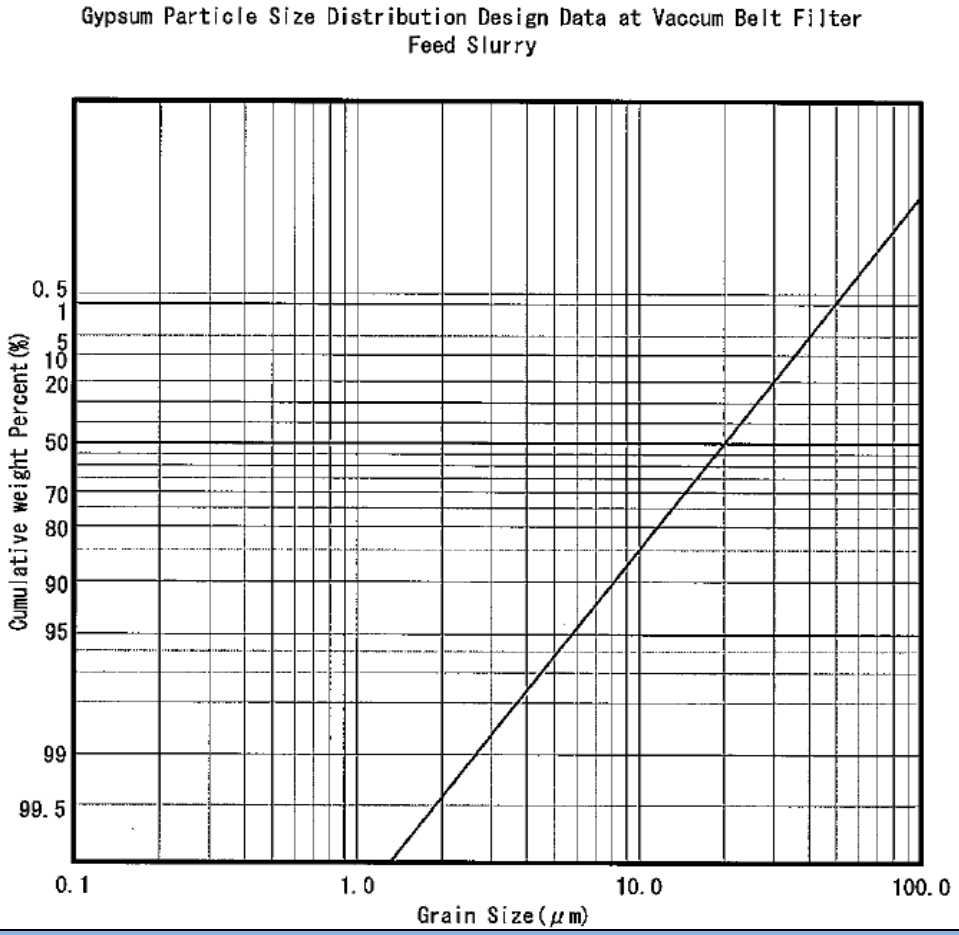
III.	**LIQUIDATED DAMAGES FOR POWER CONSUMPTION** If actual Power Consumption during prove out (or) PG Test operating at the duty point exceeds the value guaranteed by the bidder, liquidated damages for shortfall in performance shall be deducted from contract price as per the formula given below Liquidated damage deductible in USD = (GPC-CV) X P X 1 set of working system Where ▪ GPC- Guaranteed Power Consumption quoted by bidder in KW ▪ CV- Ceiling Value of Power Consumption in KW ▪ P- Penalty @ 3275 USD per KW

14.0.0	Process Flow Diagram & P&ID Diagram			
	The process flow diagram and Piping and Instrumention Diagram are enclosed in Annexure VII.			
14.0.1	**PROCESS PARAMETERS FOR PRIMARY HYDROCYCLONE**			
S.no	**Parameters**	**Primary Hydro Cyclone Feed Slurry**	**Primary Hydro Cyclone Over Flow**	**Primary Hydro Cyclone Under Flow**
a.	Total Flow (m^3/hr.)	271.72	157 *1)	114.72 *1)
b.	Total Flow (t/hr.)	330.63	174.63 *1)	156 *1)
c.	Operating Temp (C)	63	63	63
d.	Design Temp (C)	70	70	70
e.	Solid (wt. %)	30	16.6 *1)	> 45 *2)
f.	Density (Kg/m^3)	1217	1112 *1)	1360 *1)
g.	pH	4-7	4-7	4-7
h.	Cl^-(mg/l)	30000	30000	30000
14.0.2	**PROCESS PARAMETERS FOR SECONDARY HYDROCYCLONE**			
a.	**Parameters**	**Secondary Hydro cyclone – Feed Slurry**	**Secondary Hydro cyclone– Overflow**	**Secondary Hydro cyclone – 7Under flow**
b.	Total flow (m^3/hr)	157	98.15 *1)	58.85 *1)
c.	Total flow (t/hr)	174.63	100.41 *1)	74.22*1)
d.	Operating Temp (° C)	63	63	63
e.	Design Temp (C)	70	70	70
f.	Solid (wt %)	16.6	3 *2)	35 *1)
g.	Density (kg/m^3)	1112	1023	1261
h.	pH	4-7	4-7	4-7
i.	Cl^- (mg/l)	30000	30000	30000

14.0.3	**DATA SHEET OF BELT FILTER:**				
	Parameters	**Belt Filter Feed Slurry**	**Product Gypsum**	**Filtrate**	**Washing Water ****
a.	Total Flow (m^3/hr)	114.72 *1)			
b.	Total Flow (t/hr)-Wet	156 *1)	77.58		
c.	Temp(deg C)	70.0			
d.	Solid(% wt)	>45 *2)	>90 *2)	<0.2	
e.	Slurry conc.(%wt)	1360*1)	>90		
f.	pH	4~7	5~8		
g.	Cl	<27000	<100 ppm *2)		

h.	Belt filter and the peripherals shall be designed at 80 TPH (wet cake) discharge of product gypsum **a. **Quantity of water shall be finalized by the vendor.** **b. *Property of process & Clarified water is as given in 14.0.7 and 14.0.8.**
i.	*1) shall be finalized by vendor. *2) Shall be guaranteed by vendor
14.0.4	**GYPSUM PARTICLE SIZE AT HYDRO CYCLONE FEED SLURRY IS SHOWN BELOW**
	

14.0.5	Gypsum particle size at belt filter feed slurry is shown below



14.0.6	DESIGN CONDITIONS OF PRIMARY & SECONDARY HYDRO CYCLONES:		
1.	Primary hydrocyclone quantity	:	2 sets (1W+1SB)
2.	Secondary hydrocyclone quantity	:	2 sets (1W+1SB)
3.	Primary hydrocyclone capacity	:	280 m3/hr each
4.	Secondary hydrocyclone capacity	:	160 m3/hr each
5.	Type of hydro cyclone	:	Vertical
6.	Material (MOC) of Cyclone Clusters	:	Polyurethane/Urethane
7.	MOC of Feed chamber	:	CS+25 mm rubber lining
8.	MOC of overflow chamber	:	CS+12mm rubber lining
9.	MOC of under flow chamber	:	CS+12mm rubber lining

14.0.7	PROCESS WATER CHARACTERISTICS

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	

14.0.8 CLARIFIED WATER CHARACTERISTICS

Sl.no	Constituent	VALUE	Unite
1.	Iron	<0.3	mg/L as Fe
2.	Turbidity	<10	NTU
3.	Organics (as per $KMnO_4$ method)	<0.05	mg/L
4.	Gravity Filter Outlet (Effluent Turbidity)	<2	NTU
5.	Gravity Filter Inlet (Turbidity)	10	NTU

Note: 1) Process water will be used for Gypsum & Cloth washing
2) Clarified water will be used for cake wash.

15.0.0	SPARES,TOOLS & TACKLES
15.1.0	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.

15.2.0	MANDATORY SPARES	
	a) The list of mandatory spares considered essential by the Employer is indicated in the list below. 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 their Bid. 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 prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes. e) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. Bidder to provide the split up price for mandatory spares during placement of order.	
A.	**Vacuum Belt Filter**	
1.	Filter Cloths	6 Sets
2.	Belt	3 sets
3.	Vacuum box seals	2 sets
4.	Drive motors	1 number
B.	**Vacuum Pumps**	
1.	Pump Impeller Assembly	2 numbers
2.	Pump Bearing	3 sets
3.	Seals	3 sets
4.	Motor	1 numbers
C.	**Vacuum Breaker Valves**	
1.	Valve Assembly	3 numbers
2.	Actuator	1 numbers
D.	**Slurry Valves (applicable in Gypsum dewatering area)**	3 number of each type and size

	Slurry Line Bends(applicable in Gypsum dewatering area)	3 number of each type and size
E.	**Hydro-cyclones (Primary & Secondary)**	
1.	Hydro-cyclone isolation valve	20% of each type or 1 no whichever is higher
2.	Hydro-cyclone	20% of each type or 1 no whichever is higher
3.	Hydro-cyclone rubber lining	20% of each type or 1 no whichever is higher
F	**Horizontal Centrifugal Pumps (Belt filter wash pump, cake wash pump)**	
1.	Complete Impeller Assembly	2 nos. of each type
2.	Casing Liners	3sets* of each type
3.	Bearing	3sets*
4.	Motor	1 no. of each type
5.	Pump discharge valve assembly	2 nos. of each type
15.3.0	**RECOMMENDED SPARES:**	
	In addition to the spare parts mentioned above, the bidder shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices. This list shall take into consideration the mandatory spares specified in this Sub-Section and should be independent of the list of the mandatory spares. The Employer reserves the right to buy any or all of the recommended spares. The recommended spares shall be delivered at project site at least two months before the scheduled date of initial operation of first unit. However, the spares shall not be dispatched before the dispatch of the main equipment. Prices of recommended spares will not be used for evaluation of the bids. The price of these spares will remain valid up to 6 months after placement of Notification of Award for the main equipment. However, the Bidder shall be liable to provide necessary justification for the quoted prices for these spares as desired by the Employer.	
15.4.0	**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	
16.0.0	**PERFORMANCE GUARANTEE**	
	All performance tests for GDS 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 GDS and its accessories	

	2) Vendor shall Guarantee and demonstrate each Vacuum Belt Filter capacity of 80 TPH wet gypsum cake with an inlet solid concentration of not more than 45% wt. 3) The contractor shall guarantee and demonstrate that gypsum cake moisture content shall not be more than 10% and chloride content shall not be more than 100ppm. 4) The filter cloth shall be guaranteed for a minimum life of not less than 7000 hrs. 5) The liners in hydro-cyclone shall have a minimum wear life of not less than 7000 hrs. 6) The Bidder shall ensure a design of the equipment to achieve an average target availability of 98% for 120 days. 7) Noise level ≤85 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed. 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. 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.
17.0.0	**WARRANTY**
1.	The Bidder warrants that the equipments/items shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed. The Warranty/Defect Liability Period shall be thirty six (36) months from the date of delivery or twenty four (24) months from the date of commissioning, whichever first occurs. If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Bidder, the Bidder shall promptly, in consultation and agreement with BHEL regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Bidder shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.
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 .

18.0.0	**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.
19.0.0	**TRAINING**
	Successful bidder shall provide comprehensive training for NTPC/BHEL Engineering, O&M, Erection & Commissioning staffs at site covering all aspects of the GDS system - Operation & Maintenance, Troubleshooting etc.
20.0.0	**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, liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of the Specification.
21.0.0	**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 per Annexure VI. Annexure VI 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 as specified under Annexure VI. 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 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.

ANNEXURE-I-QUALIFICATION REQUIREMENT(PROVENNESS CRITERIA)

REFER TO ANNEXURE AND ATTACHMENT-3K FORMAT

SIGNATURE OF BIDDER ----------
NAME ----------
DESIGNATION ----------

ANNEXURE-II-TECHNICAL DATA SHEET

Sl. No	Description		Data
1.0	**GENERAL**		
	a. Client	:	BHEL-Ranipet
	b. Project	:	NTPC North Karanpura 3X660MW
	c. End Customer	:	NTPC
	d. Location	:	Chatra,Jharkhand
	e. Service	:	Continuous
	f. Installation	:	Inside the Building
	g. Quantity for all 3 FGD units	:	2 sets (1W+1S)
2.0	**MANUFACTURER DETAILS**		
	a. Model	:	Bidder to Provide
	b. Type	:	Bidder to Provide
3.0	**OPERATING CONDITION**		
	Medium to be handled	:	Gypsum Slurry
4.0	**Technical Data**		
4.1	**PRIMARY HYDRO-CYCLONE**		
	i. Stage		Bidder to Provide
	ii. Manufacturer		Bidder to Provide
	iii. Number of Hydro cyclone		Bidder to Provide
	iv. Diameter of Hydro cyclone		Bidder to Provide
	v. Diameter of Vortex Finder		Bidder to Provide
	vi. Diameter of Apex Valve		Bidder to Provide
	vii. Diameter of Feed Inlet		Bidder to Provide
	viii. Design Pressure		Bidder to Provide
	ix. Working Pressure		Bidder to Provide
	x. Feed Flow rate		Bidder to Provide
	xi. Overflow Rate		Bidder to Provide
	xii. Underflow Rate		Bidder to Provide

	xiii. Mesh of separation (50% Removed)	Bidder to Provide
	xiv. Solid content of feed slurry	Bidder to Provide
	xv. Solid content in underflow of Hydrocyclone	Bidder to Provide
	xvi. Solid content in Overflow of Hydrocyclone	Bidder to Provide
	xvii. Type of cyclone	Bidder to Provide
	a) Cyclone Dia/Height (mm)	Bidder to Provide
	b) Required Liquid Feed Pressure	Bidder to Provide
	c) Cyclone Connection Number/Dia. (mm)	Bidder to Provide
	d) Feed	Bidder to Provide
	e) Overflow	Bidder to Provide
	f) Underflow	Bidder to Provide
	g) Rf Value (Underflow Slurry (m3/hr/Feed	Bidder to Provide
	h) Material	Bidder to Provide
	i) Shell	Bidder to Provide
	j) Internal Structure Part	Bidder to Provide
	k) Lining	Bidder to Provide
	l) Particle Size Distribution	Bidder to Provide
	m) Weight	Bidder to Provide

4.2	**VACUUM BELT FILTERS (VBF)**			
	a. Manufacturer		:	Bidder to Provide
	b. Model No.		:	Bidder to Provide
	c. Dimensions (W x L x H) (m x m x m)		:	Bidder to Provide
	d. Cloth Width	m	:	Bidder to Provide
	e. Cloth Length	m	:	Bidder to Provide
	f. No. Working / Stand-by		:	Bidder to Provide
	g. Capacity (Guaranteed) Gypsum (Dry)		:	Bidder to Provide
	h. Inlet Flow Volume		:	Bidder to Provide

	i. Gypsum Flow (Dry)	Kg/hr	:	Bidder to Provide
	j. Moisture Removed	%	:	Bidder to Provide
	k. No. of stages of cake washing / water flow	m3/h	:	Bidder to Provide
	l. No. of stages of cloth washing / water flow	m3/h	:	Bidder to Provide
	m. Design Pressure of Vacuum Chamber		:	Bidder to Provide
	n. Operating Pressure of Vacuum Chamber		:	Bidder to Provide
	o. Material / Thickness	mm	:	Bidder to Provide
	i. Casing		:	Bidder to Provide
	ii. Cloth		:	Bidder to Provide
	iii. Gypsum Discharge Hopper		:	Bidder to Provide
	iv. Vacuum Box		:	Bidder to Provide
	p. Life of Cloth	hrs	:	Bidder to Provide
	q. Type /Material of Carrying Belt		:	Bidder to Provide
	r. Type / Material of Sealing Belt		:	Bidder to Provide
	s. Life of Carrying Belt	hrs		Bidder to Provide
	t. Life of Sealing Belt	hrs		Bidder to Provide
	u. Automatic Cloth Tensioning Mechanism Provided			Yes / No - Bidder to confirm
4.3	**VACUUM RECEIVER TANK**			
a.	No. of Tank for each VBF		:	Bidder to Provide
b.	Capacity (m3)		:	Bidder to Provide
c.	Dimensions (Dia x Height) (mm x mm)		:	Bidder to Provide
d.	Material / Thickness (mm)		:	Bidder to Provide
e.	Lining Material / Thickness mm		:	Bidder to Provide
4.4	**Vacuum Pumps**			
a.	Manufacturer		:	Bidder to Provide
b.	Make/Model			

c.	Type	:	Bidder to Provide
d.	No. of Pumps for each Vacuum Belt Filter	:	Bidder to Provide
e.	Rated Capacity Flow (m3/hr)	:	Bidder to Provide
	Rated Capacity Head (mWCl)	:	Bidder to Provide
	Rated Capacity Power (KW)	:	Bidder to Provide
f.	Power consumption (KW)	:	Bidder to Provide
g.	Pump Speed (rpm)	:	Bidder to Provide
h.	Motor Rating (KW)	:	Bidder to Provide
i.	Motor Speed (rpm)	:	Bidder to Provide
j.	Margins (Flow/Head) (%/%)	:	Bidder to Provide
k.	Operation Pressure	:	Bidder to Provide
l.	Design Pressure	:	Bidder to Provide
m.	Material/Thickness (mm) of	:	Bidder to Provide
	Base/Lining	:	Bidder to Provide
	Casing	:	Bidder to Provide
	Shaft	:	Bidder to Provide
	Impeller	:	Bidder to Provide
n.	Type of seal	:	Bidder to Provide
o.	Sealing Water Flow (m3/hr)	:	Bidder to Provide
p.	Bearing	:	Bidder to Provide
	No. of Bearings	:	Bidder to Provide
	Type Of Bearings	:	Bidder to Provide
q.	Type of coupling	:	Bidder to Provide
r.	Whether silencer provided at outlet	:	Yes/No
4.5	**SLURRY PIPES**	:	
a.	Pipe size (mm)	:	Bidder to Provide
b.	Type of Joints	:	Bidder to Provide
	Pipe to Pipe/Pipe to Fittings		Bidder to Provide
	Fittings		Bidder to Provide
c.	Material / Thickness (mm)of Pipe	:	Bidder to Provide

d.	Material Thickness of lining	:	Bidder to Provide
e.	Estimated Life of liners (hrs.)	:	Bidder to Provide
f.	Slurry Solid concentration (w/w %)	:	Bidder to Provide
g.	Slurry Settling Velocity (m/s)		Bidder to Provide
h.	Pipe Velocity (m/s)		Bidder to Provide
4.6	**BELT FILTER WASH PUMPS**		
a.	No. for each VBF		
b.	No. of stand-by pumps for each VBF		
c.	Make / Model		
d.	Impeller Type		
e.	Material / Thickness (mm) of Impeller and lining		
f.	Casing Type		
g.	Material/Thickness of Casing/Lining		
h.	Rated Flow/Head (m3/hr./mWCI)		
4.7	**CAKE WASH PUMPS**		
i.	No. for each VBF		
j.	No. of stand-by pumps for each VBF		
k.	Make / Model		
l.	Impeller Type		
m.	Material / Thickness (mm) of Impeller and lining		
n.	Casing Type		
o.	Material/Thickness of Casing/Lining		
p.	Rated Flow/Head (m3/hr./mWCI)		
4.8	**BELT ACCESSORIES**		
4.8.1	**Bearing**		
a.	Carrying	:	Bidder to Provide
b.	Return	:	Bidder to Provide
4.8.2	**Material**		
a.	Roller	:	Bidder to Provide
b.	Spindle	:	Bidder to Provide

4.8.3	**Pulleys**		
i)	General (for all types of Pulleys)	:	Bidder to Provide
a.	Pulley Shaft Diameter	:	Bidder to Provide
ii)	**Drive Pulleys**		
a.	Lagging	:	Bidder to Provide
b.	Lagging thickness	:	Bidder to Provide
c.	Minimum angle of wrap	:	Bidder to Provide
d.	Maximum out of roundness	:	Bidder to Provide
iii)	**Other Pulleys**		
a.	Lagging	:	Bidder to Provide
b.	Lagging thickness	:	Bidder to Provide
iv)	**Rubber for lagging**		
a.	Type	:	Bidder to Provide
b.	Hardness	:	Bidder to Provide
c.	Elongation	:	Bidder to Provide
d.	Strength	:	Bidder to Provide
e.	Abrasion Loss	:	Bidder to Provide
f.	Specific Gravity	:	Bidder to Provide
g.	Adhesion Strength	:	Bidder to Provide
v)	**Bearings for Pulleys**		
a.	Type	:	Bidder to Provide
b.	Casing	:	Bidder to Provide
c.	Sealing	:	Bidder to Provide
d.	Lubrication	:	Bidder to Provide
e.	Pulley Material	:	Bidder to Provide
f.	Shaft Material	:	Bidder to Provide
4.9	**Chutes and Hoppers**		
a.	Minimum Valley Angle	:	Bidder to Provide
b.	Material :	:	Bidder to Provide
	i) Chute work	:	Bidder to Provide

	ii) Sliding zones & adjacent sides	:	Bidder to Provide
	iii) No striking/ Non sliding zones	:	Bidder to Provide
	iv) Chute with valley angle 80 degree and above	:	Bidder to Provide
	v) In the zone of magnetic field	:	Bidder to Provide
	vi) In the zone of flap gates	:	Bidder to Provide
	vii) Discharge Hoods overhead pulleys	:	Bidder to Provide
c.	Inspection Doors	:	Bidder to Provide
d.	Chute Construction	:	Bidder to Provide
	i) Corners	:	Bidder to Provide
	ii) Joints Bolted	:	Bidder to Provide
	iii) Bolt size	:	Bidder to Provide
	iv) Bolts spacing	:	Bidder to Provide
	v) Fixing Arrangement	:	Bidder to Provide
4.9.1	**Skirt Boards**		
a.	Length	:	Bidder to Provide
b.	Height	:	Bidder to Provide
c.	Width	:	Bidder to Provide
4.9	**Secondary (Waste Water) Hydrocyclone**	:	Bidder to Provide
	i) Stage	:	Bidder to Provide
	ii) Manufacturer	:	Bidder to Provide
	iii) Number of Hydrocyclone	:	Bidder to Provide
	iv) Diameter of Hydrocyclone	:	Bidder to Provide
	v) Diameter of Vortex Finder	:	Bidder to Provide
	vi) Diameter of Apex Valve	:	Bidder to Provide
	vii) Diameter of Feed Inlet	:	Bidder to Provide
	viii) Design Pressure	:	Bidder to Provide
	ix) Working Pressure	:	Bidder to Provide
	x) Feed Flow rate	:	Bidder to Provide
	xi) Overflow Rate	:	Bidder to Provide
	xii) Underflow Rate	:	Bidder to Provide

	xiii) Mesh of separation (50% Removed)	:	Bidder to Provide
	xiv) Solid content of feed slurry	:	Bidder to Provide
	xv) Solid content in underflow of Hydrocyclones	:	Bidder to Provide
	xvi) Solid content in Overflow of Hydrocyclones	:	Bidder to Provide
	xvii) Type of cyclone	:	Bidder to Provide
	a. Cyclone Dia/Height (mm)	:	Bidder to Provide
	b. Required Liquid Feed Pressure	:	Bidder to Provide
	c. Cyclone Connection Number/Dia. (mm)	:	Bidder to Provide
	d. Feed	:	Bidder to Provide
	e. Overflow	:	Bidder to Provide
	f. Underflow	:	Bidder to Provide
	g. Rf Value (Underflow Slurry (m3/hr/Feed Slurry (m3/hr)	:	Bidder to Provide
	h. Material	:	Bidder to Provide
	i. Shell	:	Bidder to Provide
	j. Internal Structure Part	:	Bidder to Provide
	k. Lining	:	Bidder to Provide
	l. Particle Size Distribution	:	Bidder to Provide
	m. Weight	:	Bidder to Provide

SIGNATURE OF BIDDER ----------
NAME ----------
DESIGNATION ----------

ANNEXURE III- SCHEDULE OF GUARANTEES

Sl. No	Description			Data
1.	Rated capacity of Vacuum Belt Filter	TPH	:	Bidder to Provide
2.	Guaranteed power consumption of Gypsum Dewatering System at rated capacity	kW	:	Bidder to Provide
3.	Guaranteed a) Gypsum cake moisture content b) Gypsum cake chloride content	 % ppm		Bidder to Provide
4.	Guaranteed life of filter cloth	hrs		Bidder to Provide
5.	Guaranteed life of liners in hydro cyclone	hrs		Bidder to Provide
6.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor	dB(A)	:	Less than 85 dbA
7.	Maximum vibration (peak to peak amplitude at site)	microns	:	1) For vacuum pump & Belt Filter Wash Pump:
8.	Equipment Availability	%	:	98% for 120 days
9.	Scheduled Maintenance (Minor Overhauls): Recommended intervals between maintenance outages	hours	:	>25000 hours operation.
10.	Scheduled Maintenance (Major Overhauls): Recommended intervals between maintenance outages shall be	hours	:	>75000 hours operation.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

ANNEXURE – IV REFERENCE LIST as per format shown below. (Atleast two reference plant details)

S.no	Project Name Customer & Plant capacity	Coal fired Yes/No	Wet Limestone Based FGD Yes/No	Model	Capacity of Vacuum belt filter TPH	Year of Coming	Qty
1.							
2.							

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

ANNEXURE – V- 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 ----------

ANNEXURE-VI Documentation

A) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	No of copies With proposal
1.	Enquiry Specification (signed)	1
2.	Price Sheet	1
3.	Anchor Plan & Civil foundation Loading details	1
4.	Data Sheet	1
5.	Performance curve	1
6.	P & I Diagram	
7.	Terminal point details.	
8.	**Annexure to qualification requirement- Attachment 3K.**	1
9.	Proforma Packing List	1
10.	Shortest Manufacturing Time	1
11.	Approximate weight of each skid	1
12.	Required Electric power & other Utility List	1
13.	Deviation List	1
14.	General Assembly Drawing indicating dimension and civil loading details	1
15.	Gypsum dewatering building GA	1
16.	VBF Sizing Calculation	1
17.	Cross-sectional Drawing	1
18.	Scope of Supply	1
19.	Spare List (Recommended)	1
20.	Start-up & Commissioning Spares	1
21.	List of Special Tools	1
22.	Test Arrangement & Test procedure	1
23.	Rotor GD2 (kg-m2)	
24.	T-S curve	1
25.	Hoist/Crane requirement	1
26.	Catalogue	1
27.	Calculation of Motor rating, Bearing capacity and selection of coupling	1

28.	Bill of material along with material and code	1
29.	Overall space and headroom requirement with details of handling during Erection, operation & maintenance of the equipment.	1
30.	Erection, Operation & Maintenance manual with lubrication schedule	1
31.	Procedure for shop / site performance tests	1
32.	Time schedule for delivery.	1
33.	Quality Assurance Plan.	1
34.	Make of all bought out items.	1
35.	Deviation list	1
36.	Spares list.	1
37.	Hoist / Crane requirement.	1
38.	Reference list of similar projects executed.	1
39.	List of proposed makes and vendors	1
40.	Training program and schedule for BHEL/NTPC personnel	1
41.	Equipment maintenance schedules	1

B) DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

S.no	Document required after award of contract	No of copies after award of contract(tentative)	Delivery time
1.	Drawing Schedule	1	2 week after contract
2.	Plot Plan & Layout	1	2 week after contract
3.	Process Flow Diagram	1	2 week after contract
4.	Equipment List	1	2 week after contract
5.	Utility Consumption	1	2 week after contract
6.	Chemical List	1	2 week after contract
7.	Duly filled technical datasheet	1	2 week after contract
8.	P &I Diagram	1	2 week after contract
9.	Operation & Maintenance Manual	1	2 week after contract
10.	Performance Test Procedure & Report	1	2 week after contract
11.	Outline Drawing of Equipment	1	2 week after contract
12.	Fabrication Drawing of Equipment	1	2 week after contract
13.	Warranted Performance curve of Machinery	1	2 week after contract
14.	Platform Drawing	1	2 week after contract
15.	Line Index	1	2 week after contract
16.	Piping Material Specification	1	2 week after contract
17.	Piping Arrangement Drawing	1	2 week after contract
18.	Piping Support Arrangement Drawing	1	2 week after contract
19.	Isometric Drawing	1	2 week after contract
20.	Data sheet of Piping Parts	1	2 week after contract

21.	Valve Drawing	1	2 week after contract
22.	Instrument Schedule List	1	2 week after contract
23.	Instrument Function Loop Diagram	1	2 week after contract
24.	Interlock and Operation Description	1	2 week after contract
25.	Interlock/ Sequence Logic Diagram	1	2 week after contract
26.	Instrument Power Supply Diagram	1	2 week after contract
27.	Instrument Set Point List	1	2 week after contract
28.	Instrument Data Sheet	1	2 week after contract
29.	Valve Data Sheet, including On-Off Valve	1	2 week after contract
30.	Nozzle Elevation Plan for Level Instrument	1	2 week after contract
31.	Specification and Drawing of Instrument	1	2 week after contract
32.	Instruction Manual for Instrument	1	2 week after contract
33.	Local Control Panel Specification	1	2 week after contract
34.	Local Control Panel Drawing	1	2 week after contract
35.	Cable Duct/Tray Routing Plan	1	2 week after contract
36.	Fabrication Drawing for Cabinet Duct/Tray	1	2 week after contract
37.	Plot Plan of Field Instrument	1	2 week after contract
38.	Layout of Instrument Wiring	1	2 week after contract
39.	Layout of Instrument Air Supply Piping and Signal tubing	1	2 week after contract
40.	Hook-up Drawing for Instrument	1	2 week after contract
41.	Instrument Connection List	1	2 week after contract
42.	Instrument Cable Schedule	1	2 week after contract

43.	Parts Drawing for Instrument Installation Materials	1	2 week after contract
44.	Calculation Sheet for Flow Instrument	1	2 week after contract
45.	Motor List	1	2 week after contract
46.	Motor Data Sheet	1	2 week after contract
47.	Outline drawing of Motor	1	2 week after contract
48.	Loading Data	1	2 week after contract
49.	Planning Drawing of Building	1	2 week after contract
50.	Planning Drawing of Foundation	1	2 week after contract
51.	Consumable Parts List	1	2 week after contract
52.	Lubricant List	1	2 week after contract
53.	Special Tool List	1	2 week after contract
54.	Spare Parts List for Erection	1	2 week after contract
55.	Spare Parts List for Commissioning	1	2 week after contract
56.	Spare Parts List for 2 years of Warranty Period Operation	1	2 week after contract
57.	Construction Work Specification	1	2 week after contract
58.	Construction Manual List	1	2 week after contract
59.	Painting Specification	1	2 week after contract
60.	Transportation and Storage Specification	1	2 week after contract
61.	Shop Inspection Specification	1	2 week after contract
62.	Shop Inspection Report	1	2 week after contract
63.	Site Inspection Specification	1	2 week after contract
64.	Site Inspection Report	1	2 week after contract

65.	Supply Item List for Package Verification at Site	1	2 week after contract
66.	Packing List	1	2 week after contract
67.	Sub-Vendor List	1	2 week after contract
68.	Manufacturing Schedule	1	2 week after contract
69.	Progress Report	1	2 week after contract
70.	Spare Parts List for Erection	1	2 week after contract
71.	Spare Parts List for Commissioning	1	2 week after contract
72.	Spare Parts List for 2 years of Warranty Period Operation	1	2 week after contract
73.	Construction Work Specification	1	2 week after contract
74.	Construction Manual List	1	2 week after contract
75.	Painting Specification	1	2 week after contract
76.	Transportation and Storage Specification	1	2 week after contract
77.	Shop Inspection Specification	1	2 week after contract
78.	Shop Inspection Report	1	2 week after contract
79.	Site Inspection Specification	1	2 week after contract
80.	Site Inspection Report	1	2 week after contract
81.	Supply Item List for Package Verification at Site	1	2 week after contract
82.	Packing List	1	2 week after contract
83.	Sub-Vendor List	1	2 week after contract
84.	Manufacturing Schedule	1	2 week after contract
85.	Progress Report	1	As per progress
86.	Detail drawings indicating the dimensions of the equipments.	1	2 week after contract

87.	Detail drawings indicating the piping layouts	1	2 week after contract
88.	Detail drawing of Gypsum dewatering building	1	2 week after contract
89.	Erection drawings	1	2 week after contract
90.	Operation & Maintenance (O&M) Manuals	1	2 months after contract
91.	Civil Loading details	1	2 week after contract
92.	Performance guarantee test procedure	1	2 months after contract
93.	Quality plan & Safety Requirement	1	2 week after contract

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-VII Process Flow Diagram , Piping &Instrumentation Diagram

Bidder to confirm to the PFD and P&ID enclosed.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-VIII -Sea worthy packing(applicable for supplies from outside India)

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

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-IX Inspection and testing requirements

Refer to various clauses of Inspection and Testing Requirements

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-X Motor data sheet format

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-XI MOTORS, CABLES, JUNCTION BOX & INSTRUMENTS SPECIFICATION

Refer to the specification enclosed.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-XII Pipe & valve material specification

Refer to pipe and valve specification enclosed.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-XIII GA drawing of gypsum dewatering building

Refer to the GA drawing of GDS building enclosed.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Annexure-XIV Paint schedule

Refer to the paint schedule enclosed.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

ANNEXURE-I QUALIFICATION REQUIREMENT FOR VACUUM BELT FILTER

CLAUSE NO.	INTENT OF SPECIFICATION

TERMINOLOGY FOR ANNEXURE-I:
BIDDER MEANS BHEL
BIDDER'S SUB-VENDOR MEANS THE VACUUM BELT FILTER MANUFACURER

4.00.00 **QUALIFYING REQUIREMENTS FOR EQUIPMENTS/SYSTEMS**

4.01.01 **Provennesscriteria for critical equipment, auxiliaries, systems and bought out items:**

The Bidder / Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below:

4.01.02 ~~Booster Fans, Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, Agitators &~~ Vacuum Belt Filters for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type, application and minimum equipment rating as stipulated below such that the respective equipment(s) should have been in successful operation in at least one (1) plant for a period not less than one(1) year reckoned as on the date of consideration for approval but not later than 30TH JAN 2019

Type and Rating for Qualification

Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating
~~(a)~~	~~Booster Fans~~	~~Axial type with variable pitch control~~	~~Coal fired power plant~~	~~80% of the flow & 100% of the head of the offered Booster Fan with Fan Speed 900 rpm (maximum)~~
~~(b)~~	~~Slurry Recirculation Pumps~~	~~Centrifugal type~~	~~Wet Limestone based FGD application in Coal fired power plant~~	~~80% of the flow & 100% of the head of the offered Slurry Recirculation Pump~~

Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating
(c)	Oxidation Blowers	Centrifugal/ positive displacement type blower	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Oxidation Blower
(d)	Wet limestone Grinding mills	Horizontal Wet Ball mill	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh
(e)	Slurry Pumps	Centrifugal type	Wet Limestone based FGD application or ash slurry application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Pump(s)
(f)	Agitators	Vertical/Horizontal	Wet Limestone based FGD application in Coal fired power plant	Agitator rating not less than that supplied for 500 MW or higher size unit for similar application
(g)	Vacuum Belt filters	Belt type	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Vacuum Belt filter capacity

Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the bidder for the above equipment(s) is qualified.

The provenness criteria for equipment (Booster Fans) stipulated at Sl. No. 4.01.02(a) above shall also be considered acceptable provided the rating parameters (i.e., flow, head and rated rpm) is covered within the operating regime of the respective fan performance curve of the reference plant equipment.

4.01.03 In case the Bidder or the proposed sub-vendor is not manufacturer of proven Booster Fans as per clause 1.2(a) above but is a manufacturer of such equipment for units of at least 500 MW rating, the Bidder or the proposed sub vendor can manufacture such equipment for 660 MW units also, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such

~~equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(a) above for the Booster Fans.~~

4.01.04 A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.01.02 above in India, can also manufacture such equipment(s), provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.02 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). However, in this case, the proposed JV / Subsidiary Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.01.02 above by himself should have sourced / shall source such proven equipment(s) for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s).

Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. In addition, the Bidder along with the Indian Joint Venture Company/ Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for a particular equipment. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only) for each equipment.

4.01.05 ~~In case the Bidder or the proposed sub-vendor is not manufacturer of proven Oxidation Blowers as per clause 4.01.02(c) above but is a manufacturer of Blowers/compressors for minimum 50 NM^3/min capacity, the Bidder or the proposed sub-vendor can also manufacture Oxidation Blowers, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Oxidation Blowers in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(c) above for the Oxidation Blowers. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.~~

~~In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Oxidation Blowers. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).~~

4.01.06

~~In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.01.02(d) above but is a manufacturer of dry Grinding mills for power or cement industry of minimum 20 T/h capacity, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding mills, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Wet limestone Grinding mills in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(d) above for the Wet limestone Grinding mills. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.~~

~~In addition, the Bidderalong with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Wet limestone Grinding mills. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).~~

~~4.01.07~~

~~In case the Bidder or the proposed sub-vendor is not manufacturer of proven Agitators as per clause 4.01.02(f) above but is a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry, the Bidder or the proposed sub-vendor can also manufacture Agitators, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Agitators in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(f) above for the Agitators. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.~~

~~In addition, the Bidderalong with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the~~

	~~successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Agitators. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only~~).
~~4.01.08~~	~~In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.02(e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(e) above for the Slurry Recirculation Pumps. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.~~ ~~In addition, the Bidderalong with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Slurry Recirculation Pumps. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).~~
4.01.09	Before taking up the manufacturing of such equipment(s) as per clause 4.01.03, 4.01.04,4.01.05,4.01.06, 4.01.07 & 4.01.08 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licenser's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor. Further, the Collaborator / Licenser shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.
4.01.10	Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licenser(s) proposed by the Bidder for the above equipment(s) is qualified.
4.01.11	The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.

CLAUSE NO.	INTENT OF SPECIFICATION	
	Note to clause 4.01.02 (1) Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/lignite.	

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE
FOR
NORTHKARANPURA STPP (3X660 MW)
BIDDING DOCUMENT NO. CS-4410-109-2

Bidder's Name and Address:

To
Contract Services-II
NTPC Limited
Noida-201301

Summary of Critical Equipment indicated under clause 4.01.00, sub-section-I, Part-A of Section-VI.

Equipment	Sub-Vendor Name	Collaborator's Name, if applicable	Seeking Qualification as per clause..... Sub-Section-I, Part-A of Section-VI
~~Booster Fans~~			~~*4.01.01 /*4.01.02 /*4.01.03/*4.01.04~~
~~*Slurry Recirculation Pumps~~			~~*4.01.01 /*4.01.02 /*4.01.04 /*4.01.08~~
~~Oxidation Blowers~~			~~*4.01.01 /*4.01.02 /*4.01.04 /*4.01.05~~
~~Wet limestone Grinding mills~~			~~*4.01.01 /*4.01.02/4.01.04/*4.01.06/~~
~~Slurry Pumps~~			~~*4.01.01/*4.01.02/*4.01.04/*4.01.08~~
~~Agitators~~			~~*4.01.01 /*4.01.02/*4.01.04 /*4.01.07~~
Vacuum Belt filters			*4.01.01 /*4.01.02/*4.01.04

Note : *Strike-off whichever is not applicable.

1. If qualification sought as per clause 4.01.01, sub-section-I-A, Part-A of Section-VI then the details of the sub vendor (manufacturer) shall be filled by the bidder in the format A to G.

Signature of authorized signatory.....

2. If the qualification sought as per the clause 4.01.03, sub-section-I-A, Part-A of Section-VI, then the details of proposed sub vendor (i.e manufacturer of such equipments for at least 500 MW unit rating) shall be filled individually by the bidder in the format A and the details of collaborator who meets the requirement stipulated at 4.01.02, sub-section-I-A, Part-A of Section-VI shall also be filled by the bidder in the format A separately. Further, in case of qualification vide clause 4.01.02, sub-section-I-A, Part-A of Section-VI a copy of valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator who meets the requirement stipulated at 4.01.02, sub-section-I-A, Part-A of Section-VI shall also be furnished.

3. If the qualification sought as per the clause 4.01.04, sub-section-I-A, Part-A of Section-VI then the details of JV/Subsidiary Company formed for manufacturing of such equipments in India shall be furnished individually for each equipment by the bidder such as,

   i) Copy of document of incorporation of JV/Subsidiary company in India

   ii) Copy of valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator who meets the requirement stipulated at 4.01.02, sub-section-I-A, Part-A of Section-VI.

   iii) Copy of document of at least 26% equity participation of qualified equipment manufacturer in the Indian JV company/subsidiary company directly or indirectly through its holding company /Subsidiary company, which shall be maintained for a lock -in period of seven (7) years from the date of incorporation of such JV/subsidiary or up to the end of defect liability period of the contract which ever is later.

   Further, the details of collaborator or technology provider of the qualified equipment manufacturer who meets the requirement stipulated at 4.01.02, sub-section-I-A, Part-A of Section-VI shall be filled by the Bidder in the format A to G (format given at 1.00.00). In addition to that, the sub vendor along with the Indian JV company/subsidiary company, qualified equipment manufacturer and its holding company/subsidiary company as applicable shall furnish the DJU.

*** strike out whichever is not applicable.**

1.00.00 (Applicable for Bidder/his sub vendors seeking qualification as per clause no. 4.01.02, Sub section-I, Part-A of Section-VI. Bidder shall furnish the required data only for those equipments / auxiliaries which are proposed to be sourced under this route.)

We, hereby furnish the data on proveness criteria for critical equipment, auxiliaries, systems and Bought Out Items such as Booster Fans, Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, Agitators & Vacuum belt filters which have been designed (either by self manufacturer or under valid ongoing collaboration and technology transfer agreement), *manufactured/ *got manufactured and supplied by us /Manufacturer (or manufactured/ got manufactured & supplied by our proposed sub-vendors) and these are in successful operation in at least one (1) plant for a period not less than one year

as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder. The details of type and minimum equipment rating of such equipment are given below :

Signature of authorized signatory.....

G. **Vacuum Belt filters:** We declare that, we/our Sub-Vendor, have designed (either by itself or under collaboration / licensing agreement), *manufactured/*got manufactured and supplied at least one (1) number of Vacuum Belt filter of minimum 80% of the offered Vacuum Belt filter capacity , Belt type, working in Wet Limestone based FGD application in Coal fired power plant and which has been in successful operation for minimum one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below:

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	
2.	Client name and his address:	
3.	No. of units and capacity in MW of unit:	
4.	Whether power plant is coal fired	-*Yes/*No
5.	Whether operating in a Wet Limestone based FGD application in coal fired power plant	-*Yes/*No
6.	Name of equipment manufacturer & address:	
7.	Date of commission of the equipment:	
8.	Model no. of the equipment:	
9.	Brief Technical particulars of the equipment:	
10.	Capacity-	

Signature of authorized signatory.....

Sl. No.	Description	Reference Work
11.	Whether the equipment(s) are in successful operation in atleast one(01) plant for a period not less than one(01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	-*Yes/*No
12.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/ *Drwaing from user or *contract docu ment or *scheme or *any document in public domain enclosed at annexure....to Attachment-3K
13.	Scope of Work:	*Letter of Award or *Contract or *P.O. enclosed at Annexure.....to Attachment-3K
14.	Performance details:	*Certificate/*Letter/*E-mail from End user enclosed at Annexure.....to Attachment-3K

Signature of authorized signatory.....

***2.00.00** **Applicable for Bidder/its sub vendor seeking provenness criteria as per clause no. 4.01.02 & 4.01.03, Sub section-I, Part-A of Section-VI.**

2.01.00 We, hereby confirm that we/our sub-vendor are a regular manufacturer of Booster Fan for units of atleast 500MW rating and the details in this regard on provenness criteria as per clause **4.01.02**, sub-section-I, Part-A, Section-VI are hereby furnished below:

***Bidder to strike off whichever is not applicable.**

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

2.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the aforesaid equipment as per 2.01.00 above who meets the requirement stipulated at clause **4.01.02**, sub-section-I, Part-A, Section-VI are enclosed at **Annexure-…….** to this Attachment. The data in respect of proveneness criteria for these equipment which are in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below. We further confirm that we/ our sub vendor(s) have created manufacturing and testing facilities at our/ their works as per collaborator's/ Licensor's design, manufacturing & quality control system for these equipment(s)/ Auxiliary(ies).

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

***3.00.00** **Applicable for JV Company/Subsidiary Company meeting provenness criteria as per clause no. 4.01.04, Sub section-IA, Part-A of Section-VI.**

3.01.00 We, hereby confirm that JV company/ Subsidiary company (Strike off whichever is not applicable) formed for manufacturing and supply of equipment(s) (*Booster Fans, *Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators, *vacuum belt filters) has a valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.02 of sub-section-I, Part-A, Section VI of bidding documents (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers is having, directly or indirectly through its holding company/subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/subsidiary company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture / Subsidiary or up to the end of defect liability period of the contract, whichever is later. Before taking up the manufacturing of such equipment(s) (*Booster Fans, *Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone

Pumps,*Agitators, vacuum belt filters), we/ our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

We further confirm that details in respect of collaboration / valid licencing agreement for the aforesaid equipment(s) (*Booster Fans, *Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators, vacuum belt filters) who meets the requirement stipulated at clause **4.01.02**, sub-section-I, Part-A, Section-VI for are enclosed at **Annexure-…….** to this Attachment.

In addition, the Bidder along with its sub-vendors, as per 3.01.00 above (if applicable) and the qualified Oxidation Blower manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed at **Attachment-3K**

***4.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.05, Sub section-I, Part-A of Section-VI.**

4.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of Blowers/compressors for minimum 50 NM^3/min capacity. (Details of references enclosed at Annexure ……)

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

4.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Oxidation Blower between *us/*our sub-vendors, as per 4.01.00 above, and with qualified Oxidation Blower manufacturer, who meets the requirement stipulated at clause **4.01.02**, sub-section-I, Part-A, Section-VI are enclosed as per **Annexure-……..** to this Attachment. The data in respect of proveneness criteria for the qualified Oxidation Blower manufacturer, which are in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below. We further confirm that we/ our sub vendor(s) have created manufacturing and testing facilities at our/ their works as per collaborator's/ Licensor's design, manufacturing & quality control system for the Oxidation Blowers.

We further confirm that before taking up the manufacturing of such Oxidation Blower *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control syst

We further confirm that details in respect of collaboration / valid licencing agreement for the Oxidation Blowers who meets the requirement stipulated at clause **4.01.02**, sub-section-I, Part-A, Section-VI for are enclosed at **Annexure-…….** to this Attachment. In addition, the Bidder along with our sub-vendors, as per 4.01.00 above (if applicable) and the qualified Oxidation Blower manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed at **Attachment-3K**.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

***5.00.00 Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.06, Sub section-I, Part-A of Section-VI.**

5.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of Dry Grinding Mills for minimum 20 T/h capacity. (Details of references enclosed at Annexure ……)

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

5.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Wet Grinding Mills between *us/*our sub-vendors, as per 5.01.00 above, and with qualified Wet Grinding Mill manufacturer, who meets the requirement stipulated at clause **4.01.02**, sub-section-I, Part-A, Section-VI are enclosed at **Annexure-…..** to this Attachment. The data in respect of proveneness criteria for the qualified Wet Grinding Mill manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

We further confirm that before taking up the manufacturing of such Wet Grinding Mill *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with our sub-vendors, as per 5.01.00 above (if applicable) and the qualified Wet Grinding Mill manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed at **Attachment-3K**

Signature of authorized signatory.....

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

***6.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.07, Sub section-I, Part-A of Section-VI.**

6.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry. (Details of references enclosed at Annexure ……)

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

6.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Agitator between *us/*our sub-vendors, as per 6.01.00 above, and with qualified Agitator manufacturer, who meets the requirement stipulated at clause **4.01.02**, sub-section-I, Part-A, Section-VI are enclosed at **Annexure-…..** to this Attachment. The data in respect of proveneness criteria for the qualified Agitator manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

We further confirm that before taking up the manufacturing of such Agitator, *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with our sub-vendors, as per 6.01.00 above (if applicable) and the qualified Agitators manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed at **Attachment-3K.**

(Data to

***7.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.01.08, Sub section-I, Part-A of Section-VI.**

7.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.02 (e), sub-section-I, Part-A, Section-VI.
(Details of references enclosed at Annexure ……)

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

7.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Slurry Recirculation Pumps, between *us/*our sub-vendors, as per 7.01.00 above, and with qualified Slurry Recirculation Pump manufacturer, who meets the requirement stipulated at clause **4.01.02(b)**, sub-section-I, Part-A, Section-VI are enclosed at **Annexure-…….** to this Attachment. The data in respect of proveneness criteria for the qualified Slurry Recirculation Pump manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

We further confirm that before taking up the manufacturing of such Slurry Recirculation Pumps, *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.
In addition, the Bidder along with our sub-vendors, as per 7.01.00 above (if applicable) and the qualified Lime stone slurry recirculation pump manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed at **Attachment-3K**.

Signature of authorized signatory.....

FORM OF DEED OF JOINT UNDERTAKING TO BE PROVIDED FOR *BOOSTER FANS/*SLURRY RECIRCULATION PUMPS/*OXIDATION BLOWERS/*WET LIMESTONE GRINDING MILLS/*SLURRY PUMPS/*AGITATORS/*VACUUM BELT FILTERS (TO BE FILLED SEPARATELY FOR EACH APPLICABLE EQUIPMENT) AS PER CLAUSE 4.01.04 OF SUB-SECTION-I, PART A, SECTION VI

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

DEED OF JOINT UNDERTAKING TO BE EXECUTED BY THE BIDDER/CONTRACTOR, INDIAN JV/SUBSIDIARY COMPANY MEETING THE REQUIREMENTS SPECIFIED AT CLAUSE NO. 4.01.04 OF SUB-SECTION-I, PART A, SECTION VI AND THE QUALIFIED EQUIPMENT MANUFACTURER & ITS *HOLDING/*SUBSIDIARY COMPANY(IES), AS APPLICABLE, MEETING THE REQUIREMENTS AS PER CLAUSE 4.01.02 OF SUB-SECTION-I, PART A, SECTION VI FOR *BOOSTER FANS/*SLURRY RECIRCULATION PUMP/*OXIDATION BLOWERS/*WET LIMESTONE GRINDING MILLS/*SLURRY PUMPS/*AGITATORS/*VACUUM BELT FILTERS IN WHICH EXECUTANT OF THE DJUs ARE JOINTLY AND SEVERALLY LIABLE FOR THE SUCCESSFUL PERFORMANCE OF THE *BOOSTER FANS/*SLURRY RECIRCULATION PUMP/*OXIDATION BLOWERS/*WET LIMESTONE GRINDING MILLS/*SLURRY PUMPS/*AGITATORS/*VACUUM BELT FILTERS

The DEED OF UNDERTAKING executed this ……day of ……Two thousand ……by M/s ……a Company incorporated under ……..having its Registered Office at …… (hereinafter called the "Bidder/Contractor", which expression shall include its successors, administrators, executors and permitted assigns) AND

**M/s ……, a JV / SUBSIDIARY COMPANY as per the requirement of clause 4.01.04 of sub-section-I, Part-A, Section-VI, incorporated under …… having its Registered Office at …… (hereinafter called the " Indian JV/ SUBSIDIARY Manufacturing Company"), which expression shall include its successors, administrators, executors and permitted assigns) AND

M/s ……having its Registered Office at …… (hereinafter called the "Qualified Equipment Manufacturer", which expression shall include its successors, administrators, executors and permitted assigns) AND
*M/s ……A Company registered under ……having its Registered Office at …… , hereinafter called holding/ subsidiary company of the qualified equipment manufacturer in favour of NTPC Limited, A Government of India Enterprise, incorporated under the Companies Act, 1956, having its Registered Office at NTPC Bhawan, Scope Complex, 7, Institutional Area, Lodhi Road, New Delhi-110003 INDIA (hereinafter called "NTPC" or "Employer" which expression shall include its successors, administrators,

Signature of authorized signatory.....

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, construction, installation, testing, commissioning and conductance of guarantee tests for the **Flue Gas Desulphurisation (FGD) System Package** for **North Karanpura STPP (3X660MW)** (hereinafter referred to as "Plant") vide its Bidding Document No. **CS-4410-109-2.**

AND WHEREAS vide clause 4.01.04 of Sub-Section-I, Part A, Section VI of bidding documents, it has been specified that a Qualified Indian Manufacturing Company can also manufacture equipment listed at clause no. 4.01.02 (...)of Sub-Section-I, Part A, Section VI for which it is qualified, provided that it has a valid ongoing collaboration and technology transfer agreement for design, engineering, manufacturing of ***BOOSTER FANS/*SLURRY RECIRCULATION PUMP/*OXIDATION BLOWERS/*WET LIMESTONE GRINDING MILLS/*SLURRY PUMPS/*AGITATORS/*VACUUM BELT FILTERS** in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.02(....) of Sub-Section-I, Part-A, Section-VI of bidding documents. Before taking up the manufacturing of ***BOOSTER FANS/*SLURRY RECIRCULATION PUMP/*OXIDATION BLOWERS/*WET LIMESTONE GRINDING MILLS/*SLURRY PUMPS/*AGITATORS/*VACUUM BELT FILTERS**, the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/ licenser's design, manufacturing and quality control system for Wet limestone Grinding mill. In addition, the Bidder/Contractor along with the Qualified Indian JV/SUBSIDIARY Manufacturing Company, qualified equipment manufacturers and its holding/subsidiary company shall furnish DJU for each equipment in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment.

WHEREAS M/s ..... (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. ..... dated ..... for **Flue Gas Desulphurisation (FGD) System Package** for **North Karanpura STPP (3X660MW)** (hereinafter referred to as "Plant") vide its Bidding Document No. **CS-4410-109-2.**

AND WHEREAS M/s ..... (Indian JV/SUBSIDIARY Company) meets the requirement of clause 4.01.04 of sub-section-I, Part-A, Section-VI and has a valid ongoing collaboration*/licensing* agreement for design, engineering, manufacturing of .....(Name Of Equipment) in India with M/s .....who meets the requirements stipulated at clause 4.01.02(a)*/(b)*/(c)*/(d)*/(e)*/(f)*/(g)* of Sub-Section-I, Part A, Section-VI of bidding documents.

AND WHEREAS M/s ..... (Qualified Equipment Manufacturer) meets the requirements of clause 4.01.02 of sub-section-I, Part-A, Section-VI for .....(Name Of Equipment)

AND WHEREAS M/s..... directly*/indirectly through its holding/subsidiary company M/s .....* have atleast 26% equity participation in the Indian JV/SUBSIDIARY Company which shall be maintained for a lock in period of seven (7) years from the date of incorporation of the Indian JV/ SUBSIDIARY Company

Signature of authorized signatory.....

AND WHEREAS the Bidder/Contractor along with the *Qualified Indian Manufacturing Company , Qualified Equipment Manufacturers alongwith its holding/subsidiary company are required to jointly execute and furnish prior to the placement of order for..... (Name of equipment), an irrevocable Deed of Joint Undertaking and be jointly and severally responsible and bound unto the Employer for successful performance of the (Name of Equipment) for **North Karanpura STPP (3X660MW) Project** fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents, in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Qualified Equipment Manufacturer and the Indian JV/SUBSIDIARY Company and the Bidder/Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the ..... (Name of Equipment).

2. In case of any breach of the Contract committed by the Indian JV/SUBSIDIARY, we the Bidder/Contractor and Qualified Equipment Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the ..... (Name of Equipment) and undertake to carryout all the obligations and responsibilities under this Deed of Joint Undertaking in order to discharge the Indian JV/SUBSIDIARY Company obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the ..... (Name of Equipment), we the Bidder/Contractor and Qualified Equipment Manufacturer jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Indian JV/SUBSIDIARY Company / Bidder/Contractor before proceeding against the Qualified Equipment Manufacturer nor any extension of time or any relaxation given by the Employer to the Qualified Indian Manufacturing Company / **Bidder/Contractor shall prejudice any rights of the Employer under this Deed of Joint Undertaking to proceed against the Qualified Equipment Manufacturer.

3. The liability of the Contractor, his sub-vendor and Associate/Collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipment.

4. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:

   (a) We the Qualified Equipment Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of

procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of ..... (Name of Equipment).

Further, we, the Qualified Equipment Manufacturer shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Qualified Indian Manufacturing Company's works and/ or at Employer's project site.

Further, the Qualified Equipment Manufacturer shall depute their technical experts from time to time to the Indian JV/SUBSIDIARY Manufacturing Company's works/ Employer's project site as required by the Employer and agreed to by Indian JV/SUBSIDIARY Manufacturing Company to facilitate the successful performance of the ..... (Name of Equipment) as stipulated in the aforesaid Contract.

Further, the Qualified Equipment Manufacturer shall ensure proper design, manufacture, installation, testing and successful performance of the ..... (Name of Equipment) under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Qualified Equipment Manufacturer shall advise the Indian JV/SUBSIDIARY Manufacturing Company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

(b) In the event Indian JV/SUBSIDIARY Manufacturing Company /Contractor fail to demonstrate that the ..... (Name of Equipment) meets the guaranteed parameters and demonstration parameters as specified in the contract, the Qualified Equipment Manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.

(c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the ..... (Name of Equipment) and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor and Indian JV/SUBSIDIARY Manufacturing Company and Qualified Equipment Manufacturer.

5. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Indian JV/SUBSIDIARY Manufacturing Company do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Deed of Joint Under

Signature of authorized signatory.....

without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

6. The Bidder/Contractor and Qualified Equipment Manufacturer will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.

7. In case of Award, in addition to the Contract Performance Security for the Contract, the Qualified Equipment Manufacturer, Its holding/subsidiary campany (as applicable) and Indian JV/SUBSIDIARY manufacturing company shall furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 1.5 Million (Indian Rupees One and half Million) for each** and it shall be guarantee towards the faithful performance /compliance of this Deed of Joint Undertaking in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.

8. Any dispute that may arise in connection with this Deed of Joint Undertaking shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Deed of Joint Undertaking shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.

9. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Indian JV/SUBSIDIARY Manufacturing Company shall form an integral part of the Contracts from the date of signing of this Deed of Joint Undertaking. We further agree that this Deed of Joint Undertaking shall continue to be enforceable till its validity.

10. That this Deed of Joint Undertaking shall be operative from the effective date of signing of this Deed of Joint Undertaking.

IN WITNESS WHEREOF, the Bidder/Contractor and Qualified Equipment Manufacturer and its holding/subsidiary company (as applicable) and the Indian JV/SUBSIDIARY Manufacturing Company through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS For M/s .....

Signature of authorized signatory.....

.....
(Signature Name)

(Signature of the Authorised

Representative) .....

.....
(Official Address)

Name .....

Designation .....

Common Seal of the
Company .....

1. WITNESS

For M/s .....
(Indian JV/SUSIDIARY Company)

.....
(Signature Name)
Representative) .....

(Signature of the Authorised

.....
(Official Address)

Name.....

Designation .....

Company .....

Common Seal of the

1. WITNESS

For M/s .....
(Qualified Equipment Manufacturer)

.....
(Signature Name)

(Signature of the Authorised

.....
(Official Address)

Name.....

Designation .....

Common Seal of the
Company .....

1. WITNESS

For M/s .....
(Holding/subsidiary company to Qualified Equipment Manufacturer)

.....

(Signature Name)

(Signature of the Authorised
Representative) .....

.....
(Official Address)

Name.....

Designation .....

Company

Common Seal of the

Note : Power of Attorney of the persons signing the said Deed of Joint Undertaking is to be furnished.

* Contractor/Sub-Vendor shall strike out, whichever is not applicable