

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
34(a)	V//B	II-E2	2 of 9	3.01.00 b)	Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30	Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 % Tolerance on efficiency value applicable as per IEC 60034
34(b)	V//A	D-01	1 OF 282	5.03.09, PARA 7, LINE 3	The type of aviation obstruction lighting system shall be of medium intensity aviation obstruction lights having an effective intensity of 2000 to 20,000 cd depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 20000 cd. The intensity of lights shall be 20000 cd $\pm$ 25% at twilight and shall reduce automatically to a night time intensity of 2000 cd $\pm$ 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction lights and there will be four light units per level. The	The type of aviation obstruction lighting system shall be of high intensity aviation obstruction lights having an effective intensity of 4000 to 200,000 cd (minimum) depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 200000 cd. The intensity of lights shall be 20000 cd $\pm$ 25% at twilight and shall reduce automatically to a night time intensity of 4000 cd $\pm$ 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction lights and there will be four light units per level. The

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					intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc.	lowest level should not be lower than 45 meters above the ground and vertical spacing of the intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc.
35.	Section VI / Part B	Sub-Section -IV-D Civil Works	2.00.00	1 of 69	"Sub QR for civil works."	" Clause Deleted"
36.	VI/B	Sub-section IVD Civil Works	1.02.00	01 of 69	The specifications are intended for the general description of the work.....in writing with the Employer in respect of interpretation of any portions of this document.	The specifications are intended for the general description of the work, quality and workmanship. The specifications are not, however, intended to cover minutest details and the work shall be executed according to the relevant latest Indian Standard Codes / I. R. S. / I. R. C. specifications. Where provisions are not covered in Indian Standards, reference shall be made to ACI, AISI, ASCE, EN, CICIND and other international standards or to the best prevailing local Public Works Department practices or to the instructions of the Engineer. Some of the relevant I. S. Codes to be followed

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37.	VII/A	II- A1/A3/ A4/A5/ A6/A7/ A9/A11 Project Informa tion	5.00.00	SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT	are mentioned in the Technical Specifications. The Contractor is expected to get clarified on any doubts about the specifications, etc. before bidding, in writing with the Employer in respect of interpretation of any portions of this document. “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” given in “Civil Annexure-1” to this amendment shall replace the “ SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT ” at Clause 5.00.00, Sub-section-II- A1/ A3/A4/A5/A6/A7/A9/A11, Part-A, Sec-VI, of Tech. Specification.
38.	Amendment specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)) SI.No. 13, Page-8 of 102	No.03. to Technical specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T))		“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Lara STPP Project	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Lara STPP Project given in “Civil Annexure-2” to this amendment shall replace the “ SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT ” Amendment No.03. to Technical specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)), SI.No. 13, Page-8 of 102
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS				AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 14 of 60
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39.	Amendment No.03. to specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)) Sl.No. 14, Page-8 of 102			“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Barh STPP Project	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Barh STPP Project given in “Civil Annexure-3” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” at Amendment No.03. to Technical specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)), Sl.No. 14, Page-8 of 102
40.	Errata No.01 to Technical specifications, Section-VI (Doc. No.:CS-0011-109(1A)-2-ERRATA-01)			“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Nabinagar STPP Project (3x660MW)	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Nabinagar STPP (3x660MW) Project given in “Civil Annexure-4” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” at Errata No.01 to Technical specification (Doc. No.:CS-0011-109(1A)-2-ERRATA-01).

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41.	Section VI / Part B	Sub-Section -IV-D Civil Works	17.01.00	35 of 69	Design of steel structures shall be done by working stress method. Design shall be as per provisions of IS:800:1984.	Design of steel structures shall be done as per provisions of IS:800: 2007 (Limit state design) and other relevant IS standards.
42.	Section VI / Part B	Sub-Section -IV-D Civil Works	17.26.00	38 of 69	-	For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015 for Earthquake loads.
43.	Section VI / Part B	Sub-Section -IV-D Civil Works	17.27.00	38 of 69	-	Design drawings of steel structures shall include the connection, joint & fastener details for Main columns, Beams & Bracings.
44.	V/A	IIA2	BORE LOG	Page:23 to 39 of 48	BH No.53,54,55,57,58,60,163,164	“Bore Logs” given in “Civil Annexure-5” to this amendment shall replace the contents of Bore Logs, Page 23 to 39 of 48 , Sub-section- II-A2, Part-A Sec-VI, of Tech. Specification.
45.	V/B	IV-D	3.01.00(a)	4 of 69	-----	New Clause: Limestone Storage Silo The supporting structure for silo shall be of structural steel. Independent supporting structure shall be provided for each silo.
46.	Amendment No. 03 to technical specification (Section-VI) Sl. No. 02, Page 2 of 102				Single-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for	Single-flue chimney(s) shall be provided, except for Tanda TPP (2X660MW) and Meja TPP (2X660MW) where twin-flue

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					each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.	Chimney shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point for single flue chimney shall be minimum 150 meters above the plant grade level and for twin flue chimney flue gas emission point shall be minimum 220m above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres. For Barh-I (3X660MW) already existing 275m high chimneys shall be utilized with modifications as specified elsewhere in mechanical specification and hence, new chimney is not to be provided under FGD package. General Arrangement Drawing of already existing Chimneys at Barh-I are provided in Sub Section-II -A10, Part A, Section-VI for reference. The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be profiled into a circular shape to connect to the flue liner. The flue
47.	VI/B	IV-D	3.14.01 Para 3	11 of 69	The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be bottom supported and shall be profiled into a circular shape to connect to the	

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					flue liner. The flue duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic fluoroelastomeric fabric expansion joint.	duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic expansion joint.
48.	VI/B	IV-D	3.14.01 Para 4	11 of 69	The expansion joint in the flue liner shall comprise of non-metallic fluoroelastomeric material suitable to withstand a temperature of 300 Deg C , shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable to withstand a temperature of 300 Deg C and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh.	The expansion joint in the flue liner shall comprise of non-metallic material suitable for wet stack operations , shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable for wet stack operations and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh. Design of expansion joint shall comply EPRI guideline to avoid contact of condensate with expansion joint material and to ensure drainage of condensate.
49.	VI/B	IV-D	3.14.01 Para 5	11 of 69	Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from chimney shell	Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from

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					with chequered plate floor panels and pipe handrails, shall be provided for full height of the chimney and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch.	chimney shell with chequered plate floor panels and pipe handrails, shall be provided upto the platform just below roof platform and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch.
50.	VI/B	IV-D	3,14.01 Para 6	11 of 69	The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, mild steel wind stakes (if required) , all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects.	The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but

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51.	VI/B	IV-D	3.14.02 Para 7	12 of 69	The chimney and its components shall be designed to resist the most onerous forces resulting from all the possible combinations of the various loadings. Design of all chimney components shall be based on working stress method.
52.	VI/B	IV-D	3.14.03 Para 1	12 of 69	The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, thermal gradients etc. The load calculation and load combinations shall be as detailed in IS 4998 (Part 1) : 1992 . The wind shield shall be analysed for cases with and without flue liner loads.
53.	VI/B	IV-D	3.14.03 Para 2	12 of 69	Forces/stresses in the wind shield due to eccentricity effects of local (e.g. corbel) loadings, insulations effects, rotation of chimney foundations, construction tolerances and moments of second order shall also be considered.
54.	VI/B	IV-D	3.14.03 Para 6	12 of 69	The stresses for the shell design shall not exceed the limits given in Cl. 7.0 of IS:4998 (PART-I) 1975 for various combinations of loads, excepting the stress in concrete for the case of dead load + wind load which shall not be considered.

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					exceed 0.30fck where fck is the characteristic compressive strength of concrete.	
55.	V/B	IV-D	3.14.03 Para 9	13 of 69	There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a sudden change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level.	There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level.
56.	V/B	IV-D	3.14.03 Para 14	13 of 69	The final design shall be checked & verified by 'Wind Tunnel Test' and shall be conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located in the area or in the future expansion stage of the project shall be determined along with the other topographical features of the local area through model test.	The final design shall be checked & verified by 'Wind Tunnel Test' conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located upto distance of 20 times diameter at 2/3rd height of subject chimney , in the area or in the future expansion stage of the project, as envisaged by the owner at the time testing , shall be determined along with the other topographical features of the local area through model test.
57.	V/B	IV-D	3.14.04 Para 5	13 of 69	Clean-out door shall be provided below the flue for the removal of ash.	DELETED

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58.	VI/B	IV-D	3.14.07 Para 5	14 of 69	The chimney foundation shall be designed for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation/piles for any loading condition. Since chimney is a wind sensitive structure, no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. No allowance shall be made in the stresses for design of foundation for wind loading. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 25.	The chimney foundation shall be designed as per limit state method as per IS 4998 for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation/piles for any loading condition. Since chimney is a wind sensitive structure, no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of the radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 30.
59.	VI/B	IV-D	3.14.08 Para 2	14 of 69	The insulation thickness shall be determined based on the maximum/minimum ambient	DELETED

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					temperature, surface air velocity worked out based on the draught of ventilation air in the annular space between the flue liner and chimney shell, insulation surface emissivity of 0.3 and the insulation cold face maximum temperature not exceeding 55 degree Celsius. The draught of air in the annular space shall be the natural draught created by the heating of air by the flue liner and the air being vented out through the openings in the chimney shell. The increase in the annulus air temperature due to the rising heated air shall be taken into account while calculating the insulation thickness.	
60.	VI/B	IV-D	3.14.09 (i)	15 of 69	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) except surfaces of steel wind strakes shall be painted as specified in corrosion protection clause of this specification.	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) shall be painted as specified in corrosion protection clause of this specification.
61.	VI/B	IV-D	3.14.09 (ii)	15 of 69	All exposed surfaces of steel wind strakes shall be painted with epoxy phenolic coating system having total 240 microns DFT. a) All steel surfaces shall be provided with two component epoxy primer coat (having solid by volume minimum 51% ±2%) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2½ finish of ISO 8501-1 with surface profile 40-60 Micron. The primer	DELETED

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					coat shall be applied in shop immediately after blast cleaning by airless spray technique. b) Primer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% $\pm$2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied in shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer.	
62.	VI/B	IV-D	3.14.09 (iii)	15 of 69	All steel parts embedded in concrete like Strake embedment assembly including bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes.	All steel parts embedded in concrete like bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes.

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63.	VI/PA RT-A	II-A1 II-A2 II-A3 II-A4 II-A5 II-A6 II-A7 II-A8 II-A9 II-A10 II-A11	-	-	General Layout Plan 1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.7 2. Lara (2x800 MW) 9548-999-POM-F-001 Rev.8 3. Gadarwara (2x800 MW) 9572-999-POC-F-001 Rev.6 4. Darlipali (2x800 MW) 9549-999-POC-F-001 Rev.10 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.11 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.5 7. Tanda (2x660 MW) 9562-999-POC-F-002 Rev.9 8. Nabinagar JV (3x660 MW) 0370-999-POC-F-001 Rev.10	General Layout Plan 1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.8 (Civil Annex 6) 2. Lara (2x800 MW) 9548-999-POM-F-001 Rev.9 (Civil Annex 7) 3. Gadarwara (2x800 MW) 9572-999-POC-F-001 Rev.7 (Civil Annex 8) 4. Darlipali (2x800 MW) 9549-999-POC-F-001 Rev.11 (Civil Annex 9) 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.12 (Civil Annex 10) 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.6 (Civil Annex 11) 7. Tanda (2x660 MW)	
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					9. Meja (2x660 MW) 0360/0361-999-POC-F-001 Rev.7 10. Barh (3x660 MW) 9558/9560-999-POC-F-001 Rev.8 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 8	9562-999-POC-F-002 Rev.10 (Civil Annex 12) 8. Nabinagar JV (3x660 MW) 0370-999-PO-F-001 Rev.11 (Civil Annex 13) 9. Meja (2x660 MW) 0360/0361-999-POC-F-001 Rev.8 (Civil Annex 14) 10. Barh (3x660 MW) 9558/9560-999-POC-F-001 Rev.9 (Civil Annex 15) 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 9 (Civil Annex 16)
64.	VII/A	II-A10	List of Drawings	30 of 30	-	Include the following new drawings enclosed herewith this Amendment at Sl. No. 6 & 7 respectively. 6. General Arrangement of Twin flue Chimney for Units1&2 (2x660 MW) – Drg. No. 9558-317-POC-A-001(Civil Annex 17)

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65.						7. General Arrangement of Single flue Chimney for Unit3 (1x660 MW) – Drg. No. 9558-317-POC-A-002(Civil Annex 18) Bidder shall utilize the area identified for FGD purpose. The area identified for FGD purpose in GLP shall be levelled and free from obstructions like sheds, trees etc. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.
66.				New Clause		Dismantling & Removal of asbestos sheet shall be done by owner. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.
67.	SECTION-VI/ Part-A	V SALIEN T DESIG N DATA	7.03.00	13 of 26	DESIGN PHILOSOPHY – Ventilation System Note : Dry bulb temperature during summer season mentioned in clause 7.01.00 (Appendix-A) Sub- section V, Part-A shall be considered as Design Ambient Temperature for above.	DESIGN PHILOSOPHY – Ventilation System Note : Dry bulb temperature during summer season mentioned in clause 7.01.00 (Appendix-A) Sub- section V, Part-A shall be considered as Design Ambient Temperature for above.

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68.	SECTI ON-VI/ Part-A	V SALIEN T DESIG N DATA	7.01.00	12 of 26	For areas, where A/C load is of the order of 25-60 TR, Direct Expansion (DX) type Condensing unit (with AHU) shall be provided depending on the availability of space/ layout etc. For areas, where A/C load is of the order of 15-25TR, ductable split/package A/C shall be provided. Smaller areas which are away from the D-X type Condensing unit /central chilling units which may require air conditioning upto 15 TR rating shall be served with Hi-wall Split/Cassette air conditioner units as per requirement.	For areas like FGD control room where load is more than 15TR ,Direct expansion (D-X) type condensing unit (with AHU) shall be provided. For other areas where air conditioning requirement is 5-15 ductable split/package A/C shall be provided. If the air conditioning load is less than 5TR, then Hi-wall Split/Cassette air conditioner shall be provided.
69.	SECTI ON-VI/ Part-A	III-A2	3.00.00(i)	3 of 4	Complete compressed air and piping network for service air and instrument air application in FGD and ZLD system (if provided).	Complete compressed air and piping network for service air and instrument air application in FGD and ZLD system (if provided) shall be as per Tender drawing of compressed air system. (Mech Annexure I)
70.	VI/B	I-M4	5.02.00(b)	Page 2 of 18	Linear heat sensing cable detection system Gypsum and lime conveyor of FGD system and Cable Galleries covered under MVW Spray System.	Linear heat sensing cable detection system Gypsum and lime conveyor of FGD system and Cable Galleries.
71.	VI/B	I-M4	5.02.00(c)	Page 2 of 18	Quartzoid bulb heat detection system Equipments protected by HWW spray system, conveyors protected by MVW spray system.	Quartzoid bulb heat detection system Equipments protected by HWW spray system.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
72.	SECTION-VI/ Part-E	Tender Drawing List	1.00.00 (A)	1 of 2	--	Schematic drawing of compressed air system
73.	VI/B	I-M4 Fire Detection & Protection System	5.15.00Notes: (3)	Page 13 of 18	Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system.	Over and above, contractor shall provide all the cables so as to complete the system.
74.	VI/A	III-A2	2.00.00 (C)	2 of 4	Miscellaneous areas: All other areas like Limestone Grinding system building, Gypsum dewatering building, Recirculation pump & Oxidation Blower/compressor building etc & all other non-air conditioned areas covered under this package shall be ventilated by a combination of supply/exhaust fans and fresh air in-take / back draft louvers. For ventilation of Battery rooms and Oil rooms, fans with flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans.	Miscellaneous areas: All other areas like Limestone Grinding system building, Gypsum dewatering building etc & all other non-air conditioned areas covered under this package shall be ventilated by a combination of supply/exhaust fans and fresh air in-take / back draft louvers. For ventilation of Battery rooms and Oil rooms, fans with flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans. Note: The above list of Buildings is indicative only. Any Building under this

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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						package which are of enclosed type, shall be provided by Mechanical ventilation.
75.	VI/B	I-M4	5.05.00	5 of 18	The detection zone/loop divisions of LHSC system shall match with MVW spray zones. Conveyors where LHSC shall be installed shall be divided into no. of various zones whereas conveyor for which IR detector is installed shall be considered as one zone.	The clause stands deleted
76.	VI/B	I-M4	5.16.00	13 of 18	Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated. It shall also initiate spray system for the two adjacent zones after a time delay settable at site.	The clause stands deleted
77.	VI/B	I-M4	5.05.00	5 of 18	Mounting arrangement have been indicated in tender drawing.	Mounting arrangement will be provided as per proven practice.
78.	SECTI ON-VI/ Part-A	III-A2	3.00.00(g)	3 of 4	Monorail with Chain pulley block of minimum 2 tons or 125% of heaviest parts of equipment to be lifted whichever is more.	Monorail with electric hoist of minimum 2 tons or 125% of heaviest parts of equipment to be lifted whichever is more.
79.	A	III-A6 Zero Liquid Discharge System			Chapter 'Zero Liquid Discharge System'	Chapter 'deleted'.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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80.	A	VI	143 of 209	4.02.00 xvii)	Waste Water Treatment System (Applicable for Barh-I..... filter test.	Deleted.
81.	A	VII	16-18 of 61	1.20.00	SPARES FOR FGD Waste Water Treatment (FGD WWT) SYSTEM FOR ZLD(APPLICABLE FOR PROJECTS WHERE ZLD SYSTEM IS BEING PROVIDED)	Deleted.
82.	B	I-M7 Zero Liquid Discharge System			Chapter 'Zero Liquid Discharge System'	Chapter 'deleted'.
83.	E				Process Flow diagram for FGD waste water treatment(FGDWWT) system for ZLD Drawing No. 0011-109-POM-A-005 (Sht. 1 of 3, Sht.2 of 3 & Sht. 3 of 3)	Deleted.
84.	A	I Intent of Specification	15 of 19	4.04.00,	FGD WASTE WATER REATMENT SYSTEM FOR ZERO LIQUID DISCHARGE (ZLD)..... for each project.	Deleted
85.	A	I Intent of Specification	16 of 19	4.05.00	Provenness criteria for critical equipment, auxiliaries, systems and bought out items for FGD waste...../Anthracite coal/lignite.	Deleted

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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86.	A	I Intent of Specification	3 of 19	1.03.05	ZERO LIQUID DISCHARGE (ZLD) SYSTEM for FGD waste water for Barh-I.....	Deleted.
87.	A	I Intent of Specification	5 of 19	3.00.00 A(5)	Process Flow Diagram for FGD Waste water treatment (FGD WWT).....	Deleted.
88.	Attach ment -12 to Section VII	Part-F, Chapter -II, Sub Section :DM1	5 of 42	1.02.00 (xxviii)	Write up on ZLD...	Deleted
89.	Attach ment -12 to Section VII	Part-F, Chapter -II, Sub Section :DM2			Zero Liquid	Sub Section:DM2 'deleted'
90.	VI/A	III-A4	1	1.01.00(i)	Piping for normal -----, piping for emergency -----pump, other piping, fittings, supports, valves and specialties.....and structural steel shed for housing various equipment of Equipment cooling water system alongwith necessary handling arrangement as per CI No-14.09.00, Sub-section-M1, Part-B, Section-VI and	Piping for normal -----, piping for emergency -----pump, other piping, fittings, supports, valves and specialties.....and structural steel shed for housing various equipment of Equipment cooling water system alongwith necessary handling arrangement as per CI No-14.09.00, Sub-section-M1, Part-B, Section-VI and

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
91.	V/A	IV	2 of 3	1.04.01	Contractor shall take-----DM normal Make-up----- available along C-row at CD bay rack----- meeting the makeup water requirement of ECW system. The pressure available at TP will be 4Ksc wrt FGL (approx.).	Contractor shall take-----DM normal Make-up----- available along C-row at CD bay rack----- meeting the makeup water requirement of ECW system. The quantity (maximum) and pressure available at TP will be 2 m3/hr (Maximum) and 4Ksc wrt FGL (approx.) respectively.
92.	V/A	IV	2 of 3	1.04.02	Contractor shall take-----DM emergency Make-up header ----- available along C-row at CD bay rack----- meeting the emergency makeup water requirement of ECW system. The pressure available at TP will be 4Ksc wrt FGL (approx.).	Contractor shall take-----DM emergency Make-up header ----- available along C-row at CD bay rack----- meeting the emergency makeup water requirement of ECW system. The quantity (Maximum) and pressure available at TP will be 2m3/hr and 4Ksc wrt FGL (approx.) respectively.
93.	V/A	IV	2 of 3	1.06.00	For Gypsum washing, contractor shall take a tap off -----rack for meeting the water requirement -----washing. The pressure available at TP will be 4 Ksc (gauge) wrt FGL (approx.).	For Gypsum washing, contractor shall take a tap off -----rack for meeting the water requirement -----washing. The water quantity and pressure available at TP will be 0.015m3/hr/MW (Maximum) & 4 Ksc (gauge) wrt FGL (approx.) respectively.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
94.	V/A	VII	61 of 61	1.28.00	-----	New Cl. 1.28.00 Added for mandatory spares of ECW system. Refer Mechanical Annexure-II
95.	Section-VI, Part A	V	2.01.01	2 of 6	Limestone will be received to power plant either through road by trucks and through Indian railway rakes. Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tipplers each of minimum 40T capacity (Gross weight 60 T minimum) to discharge Feeders/ Surface Unloading Hopper, complete with all mechanical, electrical and C&I, civil & structural works for unloading Limestone by truck tipplers. Two (2) numbers Box Feeders/ Bulk-material Receiving Unit/ ~~Underground~~ Truck Unloading Hopper Surface feeder, for unloading of limestone from trucks/ self-tipping trucks/ loader shovels, complete with drives, accessories all mechanical, electrical and C&I, Civil & structural works, including its supporting foundations etc. This unit shall feed limestone onto the conveyor before Limestone crusher house.	Limestone will be received to power plant through road by truck. Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tipplers each of minimum 40T capacity (Gross weight 60 T minimum) to discharge Limestone on to Box Feeder/ Surface Feeder/ Truck Unloading Hopper, complete with all mechanical, electrical and C&I, civil & structural works for unloading Limestone by truck tipplers. Two (2) numbers Box Feeders/Bulk-material Receiving Unit/Surface feeder, for unloading of limestone from trucks/self-tipping trucks/loader shovels, complete with drives, accessories all mechanical, electrical and C&I, Civil & structural works, including its supporting foundations etc. This unit shall feed limestone onto the conveyor before Limestone crusher house.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAU SE NO.		
					Limestone received through Indian Railway Rakes will be unloaded in one of the side discharge Wagon Tipplers or Track Hopper of existing Coal Handling Plant (CHP). Before existing Crusher house of CHP, the unloaded limestone will be fed to new limestone crusher house through series of new conveyors/bucket elevators. All necessary modifications involving Mechanical, Electrical, C&I, Civil and Structural works in the existing CHP for taking feed to new limestone path shall be in the scope of the bidder.	
96.	Section-VI, Part A	IV TERMINAL POINTS & EXCLUSIONS	1.09.00 (i)	2 of 3	For unloading of Limestone through WT/Track Hopper of the existing Coal Handling Plant, limestone 'Feed Point' before existing CHP's Crusher House	Clause DELETED.
97.	Section-VI, Part B	I-M6 LIMES TONE HANDLING PLANT	3.1.0	2 of 73	Unloading, Crushing and Bunker Feeding System Indian Railway rakes consisting of wagons consisting type of wagons as specified in RDSO G-33 (Rev-1) guidelines shall transport coal to the power plant. The coal received from wagons shall be unloaded in	Unloading, Crushing and Bunker Feeding System Two (2) numbers Box feeders/Bulk material receiving unit.....facilities. A mechanized system.....crusher.

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SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.		
				underground RCC hopper by means of side discharge type wagon tippler. Side discharge type wagon tipplers are to be employed for unloading IR Coal rake. Side arm chargers are envisaged for placement of wagon on the tippler table & removal of empty wagon from tippler table after tipping. Clear access shall be provided for movement of pay loader/bulldozers on the hopper grating of wagon tippler. Grating over wagon tippler hopper shall be placed and designed accordingly. Apron feeder along with dribble conveyor are employed under each wagon tippler for extracting coal from wagon tippler hoppers. Indian Railway rakes consisting of Bottom discharge wagons shall also transport coal to the power plant. The coal received from wagons shall be unloaded in underground RCC Track hopper. Paddle feeders complete with all electrical, rails, supporting structures, end stops, cable reeling drums, trailing cables, and necessary arrangement for cabling on floor of track hoppers along with accessories, shall be installed at the bottom of the Track hoppers to scoop the coal from track hoppers and feed coal on to the underground conveyors.	

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					Limestone received through railway rakes will be unloaded in one of these three side discharge wagon tipplers or track hopper. Alternatively, Two (2) numbers Box feeders/Bulk material receiving unit.....facilities. A mechanized system.....crusher.	
98.	Sectio n-VI, Part A	V	10.15.00	25 of 26	Dust extraction system Type: Venturi scrubber type Location: Truck un-loading points, Junction Towers (limestone/ gypsum discharge & receipt points), limestone crusher house (including belt feeder & vibrating screening feeder) and lime stone/gypsum storage Shed/Silo.	Dust extraction system Type: Bag Filter type Location: Truck un-loading points, Junction Towers (limestone/ gypsum discharge & receipt points), limestone crusher house (including belt feeder & vibrating screening feeder) and lime stone/gypsum storage Shed/Silo.
		Sl. No. 73 Amdt no.3 to tech spec				
99.	Sectio n-VI, Part A	VI	4.02.00	15 of 19	Guarantees Under Category-II	Guarantees Under Category-II <i>New Clause for Guarantee for LHS & GHS added as under:</i> (xviii) Limestone Handling System and Gypsum Handling System.

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SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.	
100.	Section-VI, Part A	III-A5.	2.01.11 & sl. No. 60 of Amdt no. 3 to Tech Spec.	3 of 6	The Bidder shall demonstrate the rated capacities of each conveying stream and the associated equipments for Limestone Handling system and Gypsum Handling System. One number of covered storage shed/silo for crushed limestone. The storage shed shall be sufficient to store limestone equivalent to consumption of minimum 7 days at Design point (Generation of all units to be considered). A reclaim hopper shall be provided below the limestone storage shed for the entire length of the stockpile. Alternatively, suitable number of Limestone Storage Silos to store limestone equivalent to consumption of minimum 7 days at Design point. Suitable number of Belt feeders along with suitable crushed limestone feed regulating mechanism below silos shall be provided taking feed from silo and discharging onto onward conveyors/ Bucket elevators. The Maximum capacity of each Limestone storage Silo shall not exceed 2000 MT.

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SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
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101.	Section-VI, Part A	III-A5	2.01.10	3 of 6	Suitable number of motorized travelling tripper / flow diverter plough (as applicable) on each feeding conveyor for feeding the crushed limestone to the covered storage shed . Trippers shall be complete with all mechanical, electrical equipment, rails, chute work, rail supporting structure (along with structural stools, as required), cables with cable festooning arrangement, thruster brakes, rail clamps, electric hoist, actuator flap gates etc.
102.	Section-VI, Part B	I-M6	3.5.0	3 of 73	SYSTEM DESCRIPTION: GYPSUM HANDLING PLANT Double conveyor stream shall be provided for conveying dewatered gypsum from vacuum belt filter to over ground storage under a shed near plant boundary . The storage shed shall be sized for 7 days of gypsum production with all the units in storage shed shall be loaded to user's trucks using front-end loader/ pay loader.
103.	Section-VI, Part B	I-M6	4.11.3 (vii)	16 of 73	SYSTEM DESCRIPTION: GYPSUM HANDLING PLANT Double conveyor stream shall be provided for conveying dewatered gypsum from gypsum vacuum belt filter to over ground storage inside a closed storage shed preferably near plant boundary . The storage shed shall be sized for 7 days of gypsum production with all the units in operation. Gypsum from storage shed shall be loaded to user's trucks using front end loader/ pay loader. Feeder carriage drive shall be suitably designed so that the forward & reverse movement of carriage can be achieved without stopping the scooping operation.

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SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
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104.	Section n-VI, Part B	I-M6	4.20.00	27 of 73	Dry type dust extraction system shall be provided. New Clause: Crushed Lime Stone Storage Silo: The crushed lime stone storage silo shall be fabricated of minimum 10 mm thick carbon steel with a SS lining of grade SS 304 of minimum 4 mm thickness in the complete conical portion to ensure reliable discharge of material. The design of storage silos shall conform to IS 9178 (part 1 of 3)
105.	Section -VI, Part A	III-A5	2.01.13	4 of 6	One (1) nos. of lime sampling unit, for as received limestone in crusher house complete with all accessories and electrical, civil, structural works, supporting structures, approach/ maintenance platforms, hoists etc. Two (2) nos. of lime sampling units, one for as received limestone in crusher house and one for as used limestone in TP before feeding to limestone bunkers, complete with all accessories and electrical, civil, structural works, supporting structures, approach/maintenance platforms, hoists etc.
106.	Sl. No.-178 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		107 of 117		The duct to Absorber inlet thickness. The duct from Absorber outlet to the new wet flue chimney shall be made of Carbon steel of minimum 7mm thickness clad with 2 mm (minimum) thickness Alloy C276 / Alloy 59 / Titanium Gr-II.
107.	VII/B	I-M1	31 of 51	10.01.00	Slurry & Process Water Tanks: All the slurry tanks.....valves etc.

FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS		AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 40 of 60
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					Coarse- screen(s) at suction-side of these pumps shall be provided.	All the slurry tanks.....valves etc. Coarse- screen(s) at suction-side of slurry recirculation pumps shall be provided.
108.	VII/B	I-M1	34 of 51	13.03.07	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness or with glass lining of minimum 3 mm thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 1.5 mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness or Epoxy lining minimum three coats of 150 micron thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.
109.	VII/A	III-A1	7 of 9	11.01.00	Contractor shall provide buildings for Limestone Grinding System; Slurry re-circulating pumps &	Contractor shall provide buildings for Limestone Grinding System, Compressors,

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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					Oxidation blowers / Compressors; Gypsum Dewatering System & FGD control room & Analyser room (if required). The buildings must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipments of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.	Gypsum Dewatering System & FGD control room. Slurry re-circulating pumps & Oxidation blowers shall be located in a shed provided with roof sheeting. The buildings/structure must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.
110.	VII/A	III-A1	4 of 9	4.01.11	All Slurry re-circulating slurry pumps & Oxidation blowers shall be installed inside a building to be provided by the Contractor as per specifications specified elsewhere. <i>All pumps & Oxidation blowers shall be in straight line.</i> The building must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc. The building shall be sufficiently ventilated.	All Slurry re-circulating slurry pumps & Oxidation blowers shall be installed in a shed provided with roof sheeting to be provided by the Contractor as per specifications specified elsewhere. All pumps & Oxidation blowers shall be in straight line, however, if it is not possible due to layout constraints, in such case, arrangement for handling & maintenance should be properly & optimally designed. The shed must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.

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111.	VII/B	10 of 51	4.02.00 (iv)		Margin over pressure requirement: 44% over the calculated value	Margin over pressure requirement: Bidder shall consider the margin over pressure requirement as 44% over the calculated head value excluding the static head. Margin on Static head shall be taken as 10%.For bubbling type Absorber, Bidder shall consider choking/blockage of 10% sparger tubes while calculating the head requirements of fan.
112.	VII/B	I-M1	30 of 51	8.04.00	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized valves shall be shall be taken form the process water supply	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized/ pneumatic valves shall be shall be taken from the process water supply. The process water lines shall be provided with pneumatic/motorized valves as per the proven practice of the Bidder.
113.	VII/A	III-A1	7 OF 9	7.08.00	All the storage tanks shall be lined with vinyl ester based flake glass lining from inside.	All the storage tanks shall be lined with replaceable chlorobutyl /bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
114.	VI/B	I-M1	26 of 51	7.04.03	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.	glass lining of minimum 3 mm thickness from inside. The complete frame of the filter and all parts in contact with gypsum shall be made with corrosion resistant material .
115.	VI/B	I-M1	14 of 51	5.01.00(B)	Bubbling Type Absorber (i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and spray header and nozzles shall be required in such case. However, 2x 100% Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping for cooling pump discharge shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. The Cooling Pumps shall be installed inside a building. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.	Bubbling Type Absorber (i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and spray header and nozzles shall be required in such case. However, 3 x 50% Gas Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping which are in contact with hot flue gas shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. Cooling Pump discharge piping and valves outside the flue gas path shall be in line with the requirements

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
						specified for slurry recirculation pumps. The Cooling Pumps shall be installed in a shed with roof sheeting. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.
116.	VII/A	IV	1 of 3	1.02.00	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: i) One two tapping (depending on layout feasibility owing to space limitations and subject to Employer's approval) from the Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities. ii) One tapping on the Employers facilities.	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: i) One two tapping (depending on layout feasibility owing to space limitations and subject to Employer's approval) from the Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities. ii) One tapping on the Employers facilities.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
117.	VI/B	I-M1	2 OF 51	1.03.02	The FGD system shall be ... whenever the Steam Generator is in operation. However, provision shall the gas side, with the unit in operation. For this purpose. Motorized Guillotine type gates at (i) hot gas inlet to Booster Fans, (ii) Outlet of Booster Fans and (iii) in the bypass duct (common Flue Gas Duct going towards the existing Chimney). Further, Quick opening Bi-plane designing the control & logics for the FGD System.	The FGD system shall be ... whenever the Steam Generator is in operation. However, provision shall the gas side, with the unit in operation. For this purpose. Motorized Guillotine type gates has be provided at (i) hot gas inlet to Booster Fans, (ii) Outlet of Booster Fans, (ii) Outlet of Booster Fans. Further, Quick opening Bi-plane designing the control & logics for the FGD System.
118.	VI/B	I-M1	7 OF 51	3.03.01	The arrangement of the flue gas system shall at the outlet of each Booster fan. A gas tight, motor operated Guillotine gate shall be provided by the Contractor in the bypass duct (flue gas duct connecting the existing chimney).	The arrangement of the flue gas system shall at the outlet of each Booster fan.

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SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.	
119.	Sl.no. 177 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		106 of 117	A "wet Chimney" shall be operation. The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation. The wet stack shall be designed as per the guidelines of EPRI Revised Wet Stack Design Guide. Alternatively, ... year full replacement guarantee and fulltime onsite QA supervision, during erection & commissioning, by the supplier of the lining of the chimney flue liner shall be wrapped with 2 mm thick Titanium / C-276 sheet. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet. < 18 at Design Point External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet.	A "wet Chimney" shall be operation. The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. The top flue liner above the roof slab shall be made of solid C276 / Titanium (Grade 2 as per ASME SB265) of minimum 10 mm thickness. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation. The wet stack shall be designed as per the guidelines of EPRI Revised Wet Stack Design Guide. Alternatively, ... year full replacement guarantee and fulltime onsite QA supervision, during erection & commissioning, by the supplier of the lining system. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet.
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS				AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 47 of 60
BIDDING DOCUMENT NO.: CS-0011-109(1A)-2					

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.		
120.	Sl.no. 176 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		106 of 117	All the gates shall be designed for tight shut off. The Guillotine gate type dampers mentioned at condition without the use of seal air fans of the damper. The Guillotine gates shall also be provided with a 2X100% complete seal air system. The bypass damper shall minimum one type of damper of each type and size.	 18 at Design Point
121.	Sl.no.05 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-04(T)			Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I (3X660 MW) shall be 30 m ³ /hr averaged over a 24 hour period and for Nabinagar (4x250 MW) shall be 20 m ³ /hr averaged over a 24 hour period.	Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system shall be 10m³/hr (except for BRBCL where it shall be less than 5 m³/hr) averaged over a 24 hour period from each unit.

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.		
122.	Sl.no. 144 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		94 of 117	Clean gas from the absorber shall be taken to the Wet Chimney, to be provided by the Contractor, through three stage mist eliminators. Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper & Gate is included in the scope of the Contractor.	Clean gas from the absorber shall be taken to the Wet Chimney, to be provided by the Contractor, through three stage mist eliminators. Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper is included in the scope of the Contractor.
123.	VII/B	I-M1	14 of 51	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side.	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side. In order to optimise power consumption of FGD system at part load operation, Bidder to provide atleast one slurry recirculation pump preferably lower level with Variable Frequency Drive (VFD).
124.	VII/B	I-M1	31 of 51	The tanks shall be of welded construction. Interior surface of the tanks shall be lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 5 mm thickness and the outside surface shall be coated with paint as approved by the Employer	The tanks shall be of welded construction. Interior surface of the tanks shall be lined with the following: - Wastewater tank , Filtrate tank, Secondary hydro cyclone feed tank : Vinyl ester based Flake lining of min 3 mm thickness

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
						- Slurry tanks : Replaceable chlorobutyl /bromobutyl Rubber lining of minimum 4 mm thickness The outside surface of the tanks shall be coated with paint as approved by the Employer. Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The contractor may provide a recirculation line with motorized isolation valve / restriction orifice made of erosion resistant material for the above purpose. Flanged valves shall be rated at no less than ANSI press class of 150 lbs. GA Drawing & Datasheet of Hoist for Ball Mill Building GA & Datasheet of Hoist In case the absorber is equipped with several spray levels they shall be designed as follows: (i) For spray type Absorber, the last spray level upstream the mist eliminator shall be operated only in counter flow. (ii) (iii)
125.	VII/B	I-M1	33 of 51	12.01.00	Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The contractor may provide a recirculation line with motorized isolation valve for the above purpose.	
126.	VII/B	III-C7	2 of 5	2.09.00	Flanged valves shall be rated at no less than ANSI press class of 300 lbs.	
127.	VII/B	-I-M9	15 of 24	MDL 387 388	GA Drawing & Datasheet of 12T Hoist for Ball Mill Building GA & Datasheet of 25T Hoist	
128.	VI	I-M1	19 of 51	5.06.18	In case the absorber is equipped with several spray levels they shall be designed as follows: (i) The last spray level upstream the mist eliminator shall be operated only in counter flow. (ii) (iii) (iv)	

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
						(iv)
129.	VI	I-M1	8 of 51	4.01.01 3(iii)	Pressure at Booster Fan suction	0 mmWc Pressure at terminal point before Booster Fan suction
130.	VI/B	I-M1	27 of 51	7.07.05	The secondary wastewater underflow shall be taken to the adequately sized filtrate tank, while the overflow shall be taken to a wastewater tank.	The secondary wastewater underflow shall be taken to the adequately sized filtrate tank while the overflow shall be taken to a wastewater tank. In case Bidder opts to provide additionally Lamella separator before the waste water tank and after the secondary hydro cyclone for removing impurities from the system, the solids concentration in waste water up to max 10% can be acceptable .However, the required moisture content in Gypsum & required Gypsum quality shall be complied.
131.					ZLD envisaged for Barh (3x660 MW) & BRBCL (4x250MW)	ZLD stands deleted for both these projects (Barh-I (3x660 MW) & BRBCL (4x250MW)). Accordingly, all clauses and Drgs indicated in the specification pertaining to ZLD will not be applicable and clauses and drgs indicated in the

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
132.	VII/A	IV	2 of 3	1.08.00	Waste Water FGD waste water pipes shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at terminal point shall be 3.0 kg/cm²(g) , pH shall be 7.0 (approx.) and temperature shall be <50°C. Waste Water FGD waste water pipes shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at terminal point shall be 3.0 kg/cm²(g) , pH shall be 7.0 (approx.) and temperature shall be <50-60°C. For (Barh-I (3x660 MW) & BRBCL (4x250MW)):- FGD waste water pipes shall terminate along with isolation valve ash slurry sump. PH shall be 7.0 (approx.) and temperature shall be <50-60°C at terminal point.	specification related Wastewater treatment system shall be applicable to these two projects also.
133.	VII/A	VII	1 of 61	1.01.00 a)	The list of mandatory spares considered essential by the Employer is indicated in the list enclosed to this Sub-Section. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he 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	The list of mandatory spares considered essential by the Employer is indicated in the list enclosed to this Sub-Section. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS BIDDING DOCUMENT NO.: CS-0011-109(1A)-2						AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T) Page 52 of 60

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms & Price Schedules. Whenever the quantity is mentioned in “sets” the bidder has to give the item details and prices of each item.	price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish total population of each item for the project in the Bid Forms & Price Schedules. Whenever the quantity is mentioned in “sets” the bidder has to give the item details and prices of each item.
134.	VII/A	VII	6-11 of 61	1.01.00-1.17.00	Mandatory Spares List (For each Project) Cl. No. 1.01.00 to 1.17.00	Mandatory Spares List (For each Project) - Cl. No. 1.01.00 to 1.17.00 revised attached as Mech Annexure III
135.	VII/A	VII	44 of 61	Note to cl. No. 1.24.00	Note	Add below Note:- 6. Wherever rubber part viz: coupling, V belt, flexible hose etc have been used ,minimum quantity as specified above is to be supplied and any item which is not covered above minimum 10% or 01 no whichever is higher is to be supplied. 7. Wherever nonmetallic fabric/paper filter etc have been used ,minimum quantity as specified above is to be supplied and any item which is not covered above minimum 10% or 01 no whichever is higher is to be supplied 8. Any special tool required for maintenance of any of the equipment being supplied is to be included in

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
						mandatory T&P along with the equipment.
136.	Section-VI, Part A	VI	5.00.00	20-23 of 24	AUXILIARY POWER CONSUMPTION(PA) FOR EACH PROJECT	Revised AUXILIARY POWER CONSUMPTION (PA) FOR EACH PROJECT is enclosed at Mech Annexure-IV
137.					--	In case distance from Limestone Grinding system/ Gypsum Dewatering and Absorber is more than 500M, Bidder shall provide the following :- Flushing system at intermittent locations for the lime stone slurry pipeline which shall contain tank and pumps. Intermittent location distance of flushing system shall be based on their proven practice.
138.	VI/B	I:M9	1 to 24 of 24	MDL List	MDL List no. 213.Motor for Booster Fan - Sub QR documents of M/s Crompton Greaves Ltd., Bhopal 214. Motor for Booster Fan - Sub QR documents of M/s Weg, Hosur 215. Motor for Booster Fan - Sub QR documents of M/s Crompton Greaves Ltd., Mandideep 433. Oxidation Blower - Sub QR documents of M/s ITO, Japan 434.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Thysencrupp, Germany	MDL List no. 213.Motor for Booster Fan - Sub QR documents 214. Motor for Booster Fan - Sub QR documents 215. Motor for Booster Fan - Sub QR documents 433. Oxidation Blower - Sub QR documents 434.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents 435.Recirculation Slurry Pump - Sub QR documents 436.Booster Fan - Sub QR documents

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SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.	
				435.Recirculation Slurry Pump - Sub QR documents of M/s DUCHTING PUMPEN, GERMANY 436.Booster Fan - Sub QR documents of M/s Solyvent Flakt AB, Sweden 437.Slurry Pump - Sub QR documents of M/s Duchtig Pumpen, Germany 438.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Metso, USA 439.Agitators - Sub QR documents of M/s EKATO RMT GMBH. Germany 440.Vaccume Belt Filters -Sub QR documents of M/s Shanghai Xuhe Environmental Technology Co. Ltd., Shanghai, China 441.Vaccume Belt Filters -Sub QR documents of M/s FLSmith, USA 442.Agitators - Sub QR documents of M/s Zhejiang Greatwall Reducer Mfg Co. Ltd. 443.Gas to Gas Heat Exchanger (GGH) - Sub QR documents 444.Slurry Pump - Sub QR documents of M/s Weir Minerals, USA 445.Slurry Pump - Sub QR documents of M/s Sam Turbo Industries Pvt. Ltd., Koimbatoor 446.Booster Fan - Sub QR documents of M/s Suewon Poongryuk Machinery Co. Ltd, Korea 447.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Cemtec, Austria	437.Slurry Pump - Sub QR documents 438.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents 439.Agitators - Sub QR documents 440.Vaccume Belt Filters -Sub QR documents 441.Vaccume Belt Filters - Sub QR documents 442.Agitators - Sub QR documents 443.Not used 444.Slurry Pump - Sub QR documents 445.Slurry Pump - Sub QR documents 446.Booster Fan - Sub QR documents 447.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Cemtec, Austria 448.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Christian Pfeiffer Maschinenfabrik Austria 449. Oxidation Air Blower - Sub QR documents of m/s Siemens Turbo Machinery / HV Turbo 602. MQP for PDB of M/s pyrotech Electronics Udaipur 628. MQP for foundation bolts M/s Quality Engineering Works, Kolkata 629. MQP for foundation bolts M/s Indiana Conveyors, Jejuri 671. MQP for Ball Valve (M/s Leader) -All drgs pertaining to GGH stands deleted

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					448. Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Christian Pfeiffer Maschinenfabrik Austria 449. Oxidation Air Blower - Sub QR documents of m/s Siemens Turbo Machinery / HV Turbo 602. MQP for PDB of M/s pyrotech Electronics Udaipur 628. MQP for foundation bolts M/s Quality Engineering Works, Kolkata 629. MQP for foundation bolts M/s Indiana Conveyors, Jejuri 671. MQP for Ball Valve (M/s Leader) -All drgs pertaining to GGH	
139.	V/A	A -10	14 of 24		Drawing not attached	The drawing for Equipment layout at EL 0.0M (Drg. no. 9558-999-POM-A-001) for Barh-1 project is attached as Mechanical Annexure V
140.					Barh-I (3X660MW) clauses and drgs indicated considering that FGD outlet will led to New Chimney.	Barh-I (3X660MW) clauses and drgs revised considering that FGD outlet will led to existing chimney and accordingly absorber discharge will be connected to ID fan discharge duct with additional damper(s). Bypass duct from bypass damper to chimney and existing chimney shall be lined. Further, Condensate

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
141.	VII/A	I	9 of 19	4.01.07	In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.01 (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 4.01.01 (e) above for the Slurry Recirculation Pumps. Before ---- equipment.	draining system and condensate study shall also be in the bidder's scope. Sketch and details are enclosed at Mechanical Annexure-VI. In case the Bidder or the proposed sub-vendor is a manufacturer of Pumps, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps and slurry 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 4.01.01 (b) & 4.01.01 (e) above for the Slurry Recirculation Pumps and slurry pump respectively. Before --- equipment.
142.	VII/A	V	10 of 26	Notes for clause no. 6.000	Notes:-	Following note is added. Note:- 3.For the purpose of sizing of equipments and guarantee, MgCO₃ shall be considered as unreactive dolomitic form.
142 (a)	VII/B	I-M1	8 of 51	4.01.00	The Booster -----specified range of fuels. Additionally a pressure loss of 100 mm wcl (excluding margin) shall be built up in booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-NOx system.	The Booster -----specified range of fuels. Additionally a pressure loss of 100 mm wcl (including margin) shall be built up in both booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-NOx system.

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					De-Nox system.	
142 (b)	VII/A	III-A1	9 of 9	25.00.05	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided. Storage tank/neutralization tank shall be complete with dosing, mixing and preparation system. After neutralization of the stack condensate collection, same shall be pumped to common drain system. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration. All the material in contact with the condensate shall be of suitable material for the operating duty. Bidder should provide the condensate collection system such that the condensate collected shall be routed to absorber by gravity, bidder should ensure safe discharge to the absorber. However, in-case of the distance between absorber and wet stack is considerably far, bidder should provide the condensate collection system such that condensate shall be collected in a storage tank and pumped to absorber. Tank shall be placed at zero meter with a capacity 5 m3/hr along with associated pumping system. A common storage tank for the both the units of storage capacity of 5 m3/hr of stack condensate of both the stack shall be provided. Storage tank shall be complete with stack condensate collection be pumped to absorber. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration. All the material in	
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS					AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 58 of 60
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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
142	Sl. No.-165 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		101 of 117		2x100% electric driven, single stage, integrally geared, single or dual vane oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.	contact with the condensate shall be of suitable material for the operating duty.
143.	SECTI ON-VI, PART-B	I-M1	33 OF 51	12.02.00	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 300 NB made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same.	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 300 NB made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same. Outer surface of the pipes should be fire retardant.
144.	VII/B	I-M1	19 of 51	5.06.11 & Refer the SI.No.178 of Amendme nt No. CS-0011-	The absorber vessel shall be made of minimum 7 mm thick carbon steel. The absorber oxidation tank, absorber tower & absorber outlet duct shall be provided with 2 mm (minimum) thickness lining / cladding / wall paper of Alloy C276 / Alloy 59 or better material.	The absorber vessel shall be made of minimum 7 mm thick carbon steel. The absorber oxidation tank, absorber tower & absorber outlet duct up to absorber outlet flange shall be provided with 2 mm (minimum) thickness lining / cladding / Alloy C276 / Alloy 59 or better material.

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AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
145.	VII/B	I-M1	17.01.00	109(1A)-2-AMDT-03(T) 42 of 51	Thermal Insulation along with aluminum cladding shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius.	Thermal Insulation along with aluminum cladding shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius except for absorber. Further, Thermal insulation of min 70 mm shall be provided for absorber outlet flue gas duct irrespective of skin temperature.

CLAUSE NO.	TECHNICAL REQUIREMENTS		
10.00.00	ANALYSER INSTRUMENTS (OTHER THAN CEMS)		
10.01.00	Common requirements:-		
	1	Type	Microprocessor based with self-indicating type diagnostic feature. Output signal: 4-20 mA DC galvanically isolated. Binary Signal: 2NO+2NC
	2	Display	Digital display with reading in engineering units. Display of the measurement values as well as all the information required for checking/maintenance of the analyzer.
	3	Zero & span Adjustment	To be provided for all selectable ranges.
	4	Ambient temp.	0-50°C unless defined otherwise.
	5	Analyser enclosure Type/Material	Weather protection for analyser mounted inside analyser panel shall be IP-22 or better. For all other analysers, weather protection class shall be IP-55.
	6	Calibration	Auto & Manual (from Remote).
	7	Power Supply	To be arranged by Contractor subject to Employer’s approval.
	8	Others	i) All interconnection tubing and cabling between probe and analyser / analyser panel and cabling from analyser/ analyser panel to FGD Control system are to be provided by Contractor. ii) All the calibration gases (certified cylinder) required for one year continuous operation shall be provided. The calibration gas container material shall not contaminate the calibration gas.
	9	Compliance to standards	USEPA, TUV, MCERTS or equivalent standards
	10	Type of Technology	SO2/NOx :- Hot-extractive sampling type/ Dilution Extractive/ In-situ (Path) type Note:- For Hot extractive sampling type and Dilution extractive sampling type system – The components involved in sample handling system shall be imported & further, Sample handling system design shall be vetted by Original Analyzer Manufacturer (OAM). Necessary documents shall be furnished during detailed engineering in order to establish the above requirement. Technical expert of OAM shall witness testing of sample handling system and validate it. Alternatively sampling handling system assembled at Original Analyzer manufacturer (OAM) works shall also be accepted.
	11	Measurement range, tapping point	As per FGD system design and process parameters.
Note: Analysers shall be placed inside CONTAINERISED ROOM (PORTABLE CABIN) provided by the contractor. For detailed specification of CONTAINERISED ROOM			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C2 MEASURING INSTRUMENTS PAGE 1 OF 13

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC	
10.02.00	(PORTABLE CABIN), Contractor to refer Sub section IIIC-11, Part-B, Section-VI of technical specification.				
	Specific requirements for Hot-extractive sampling type SO2 analysers				
	Specification Requirements		SO2 Analyser		
	Type of Instrument		Sampling type - Hot Extractive type		
	Principle of Measurement		Radiation absorption		
	Accuracy		+/- 1% of lowest measurement range or better		
	Linearity		≤ +/-1% of lowest measurement range		
	Repeatability		≤ 1% of lowest measurement range		
	Minimum detection limit		≤ 0.5% of lowest measurement range		
	Temperature Drift		≤ +/- 2%/10 Deg.C		
	Zero Drift		≤ +/-1% of lowest measurement range /week		
	Span Drift		≤ +/-1% of lowest measurement range /week		
	Analyser Response time (up to 90% of full scale)		≤ 5 secs		
	Operating Temperature Range for probe		0-300 deg.C		
	10.03.00	Filter		Ceramic 3.5 Micron	
Accessories for purging system		Purging system including Auto Scavenging facility shall be provided			
Sample gas inlet temperature to analyser		Temperature of the sample gas inlet to analyser shall be controlled before analyser as per manufacturer standards.			
Specific requirements for Dilution Extractive type SO2 Analysers					
The design of the Dilution Extractive type system shall be satisfying the following requirements. The sampling system shall consist of In-situ dilution probe, dilution probe controller, sample conditioning system like air drier and filters etc and other accessories meeting the following requirements as a minimum. All system components and accessories required for completion of this system shall be furnished although these may not be individually specified herein. Following are the minimum requirements: a) Modular Electronic Design. b) Heatless Air dryer with inlet filter, chemical scrubbers to remove traces of NOx/CO2/SO2 from air and accumulator. c) Self test facility with screen display.					
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2		SUB-SECTION-III-C2 MEASURING INSTRUMENTS	PAGE 2 OF 13

CLAUSE NO.	TECHNICAL REQUIREMENTS	एन टी पी सी NTPC																							
10.04.00	d) Protection of instrument in case ambient or surrounding temp going high beyond stipulated limit.																								
	e) The following are the minimum requirement for the probe:-																								
	- Flange and counter flange for inserting probe - Flange and counter flange for inserting probe - Coarse and Fine Filters - Critical orifice - Automatic blow back or purging facility - SS316L probe material																								
	f) Further dilution probe controller shall be provided with the ability to control dilution ratio.																								
	g) Unheated umbilical chord to be provided for transportation of the diluted sample, zero air, vacuum pressure, and calibration gas. This chord has to be a single bundle in FRLS PVC outer sheath. The sample line has to be of PTFE.																								
	<table><tr><th>Specification Requirements</th><th>SO2 Analyser</th></tr><tr><td>Principle of measurement</td><td>Pulsed/UV Fluorescence technology.</td></tr><tr><td>Probe operating temp</td><td>0-300 deg C</td></tr><tr><td>Accuracy</td><td>+/- 1% of lowest measurement range or better</td></tr><tr><td>Linearity</td><td>≤ +/-1% of lowest measurement range</td></tr><tr><td>Repeatability</td><td>≤ 1% of lowest measurement range</td></tr><tr><td>Minimum detection limit</td><td>≤ 0.5% of lowest measurement range</td></tr><tr><td>Zero drift</td><td>≤ +/-1% of lowest measurement range/week</td></tr><tr><td>span drift</td><td>≤ +/-1% of lowest measurement range/week</td></tr><tr><td>Response time (up to 95% of full scale)</td><td>100 sec</td></tr><tr><td>Sample gas inlet temperature to analyser</td><td>5 deg.C - 40 deg.C</td></tr></table>	Specification Requirements	SO2 Analyser	Principle of measurement	Pulsed/UV Fluorescence technology.	Probe operating temp	0-300 deg C	Accuracy	+/- 1% of lowest measurement range or better	Linearity	≤ +/-1% of lowest measurement range	Repeatability	≤ 1% of lowest measurement range	Minimum detection limit	≤ 0.5% of lowest measurement range	Zero drift	≤ +/-1% of lowest measurement range/week	span drift	≤ +/-1% of lowest measurement range/week	Response time (up to 95% of full scale)	100 sec	Sample gas inlet temperature to analyser	5 deg.C - 40 deg.C		
Specification Requirements	SO2 Analyser																								
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	<table><tr><th>Specification Requirements</th><th>SO2 Analyser cum monitor</th></tr><tr><td>Principle of Measurement</td><td>Differential Optical Absorption Spectroscopy</td></tr><tr><td>Accuracy</td><td>+/- 1% of lowest measurement range or better</td></tr><tr><td>Linearity</td><td>≤ +/-1% of lowest measurement range</td></tr></table>	Specification Requirements	SO2 Analyser cum monitor	Principle of Measurement	Differential Optical Absorption Spectroscopy	Accuracy	+/- 1% of lowest measurement range or better	Linearity	≤ +/-1% of lowest measurement range																
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	Repeatability		≤ 1% of lowest measurement range				
	Minimum detection limit		≤ 0.5% of lowest measurement range				
	Temperature Drift		≤ +/- 2%/10 Deg.C				
	Zero Drift		≤ +/-1% of lowest measurement range/week				
	Span Drift		≤ +/-1% of lowest measurement range/week				
	Response time(up to 90% of full scale)		≤ 5 sec				
	Probe Operating Temperature Range		0 to 300 deg C				
	Accessories for purging system		Purging system to be provided with heavy duty blowers and shutter mechanism for automatic isolation of lens during purge air failure.				
	Temperature compensation		Automatic temperature compensation to be provided				
	10.05.00	pH Analyser					
a)		Type	: Cell - flow through				
b)		Accuracy	: < ± 1% of reading				
c)		Range	: 0 - 14 pH freely programmable (For others)				
d)		No. of steams	: Single				
e)		Temp. compensation	: Automatic				
11.00.00	CONTINUOUS EMISSION MONITORING SYSTEM (CEMS):-						
	(i) CEMS comprising of analysers and associated items for measurement of SO2, NOx, CO, CO2, Mercury, Particulate Matter (dust density) monitor and Stack Flue Gas Flow in Stack emission shall be provided by the Contractor.						
	(ii) Direct measurement of NO and NO2 shall be done. Total NOx values shall be reported as NO2 i.e. NOx = NO + NO2 = NO X 1.53 + NO2 = NOx as NO2.						
	(iii) Oxygen (O2) measurement in stack emission based on Paramagnetic/ Zirconia type instrument shall be provided by the Contractor for correction of SO2, NOx and Particulate matter value corresponding to the standard/reference O2.						
	(iv) CEMS Parameters shall be normalized for temperature, pressure, moisture (applicable in case wet measurement techniques), etc. This facility shall be available						
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2		SUB-SECTION-III-C2 MEASURING INSTRUMENTS		PAGE 4 OF 13	

CLAUSE NO.	TECHNICAL REQUIREMENTS																											
11.01.00	in the respective analysers. Necessary measurement shall be provided by the Contractor for these parameters. All the CEMS parameters shall be reported on dry basis. (v) CO2 Measurement at stack and at instrument end shall be provided in case dilution techniques are used. (vi) CEMS analysers for which dual ranges are specified shall be calibrated for range near to operating process value. (vii) Offered CEMS should be capable of operating unattended over the prolonged period of time. (viii) CEMS analysers shall be placed inside CONTAINERISED ROOM (PORTABLE CABIN) provided by the contractor. For detailed specification of CONTAINERISED ROOM (PORTABLE CABIN), Contractor to refer Sub section IIIC-11, Part-B, Section-VI of technical specification. The common requirements to be met for all types of analysers are as below. The specific requirements to be met by each type of analyser are detailed in the subsequent clauses. Common Requirements for all Analysers <table><tr><td>1</td><td>Type</td><td>Microprocessor based with self-indicating type diagnostic feature. Output signal: 4-20 mA DC galvanically isolated. Digital signal transmission: RS232/ RS485 Modbus Protocol/ Ethernet TCP/IP protocol shall be provided in CEMS analysers for bidirectional communication of stack emission data to Employer's cloud server.</td></tr><tr><td>2</td><td>Display</td><td>Digital display with reading in engineering units. Display of the measurement values as well as all the information required for checking/maintenance of the analyzer.</td></tr><tr><td>3</td><td>Zero & span Adjustment</td><td>To be provided for all selectable ranges.</td></tr><tr><td>4</td><td>Ambient temp.</td><td>0-50°C unless defined otherwise.</td></tr><tr><td>5</td><td>Analyser enclosure Type/Material</td><td>Weather protection for analyser mounted inside analyser panel shall be IP-22 or better. For all other analysers, weather protection class shall be IP-55.</td></tr><tr><td>6</td><td>Calibration</td><td>Auto & Manual (from Remote). CEMS analyser should have inbuilt zero and calibration check capability.</td></tr><tr><td>7</td><td>Power Supply</td><td>To be arranged by Contractor subject to Employer's approval.</td></tr><tr><td>8</td><td>Others</td><td>i) All interconnection tubing and cabling between probe and analyser / analyser panel and cabling from analyser/ analyser panel to DCS (in respective unit control room) are to be provided by Contractor. ii) All the calibration gases (certified cylinder) required for one year continuous operation shall be provided. The calibration gas container material shall not contaminate the calibration gas.</td></tr></table>				1	Type	Microprocessor based with self-indicating type diagnostic feature. Output signal: 4-20 mA DC galvanically isolated. Digital signal transmission: RS232/ RS485 Modbus Protocol/ Ethernet TCP/IP protocol shall be provided in CEMS analysers for bidirectional communication of stack emission data to Employer's cloud server.	2	Display	Digital display with reading in engineering units. Display of the measurement values as well as all the information required for checking/maintenance of the analyzer.	3	Zero & span Adjustment	To be provided for all selectable ranges.	4	Ambient temp.	0-50°C unless defined otherwise.	5	Analyser enclosure Type/Material	Weather protection for analyser mounted inside analyser panel shall be IP-22 or better. For all other analysers, weather protection class shall be IP-55.	6	Calibration	Auto & Manual (from Remote). CEMS analyser should have inbuilt zero and calibration check capability.	7	Power Supply	To be arranged by Contractor subject to Employer's approval.	8	Others	i) All interconnection tubing and cabling between probe and analyser / analyser panel and cabling from analyser/ analyser panel to DCS (in respective unit control room) are to be provided by Contractor. ii) All the calibration gases (certified cylinder) required for one year continuous operation shall be provided. The calibration gas container material shall not contaminate the calibration gas.
	1	Type	Microprocessor based with self-indicating type diagnostic feature. Output signal: 4-20 mA DC galvanically isolated. Digital signal transmission: RS232/ RS485 Modbus Protocol/ Ethernet TCP/IP protocol shall be provided in CEMS analysers for bidirectional communication of stack emission data to Employer's cloud server.																									
	2	Display	Digital display with reading in engineering units. Display of the measurement values as well as all the information required for checking/maintenance of the analyzer.																									
	3	Zero & span Adjustment	To be provided for all selectable ranges.																									
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	9	Location of probe	SO2/NOx/CO/CO2-On stack at approximate elevation of 35 Mtrs. Particulate Matter (Dust Density) & Flow measurement -On stack at approximate elevation of 88 Mtrs Mercury:- On stack at approximate elevation of 35 Mtrs	
	10	Location of the analysers (other than insitu type)/Analyser Panel.	AT 0' Mtrs near stack for CEMS analysers except particulate matter analyser. For particulate matter preferred location is '0' meter near stack. Remote display cum configuration unit for particulate matter analyser should be provided at '0' meter near stack in the analyser panel in case particulate matter analyser is kept near the sample point due to technical limitation.	
	11	Compliance to standards	USEPA, TUV, MCERTS or equivalent standards	
	12	Type of Technology	SO2/NOx :- Hot-extractive sampling type/ Dilution Extractive/ In-situ (Path) type CO :- Hot-extractive sampling type/ Dilution Extractive/ In-situ (Cross-duct) type. (can be combined with SO2/NOx) CO2 :- Hot-extractive sampling type/ Dilution Extractive/ In-situ (Cross-duct) type (can be combined with CO or SO2/NOx above). Particulate Matter (Dust Density):- Extractive type with reheating or dilution. Mercury (Hg) :- Hot extractive type Note:- For Hot extractive sampling type and Dilution extractive sampling type system – The components involved in sample handling system shall be imported & further, Sample handling system design shall be vetted by Original Analyzer Manufacturer (OAM). Necessary documents shall be furnished during detailed engineering in order to establish the above requirement. Technical expert of OAM shall witness testing of sample handling system and validate it. Alternatively sampling handling system assembled at Original Analyzer manufacturer (OAM) works shall also be accepted.	
	13	Contractual conditions for CEMS system	Warranty:- As defined elsewhere in the Contract. Comprehensive Annual Maintenance Contract:-. Refer sub-section-IIC-C& I/ Section-VI/ Part-A. This shall cover total maintenance of all hardware and software related to CEMS and shall include free repair/replacement of all components/cables/equipment etc and supply of expendable items. Availability of valid data:-AT least 90% of time during warranty and CAMC period. For this purpose, contractor may take necessary steps to ensure availability. Services to be provided during Warranty and CAMC period shall be as per clause no. 2.04.00, 2.05.00 and 2.06.00, Sub-Section-III-C, SECTION-VI, PART-A.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS 			
11.02.00	Specific requirements for Hot-extractive sampling type SO₂, NO_x, CO₂ & CO analysers			
	Specification Requirements	SO₂ Analyser and Nox Analyser cum monitor (combined)	CO₂ ANALYZER	CO Analyser
	Type of Instrument	Sampling type - Hot Extractive type	Hot-Extractive	Hot-extractive type
	Principle of Measurement	Radiation absorption	NDIR absorption	NDIR absorption
	Measurement Range	0-100 / 0-1000 mg/Nm ³ (selectable)	0 to 25% (selectable)	0-100/ 0-1000 mg/Nm ³ (selectable)
	Accuracy	+/- 1% of lowest measurement range or better	+/- 1% of Span or better	+/- 1% of lowest measurement range or better
	Linearity	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range
	Repeatability	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range
	Minimum detection limit	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range
	Temperature Drift	≤ +/- 2%/10 Deg.C	≤ +/- 2% / 10 Deg.C	≤ +/- 2%/10 Deg.C
	Zero Drift	≤ +/-1% of lowest measurement range /week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week
	Span Drift	≤ +/-1% of lowest measurement range /week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week
	Analyser Response time (up to 90% of full scale)	≤ 5 secs	≤ 5 secs	≤ 5 secs
	Operating Temperature Range for probe	0-300 deg.C	0-300 deg.C	0-300 deg.C
	Filter	Ceramic 3.5 Micron	Ceramic 3.5 Micron	Ceramic 3.5 Micron
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CLAUSE NO.	TECHNICAL REQUIREMENTS 			
11.03.00	Accessories for purging system	Purging system including Auto Scavenging facility shall be provided	Purging system including Auto Scavenging facility shall be provided	Purging system including Auto Scavenging facility shall be provided
	Sample gas inlet temperature to analyser	Temperature of the sample gas inlet to analyser shall be controlled before analyser as per manufacturer standards.	Temperature of the sample gas inlet to analyser shall be controlled before analyser as per manufacturer standards.	Temperature of the sample gas inlet to analyser shall be controlled before analyser as per manufacturer standards.
	Specific requirements for Dilution Extractive type SO₂, NO_x, CO₂ & CO Analysers The design of the Dilution Extractive type system shall be satisfying the following requirements. The sampling system shall consist of In-situ dilution probe, dilution probe controller, sample conditioning system like air drier and filters etc and other accessories meeting the following requirements as a minimum. All system components and accessories required for completion of this system shall be furnished although these may not be individually specified herein. Following are the minimum requirements: h) Modular Electronic Design. i) Heatless Air dryer with inlet filter, chemical scrubbers to remove traces of NO_x/CO₂/SO₂ from air and accumulator. j) Self test facility with screen display. k) Protection of instrument in case ambient or surrounding temp going high beyond stipulated limit. l) The following are the minimum requirement for the probe:- • Flange and counter flange for inserting probe • Flange and counter flange for inserting probe • Coarse and Fine Filters • Critical orifice • Automatic blow back or purging facility • SS316L probe material m) Further dilution probe controller shall be provided with the ability to control dilution ratio. n) Unheated umbilical chord to be provided for transportation of the diluted sample, zero air, vacuum pressure, and calibration gas. This chord has to be a single bundle in FRLS PVC outer sheath. The sample line has to be of PTFE. o) Any dilution extractive system must have CO₂ measurement facility at source/stack and measuring point/instrument end to prove the correctness of the selected dilution ratio.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS					एन टी पी सी NTPC																																																											
	<table><tr><th>Specification Requirements</th><th>SO2 Analyser</th><th>NOx Analyser</th><th>CO2 Analyser</th><th>CO Analyser</th></tr><tr><td>Principle of measurement</td><td>Pulsed/UV Fluorescence technology.</td><td>Chemiluminescence technology.</td><td>Gas Filter correlation</td><td>Gas Filter Correlation technology</td></tr><tr><td>Measurement Range</td><td>0-100 / 0-1000 mg/Nm3 (selectable)</td><td>0-100 / 0-1000 mg/Nm3 (selectable)</td><td>0 to 25% (selectable)</td><td>0-100/ 0-1000 mg/Nm3 (selectable)</td></tr><tr><td>Probe operating temp</td><td>0-300 deg C</td><td>0-300 deg C</td><td>0-300 deg C</td><td>0-300 deg.C</td></tr><tr><td>Accuracy</td><td>+/- 1% of lowest measurement range or better</td><td>+/- 1% of lowest measurement range or better</td><td>+/- 1% of lowest measurement range or better</td><td>+/- 1% of lowest measurement range or better</td></tr><tr><td>Linearity</td><td>≤ +/-1% of lowest measurement range</td><td>≤ +/-1% of lowest measurement range</td><td>≤ +/-1% of lowest measurement range</td><td>≤ +/-1% of lowest measurement range</td></tr><tr><td>Repeatability</td><td>≤ 1% of lowest measurement range</td><td>≤ 1% of lowest measurement range</td><td>≤ 1% of lowest measurement range</td><td>≤ 1% of lowest measurement range</td></tr><tr><td>Minimum detection limit</td><td>≤ 0.5% of lowest measurement range</td><td>≤ 0.5% of lowest measurement range</td><td>≤ 0.5% of lowest measurement range</td><td>≤ 0.5% of lowest measurement range</td></tr><tr><td>Zero drift</td><td>≤ +/-1% of lowest measurement range/week</td><td>≤ +/-1% of lowest measurement range/week</td><td>≤ +/-1% of lowest measurement range/week</td><td>≤ +/-1% of lowest measurement range/week</td></tr><tr><td>span drift</td><td>≤ +/-1% of lowest measurement range/week</td><td>≤ +/-1% of lowest measurement range/week</td><td>≤ +/-1% of lowest measurement range/week</td><td>≤ +/-1% of lowest measurement range/week</td></tr><tr><td>Response time (up to 95% of full scale)</td><td>100 sec</td><td>60 sec</td><td>90 sec</td><td>60 sec</td></tr><tr><td>Sample gas inlet temperature to analyser</td><td>5 deg.C - 40 deg.C</td><td>5 deg.C - 40 deg.C</td><td>5 deg.C - 40 deg.C</td><td>5 deg.- 40 deg.C</td></tr></table>					Specification Requirements	SO2 Analyser	NOx Analyser	CO2 Analyser	CO Analyser	Principle of measurement	Pulsed/UV Fluorescence technology.	Chemiluminescence technology.	Gas Filter correlation	Gas Filter Correlation technology	Measurement Range	0-100 / 0-1000 mg/Nm3 (selectable)	0-100 / 0-1000 mg/Nm3 (selectable)	0 to 25% (selectable)	0-100/ 0-1000 mg/Nm3 (selectable)	Probe operating temp	0-300 deg C	0-300 deg C	0-300 deg C	0-300 deg.C	Accuracy	+/- 1% of lowest measurement range or better	+/- 1% of lowest measurement range or better	+/- 1% of lowest measurement range or better	+/- 1% of lowest measurement range or better	Linearity	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range	Repeatability	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range	Minimum detection limit	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range	Zero drift	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	span drift	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	Response time (up to 95% of full scale)	100 sec	60 sec	90 sec	60 sec	Sample gas inlet temperature to analyser	5 deg.C - 40 deg.C	5 deg.C - 40 deg.C	5 deg.C - 40 deg.C	5 deg.- 40 deg.C
Specification Requirements	SO2 Analyser	NOx Analyser	CO2 Analyser	CO Analyser																																																													
Principle of measurement	Pulsed/UV Fluorescence technology.	Chemiluminescence technology.	Gas Filter correlation	Gas Filter Correlation technology																																																													
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
11.04.00	Specific requirements for In-situ (Path) type SO₂, NO_x, CO₂ & CO analysers			
	Specification Requirements	SO₂/NO_x Analyser cum monitor	CO₂ Analyser cum monitor	CO Analyser cum monitor
	Principle of Measurement	Differential Optical Absorption Spectroscopy	Differential Optical Absorption Spectroscopy	IR absorption
	Measurement Range	0-100 / 0-1000 mg/Nm ³ (selectable)	0-25% (selectable)	0-100/ 0-1000 mg/Nm ³ (selectable)
	Accuracy	+/- 1% of lowest measurement range or better	+/- 1% of lowest measurement range or better	+/- 1% of lowest measurement range or better
	Linearity	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range	≤ +/-1% of lowest measurement range
	Repeatability	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range	≤ 1% of lowest measurement range
	Minimum detection limit	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range	≤ 0.5% of lowest measurement range
	Temperature Drift	≤ +/- 2%/10 Deg.C	≤ +/- 2%/10 Deg.C	≤ +/- 2%/10 Deg.C
	Zero Drift	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week
	Span Drift	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week	≤ +/-1% of lowest measurement range/week
	Response time(up to 90% of full scale)	≤ 5 sec	≤ 5 sec	≤ 5 sec
	Probe Operating Temperature Range	0 to 300 deg C	0 to 300 deg C	0 to 300 deg C
	Accessories for purging system	Purging system to be provided with heavy duty blowers and shutter mechanism for automatic isolation of lens during purge air failure.	Purging system to be provided with heavy duty blowers and shutter mechanism for automatic isolation of lens during purge air failure.	Purging system to be provided with heavy duty blowers and shutter mechanism for automatic isolation of lens during purge air failure.
	Temperature compensation	Automatic temperature compensation to	Automatic temperature compensation to be	Automatic temperature compensation to be provided
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CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC			
11.05.00		be provided	provided	
	Specific requirements for Particulate Matter (Dust density) monitor			
	Specification Requirements	PARTICULATE EMISSION (Dust density Stack Opacity) monitor		
	Type of Instrument	Extractive type with reheating or dilution.		
	Principle of Measurement	Scattered Light measurement		
	Measurement Range	0-50 mg/Nm ³ / 0 - 300 mg/Nm ³ (Programmable)		
	Accuracy	+/- 2% of lowest measurement range or better		
	Linearity	≤ +/- 1% of lowest measurement range		
	Repeatability	≤ 1% of lowest measurement range		
	Minimum detection limit	≤ 1% of lowest measurement range		
	a) Temperature Drift	≤ +/- 2%/10 Deg.C		
	b) Zero Drift	≤ +/-1% of lowest measurement range/week		
	c) Span Drift	≤ +/-1% of lowest measurement range/week		
	Analyser Response time(up to 90% of full scale)	≤ 5 sec		
	Operating Temperature Range for probe	0-300 deg.C		
	Filter	To be provided		
	Accessories purging system	Purging system to be provided.		
	Temperature compensation/measurement	Temperature compensation to be provided, if applicable.		
		First site Calibration of the instrument should be done based on the results of an extractive IsoKinetic Test by the Contractor.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
11.06.00	Specific requirements for Continuous On-line Mercury Analyser			
	S.NO.	PARAMETER	DETAILS	
	1	Measurement Principle	Atomic Absorption Spectrometry/ Atomic Fluorescence spectrometry.	
	2	Range	0 - 35 microgram/Nm3	
	3	Accuracy	+/- 1% of Span or better	
	4.	Minimum detection limit	1 microgram/Nm3	
11.07.00	ULTRASONIC FLOW METER FOR FLUE GAS FLOW IN STACK			
	Type	Microprocessor based with self-indicating type diagnostic feature. Output signal: 4-20 mA DC galvanically isolated. Digital signal transmission: RS232/ RS485 Modbus Protocol/ Ethernet TCP/IP protocol for bidirectional communication of stack emission data to Employer's cloud server.		
	Mounting Style	Transducers on the duct/stack		
	Transducer type and material	Single pair of Corrosion resistant material to be provided		
	Zero and Span adjustment	To be provided		
	Flow measurement	Instantaneous Flow rate as well as totalized flow		
	Power supply Distribution	To be arranged by the Contractor from Employer's terminal point.		
	Display/Indication	Flow meter with LCD screen backlight based local display and keypad . If required, transmitter shall be suitably located away from the sensor for better access and visibility.		
	Recording / Totalizing/Logging Facilities	To be provided		
	Diagnostics	False signal tolerance , power supply failure etc		
	Protection class	IP-65 or better		
	Ambient temperature	-20 deg to +60 deg C		
	Accuracy	+/- 2% of span or better		
	Electrical connection	Plug and socket		
	Accessories	All mounting hardware required like clamping fixtures, mechanism to remove the transducers online, interconnecting cables to DDCMIS, cables, flexible conduits, junction boxes etc		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
11.08.00			Purging arrangement for Cleaning sensors to be provided. Material of all fittings shall be SS 316.	
	Software features		Compensation for temperature and pressure and any cross path errors. Programming, configuration, shall be possible from front panel.	
	NOTES:-			
	01. Hot extractive sampling type/ Dilution extractive type systems shall be provided with dual sample probes along with all required accessories such as redundant heavy duty pumps with continuous rated motors, moisture detection facility, pre-fabricated heated (for sampling type only) sample lines from probes to analyser panel, solenoid valves, filters, coolers along with level switch in gas coolers for auto draining purpose and flow meter etc as applicable. Alternatively, permeation based dryer (located near the tapping point) alongwith necessary sample conditioning devices to ensure full protection, to avoid clogging & long life of permeation tubes may also be provided in place of sample cooler. Also, healthiness status/alarm/indication of permeation based dryer shall be provided in analyser panel.			
	02. In case IR based technique is used for SO2/NOx measurement, correction for H2O cross interference shall be available in the analyser.			
	03. If the SOx, NOx, CO2 & CO (if sampling/dilution type) analyzers do not meet the environmental conditions specified at cl. 7.00.00 of Sub Sec IIIC-01, Section-VI, Part-B, all weather Local Panel fitted with integral Air Conditioner located in non-air conditioned area shall be provided for housing analysers etc.			
	04. For O2 Analyser, the construction of the sensor shall be such that joints between dissimilar materials are avoided to prevent formation of cracks.			
	Connectivity with DDCMIS and provision for bidirectional communication with Employer's Cloud Server			
	1. 4-20mA signals from all the above analysers, flow meters, stack gas temperature, stack pressure, stack gas moisture, stack gas O2 shall be wired to DCS of respective unit.			
	2. RS232/ RS485 Modbus protocol/ Ethernet TCIP/IP protocol for bidirectional communication with Employer's Cloud Server as defined in Sub-section-IIIC-C&I/ Section-VI/ Part-A.			
All the accessories and cables required for connecting Analysers outputs to DCS and provision of bidirectional communication as defined above shall be provided by Contractor on as required basis.				
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CLAUSE NO.	MANDATORY SPARES		
1.25.00	CONTROL AND INSTRUMENTATION (EXCLUDING AIR CONDITIONING AND VENTILATION SYSTEM, COMPRESSED AIR SYSTEM, FIRE DETECTION AND PROTECTION SYSTEM. For mandatory spare of these systems, refer mandatory spare clauses specified under respective systems)		
	1.00.00	CONTROL AND INSTRUMENTATION	
	1.01.00	MEASURING INSTRUMENTS	
	1.01.01	(i) Transmitters of all types and model no. (for measurement of pressure, differential pressure, flow, level, temp, etc.). This shall include magnetic/ electromagnetic flow meter, mass flow meter also. (ii) Density meter	10% or 1 no. of each type and model, whichever is more. 10% or 1 no. of each type and model, whichever is more.
	1.01.02	Temp Elements along with thermo well (except winding temp elements of motor)	10% or 2 no. of each type, model & length, whichever is more.
	1.01.03	(i) Process Actuated Switches (Pressure, Differential pressure, flow, level, temp) (ii) Limit switches (for pneumatic and manual valves)	10% or 2 no. of each type and model, whichever is more. 10% or 2 no. of each type and model, whichever is more.
	1.01.04	Local Gauges for Pressure, Differential pressure, flow, level, temp	5% or 1 no. of each type, model and range, whichever is more.
	1.01.05	Vibration monitoring system	
	(i)	Sensors	10% or Minimum 2 Nos. of each type, make and model whichever is more. *if prefab cable or prefab extension cable is used same should be supplied in proportion.
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CLAUSE NO.	MANDATORY SPARES 		
	(ii)	Power Supply Module Cards	10% or minimum 2 nos which ever is more
	(iii)	Driver / Interface Cards & all other electronic cards.	10% or minimum 2 nos which ever is more
	1.02.00	Continuous Emission Monitoring System (CEMS)	
	(i)	Analyzer for SO ₂ , NO _x , CO ₂ , CO.	1 no. complete analyser of each type and model.
	(ii)	Flue gas flow measurement instrument	1 no. complete instrument along with sender/receiver unit.
	(iii)	Analyser for Particulate Matter	1 no. complete analyser
	(iv)	Analyser for Mercury	1 no. complete analyser
	(v)	O ₂ Analyser	1 no. complete analyser
	(vi)	Electronic card assembly/ PCBs, moisture/condensate monitor, power supply modules	10% of each type, model and rating
	(vii)	Set of gaskets/O-rings/ seals	200% of each type, model, rating and size
	(viii)	Temp. Sensor	20% of each type and model
	(ix)	Heater assembly, Coolers/dryers, Pumps, etc..	20% of each type and model
	(x)	Complete Probe with shield assembly (Not applicable for In situ- path)	1 no. of each type and model
	(xi)	Solenoids	2 nos. of each type, model and rating
	(xii)	Filters, light source, sensor, detector, etc.	100% of each type, model and rating
	(xiii)	Calibration gases, Calibration cell and other consumables for calibration: - of all types and ranges.	One year supply
	(xiv)	Blower assembly	1 no. of each type, size and rating.
	1.03.00A	Analysers and associated items for other than CEMS	
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CLAUSE NO.	MANDATORY SPARES		एनटीपीसी NTPC	
	(i)	Analysers for SO2, O2, pH	1 no. complete analyser of each type and model.	
	(ii)	Set of gaskets/O-rings/ seals	200% of each type, model, rating and size	
	(iii)	Heater assembly, Coolers/dryers, pumps	20% of each type and model	
	(iv)	Filters, light source, sensor, detector, etc.	100% of each type, model and rating	
	(v)	Complete Probe with shield assembly (Not applicable for In situ- path)	1 no. of each type and model	
	(vi)	Solenoids	2 nos. of each type, model and rating	
	(vii)	Electronic card assembly/ PCBs, moisture/condensate monitor, power supply modules	10% of each type, model and rating	
	(viii)	Calibration gases, Calibration cell and other consumables for calibration: - of all types and ranges.	One year supply	
	2.07.00	DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEM (DDCMIS)		
	SI No	ITEM	QUANTITY	
	1.	HMI Devices		
	A)	Work station/PC station/servers		
		(i) OWS with licensed software	2 nos. of each type and model	
		(ii)Server/Information Workstation with licensed software (as applicable)	1 no. of each type and model	
		(iii)Programmer cum documentation station along with licensed software	1 no. of each type and model	
		(iv) Keyboard	2 nos. of each type and model	
		(v) Mouse	4 nos. of each type and model	
	B)	Printers		
	(i) Color laser printer (A4)	1 no		
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CLAUSE NO.	MANDATORY SPARES 		
		(ii)Print head assembly for A4 color laser printer	2 nos of each type and model
	C)	Network Components	
		(i)Switch/repeaters/hubs/firewalls for DDCMIS	2 nos. of each type and model
		(ii)Wireless equipment like power supplies ,modems, electronic modules, media converter(if applicable),connectors patch card, antenna etc.	2 nos. of each type and model
		(iii) Any other device/equipment not covered under above items but required to make system complete.	2 nos. of each type and model
	D)	Miscellaneous items	
		(i)Hard disk drive unit of each type as offered in main offer complete with disks and other accessories	4 nos. (to be divided based on main population)
		(ii)Bulk Storage drive unit	2 nos. of each type and model
		(iii)Graphic processors modules/Card for work station/server	2 nos. of each type and model
	E)	Other HMIPIS devices required for Unified HMIPIS which are not covered in above items like protocol converters, stations with software, gateway etc	10% of each type and model
	(F)	Any other device/items for HMIPIS system which are not covered in above items but are required to make the system complete.	1 no of each type and model
	2.	Cables and Connectors.	
		(i)Prefab interconnecting cables with connectors	2 no. of each type and length.
		(ii)System bus cable with connectors	2 no. of each type and length.
		(iii)I/O bus cable with connectors for remote I/O units	2 no. of each type and length.
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CLAUSE NO.	MANDATORY SPARES 		
1.26.00		(iv) Loose Connectors	5 nos. (sets) of each type
	3.	Power Supply Modules & Power Packs for control system	20% or 4 nos. of each type model and rating, whichever is more.
	4.	Electronic modules of each type and model for control system, Data communication system, Master and Slave Clock etc. (This shall include all type of cards like I/O cards, Remote I/O cards, communication/Interface cards, controller cards, CPU module or Card, logic cards, etc.)	20% or 2 Nos of each type, model and rating whichever is more subject to maximum of 20 Nos of each type.
	5.	Bus coupler/Interface hardware / other communication devices.	20% of each type and model or minimum 2 nos. whichever is more.
	6.	Relays	10% of each type and model or minimum 2 nos which ever is more
	7.	Batteries used for battery backup of RAMs(If applicable)	10% of each type and model or minimum 2 nos whichever is more
	8.	Fuses	200 % of each type and rating
	9.	Cooling fans for Power supply and cabinets.	10 % of each type and model
	10	Intelligent mini UPS for workstation server, PCs, L3 switch.	1 no. of each size and rating
	11	For all items of Fieldbus system (including field accessories) except fieldbus cables	20% or 2 Nos. of each type, model and rating whichever is more subject to maximum of 40 Nos of each type.
	12	Fieldbus cable	10% of total length used in the project.
	ELECTRICAL		
	1.02.00 ELECTRIC ACTUATORS		
	1	Actuators	1 no of each type and rating
	2	Electronic PCB of all types	10% of each type & model
	3	Absolute Encoder (replaceable part)	5% of each type & model
	4	Electronic Torque sensor	5% of each type & model
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CLAUSE NO.	MANDATORY SPARES			
1.22.00	FIRE DETECTION AND PROTECTION SYSTEM			
	7.5	PLC CONTROL SYSTEM	Quantity	
	7.5.1	Power Supply Unit	1 No. of each type and model,	
	7.5.2	Electronic modules(I/O modules, communication modules and any other module used in the system)	10% or 1 No. of each type and model, whichever is more.	
	7.5.3	Central Processor Unit	1 No. of each type and model	
	7.5.4	Interconnecting Cables	10% of each type & size	
	7.5.5	Cooling Fan in PLC system / cabinet	2 Nos.	
	7.5.6	Indication lamps of all types	100%	
	7.5.7	Graphical Interface Unit	1 No.	
	7.6	24V – DC POWER SUPPLY SYSTEM		
	7.6.1	CTs, CVTs, VTs, chokes, AC/DC isolators, contactors, timers, relays	5% or 2 Nos. of each type and rating whichever is more.	
	7.6.2	Fuses of each type and rating	200%	
	7.6.3	Fuse free Circuit breakers	5% or 5 Nos. of each type and rating whichever is more.	
	7.6.4	Electronic modules of all types	One No. of each type	
	7.6.5	Indication lamps	100%	
	7.6.6	Cooling Fans	1 No. of each type	
	7.6.7	Indicators	1 No of each type and rating	
	7.6.8	Relays of all types including overload relays	2 Nos. of each type and rating	
	7.6.9	Batteries	5% or 2 nos. of each type & rating whichever is more	
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CLAUSE NO.	TECHNICAL REQUIREMENTS	
1.00.00 1.01.00 1.02.00 1.02.01 1.02.02 2.00.00 2.01.00 2.01.01 2.01.02 2.02.00 2.03.00	GENERAL: Actuators shall be designed for valve operation to ensure proper function in accordance with specifications given below and complying to EN15714-2 or equivalent. All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. This sub-section of specification is applicable for following types of electric actuators: Modulating duty electric actuators: These shall be provided as per standard practice of OEM of equipment, meeting other requirements of specifications. For specifications of Blade pitch actuators, refer clause no. 5.00.00 of this chapter. Electric actuators for valves/ dampers/ gates (other than covered in 1.02.01): These actuators shall be Non-Intrusive type electric actuators. The interface of these actuators with DDCMIS shall be of two types viz. with Hardwired interface and with Fieldbus interface. The common requirements of both these type of actuators are specified at clause 2.00.00, specific requirements of Non-Intrusive hardwired actuators are specified at clause 3.00.00 and specific requirements of Non-Intrusive fieldbus actuators are specified at clause 4.00.00. The applications where these two types of actuators are to be provided is specified in Part-A of Technical Specifications. COMMON REQUIREMENTS FOR NON INTRUSIVE ELECTRIC ACTUATORS TYPE: The actuators shall have integral starters with built in SPP (Single Phasing Preventer). 415 V, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply. The actuators shall be Non- Intrusive electric actuator. All actuator settings including torque, limit shall be possible without opening the actuator cover and LCD indication shall be available integral to actuator body. RATING: (a) Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire & 50HZ +/-5%. (b) Sizing: Open/Close at rated speed against designed differential pressure at 90% of rated voltage. For ON/OFF type: Three successive open-close operations or 15 minutes, whichever is higher. For inching type: 150 starts per hour or required cycles, whichever is higher. CONSTRUCTION: (a) Enclosure: Totally enclosed weatherproof, minimum IP-68 degree of protection. (b) Manual Wheel: Shall disengage automatically during motor operation.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.04.00	MOTOR: (a) Type : Squirrel cage induction motor suitable for Direct On Line (DOL)starting. (b) Enclosure: Totally enclosed, self-ventilated. (c) Insulation Class F. Temperature rise 70 Deg C. over 50 Deg C ambient. (d) Bearings: Double shielded, grease lubricated antifriction. (e) Earth Terminals: Two (f) Protection: Single Phasing Protection, Over heating protection through Thermostat (as applicable) and wrong phase sequence protection shall be provided over and above other protection features standard to bidder's design. Suitable means shall be provided to diagnose the type of fault locally.			
2.05.00	POSITION/TORQUE TRANSMITTER: The Position/ Limit measurement shall be done using absolute encoders which will give information of position/ limit in both the directions. Electronic measurement of torque shall be provided.			
2.06.00	LOCAL OPERATION: It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator.			
2.07.00	LCD DISPLAY: A local LCD display shall be provided to give information regarding actuator alarms, status and valve position indications as a minimum in local.			
2.08.00	WIRING: Suitable voltage grade copper wire.			
2.09.00	TERMINAL BLOCK: For power cables, the grade of TBs shall be minimum 650V.			
2.10.00	ACCESSORIES: All required accessories (if applicable) for calibration / settings/ configuration of various parameters of actuator shall be provided. For quantities, please refer Part A of technical specifications.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.11.00	SIL CERTIFICATION: All actuators shall be certified for SIL 2 or better.			
3.00.00	SPECIFIC REQUIREMENTS FOR NON INTRUSIVE HARDWIRED ACTUATORS			
3.01.00	INTERFACES: For ON-OFF and INCHING type actuators interface with the control system shall be through hardwired signal only. (a) Open/Close command, open/ close status and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch at local & other protections operated) shall be provided hardwired. (b) The actuator shall be able to accept open/close command at 24V DC with max. 2.5VA load from control system. Accordingly suitable isolated interface in the actuator shall be provided. (c) Open/close command termination logic shall be suitably built inside actuator. (d) For typical wiring diagram Refer Tender Drawing No. 0000-999-POI-A-063 (Except plug & socket connector, if not applicable)			
3.02.00	TERMINAL BOX: Suitable terminals/ connectors, integral to actuator, for terminating instrumentation & power cables shall be provided. Necessary glands for power cables and instrumentation cables shall be provided.			
3.03.00	TRAINING: Contractor shall provide training on Non-Intrusive hardwired Electric Actuator for Employer's personnel. The duration of the training shall be as elaborated in Part-C, Section-VI of technical specifications.			
4.00.00	SPECIFIC REQUIREMENTS FOR NON INTRUSIVE FIELDBUS ACTUATORS			
4.01.00	INTERFACES: For ON-OFF and INCHING type actuators interface with the control system shall be through fieldbus network. (a) Open/ close commands, open/ close feedback status, disturbance signal etc. shall be available to the Control System through the fieldbus network along with diagnostics. The detailed diagnostics including the actuator operating data shall be available to the DDCMIS through the fieldbus network. (b) All actuators shall be Foundation Fieldbus/ Profibus compatible. However the exact protocol shall be based on finalized protocol of DDCMIS. If Profibus DP protocol is envisaged then actuator shall have two (redundant) Profibus DP ports for connecting the redundant Profibus DP cables. That is if one profibus cable is cut or not working/ not available, then complete actuator functionality shall be available through the second redundant cable without any manual intervention. (c) Open/close command termination logic shall be suitably built inside actuator.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
4.02.00	TERMINAL BOX:			
	Suitable terminals/ connectors, integral to actuator, for terminating fieldbus cables and power cables shall be provided. Necessary glands for power cables and armored fieldbus cables shall be provided.			
	4.03.00	TRAINING:		
Contractor shall provide training on Non-Intrusive Fieldbus Electric Actuator along with detail training on Foundation Fieldbus/ Profibus interface used in actuator for Employer's personnel. The duration of the training shall be as elaborated in Part-C, Section-VI of technical specifications.				
5.00.00	SPECIFIC REQUIREMENTS FOR BLADE PITCH ACTUATORS			



CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.01.00	SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS			
	Sl.No.	Features	Essential/Minimum Requirements	
	1.	Type of Transmitter	Microprocessor based 2 wire type (loop powered), Hart protocol compatible.	
	2	Output signal	4-20 mA DC (Analog) along with superimposed digital signal based on HART protocol	
	3	Accuracy	± 0.060 % of calibrated range (minimum) for calibrated range greater than 400 mmwc. $+0.065\%$ of calibrated range (minimum) for calibrated range greater than 250 kg/cm2. ± 0.10 % of calibrated range (minimum) for calibrated range less than 400 mmwc	
	4.	Turn down (minimum)	50:1 for greater than or equal to span of 400mmwcl. 20:1 for span below 400mmwcl. 10:1 for span greater than 250 kg/cm2	
	5.	Stability	0.25 % of calibrated range for 10 years for calibrated range greater than equal to 400 mmwc on standard conditions of manufacturer. 0.2 % of calibrated range for 1 years for calibrated range less than 400 mmwc on standard conditions of manufacturer. 0.15% of calibrated range for 5 years for static pressure greater than 250 kg/cm2.	
	(Above mentioned (3,4,5) parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only).			
	6.	Zero and span drift	+/- 0.015 per degC at max span +/-0.11% per degC at min. Span	
		Power Supply	24V DC $\pm 10\%$.	
	7.	Load impedance	500 ohm (minimum)	
	8.	Housing	Weather proof as per IP-67, metallic housing with durable corrosion resistant coating	
	9.	Over Pressure	150% of max. Operating pressure	
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CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
	10.	Electrical Connection	Plug and socket type except in hazardous area	
	11.	Process connection	1/2 inch NPT (F)	
	12.	Span and Zero	Continuous, tamper proof, Remote as well as manual adjustability from instrument with zero suppression and elevation facility.	
	13.	Accessories	-Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition.	
		Diagnostics and Display	Self-Indicating feature and digital display	
	14.	Accessories	2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for Differential Pressure and 5 valve manifold for Level /Flow applications. The valve manifold shall be non integral type (except Fuel Oil area). -For hazardous area, enclosure as described in NEC article 500 -2 inch pipe for mounting with Enclosure /Rack/Canopy	
	15.	Certification	SIL 2 or Better	
	16.	Adjustment/calibration/maintenance	From hand held HART calibrator	
		Notes		
			LVDT type is not acceptable.	
3.05.00			For primary air/ secondary air/flue gas applications, DP type transmitters shall be provided for pressure measurement below range of 2000 mmwc	
			Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.	
	TEMPERATURE TRANSMITTER (TT)			
			Following specifications are applicable for Dual input/ Single input temperature transmitter.	
			Temperature transmitter shall be 2-wire (loop powered) directly powered from 4-20mA input cards of DDCMIS. TT shall be fully compatible with thermocouples and RTDs being	
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CLAUSE NO.	TECHNICAL REQUIREMENTS																																									
	provided by the contractor. Temperature compensation for thermocouples shall be performed in the temperature transmitter itself. <table><thead><tr><th>S No.</th><th>Features</th><th>Essential/Minimum Requirements</th></tr></thead><tbody><tr><td>1.</td><td>Output</td><td>2-wire (power supply from input card of control system) with 4-20mA output with superimposed HART protocol signal</td></tr><tr><td>2.</td><td>Input</td><td>Same transmitter shall be capable to handle Pt-100 RTD, Thermocouples –K, R & ,S types (Selectable through HART terminal/calibrator)</td></tr><tr><td></td><td>Isolation</td><td>Min 500 VAC</td></tr><tr><td></td><td>EMC compatibility</td><td>As per EN 61326</td></tr><tr><td></td><td>Power supply</td><td>24 V C +/- 10%</td></tr><tr><td>3.</td><td>Housing</td><td>Weather proof as per IP-67, metallic housing with durable corrosion resistant coating</td></tr><tr><td>4.</td><td>Electrical connection</td><td>Plug and Socket connector except hazardous area</td></tr><tr><td>5.</td><td>Diagnostics display</td><td>& Self-Indicating feature and digital display on transmitter</td></tr><tr><td>6.</td><td>Operating Ambient temperature</td><td>85 deg C without display. 70 deg C with display.</td></tr><tr><td>7.</td><td>Mounting</td><td>2 inch pipe mounting with Canopy.</td></tr><tr><td>8.</td><td>Accessories</td><td>As required by service and operating condition.</td></tr><tr><td>9.</td><td>Composite Accuracy</td><td>(Refer note 2) RTD =<0.25% of 0-250 deg C span T/C-K type =<0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C</td></tr></tbody></table> Notes: - In case of failure (open or burn-out) of RTD/thermocouple, transmitter shall provide low temperature output. - Dual input temperature transmitter shall have bump less changeover facility to second sensor in case first sensor fails. This changeover is to be alarmed in control system. - Composite accuracy is to be calculated as summation of all applicable accuracies of temperature transmitter for converting sensor input to output (e.g., A/D accuracy, basic accuracy, digital accuracy, etc.) and temperature effect on these			S No.	Features	Essential/Minimum Requirements	1.	Output	2-wire (power supply from input card of control system) with 4-20mA output with superimposed HART protocol signal	2.	Input	Same transmitter shall be capable to handle Pt-100 RTD, Thermocouples –K, R & ,S types (Selectable through HART terminal/calibrator)		Isolation	Min 500 VAC		EMC compatibility	As per EN 61326		Power supply	24 V C +/- 10%	3.	Housing	Weather proof as per IP-67, metallic housing with durable corrosion resistant coating	4.	Electrical connection	Plug and Socket connector except hazardous area	5.	Diagnostics display	& Self-Indicating feature and digital display on transmitter	6.	Operating Ambient temperature	85 deg C without display. 70 deg C with display.	7.	Mounting	2 inch pipe mounting with Canopy.	8.	Accessories	As required by service and operating condition.	9.	Composite Accuracy	(Refer note 2) RTD =<0.25% of 0-250 deg C span T/C-K type =<0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C
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	accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of temperature elements specified. All such accuracy/ temperature effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures. All temperature transmitters shall be interchangeable (i.e. can be used for either RTD or thermocouple) and composite accuracy shall be met for each type of input as specified above. 4. Above mentioned parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only. 5. Dual input temperature transmitters can also be accepted in place of single input TT.			
15.00.00	Vibration Monitoring System The Vibration Monitoring System shall be furnished on a system basis including, vibration transducers, phase marker sensor with low noise flexible cables in flexible conduit, terminated in local terminal boxes, necessary pre-amplifier/electronics mounted in local weather proof boxes, vibration monitors, mounting racks and cabinets etc. The vibration monitoring system shall include all power supplies, interconnecting cabling, calibration equipment, indicators, integrating units, signal conditioning devices and all other accessories, erection hardware required for monitoring of Vibration at each point. The contractor shall provide the vibration pads. Contractor can offer up to Four Channel Vibration monitors. The allocation of channels shall be such that loss of one monitor shall not affect more than one side of the bearing of one machine. In the case of more than two channel Vibration monitors being provided by the Contractor, then one spare monitor shall be provided mounted in the panel to take care of immediate replacement of any failed monitors. Offered vibration monitors shall be modular in construction, plug in type. Eddy current / piezoelectric type transducers shall be used. The sensors shall be either proximity or velocity or accelerometer type. However, the finally selected sensor type shall also depend on recommendation of the equipment manufacturer & suitable for application requirement which shall be finalised during detail engineering and without any extra price. Transducers shall be furnished in weatherproof housing suitable for field conditions. Cables/cabling from transducers local JB to Vibration Monitoring system in Control Room/Control Equipment Room shall be provided by the Contractor. Vibration monitoring system shall give one no. buffered output of 4-20 mA DC and two no. of buffered raw signal for each point monitored and one no. of buffered raw signal for each phase marker sensor. The 4-20mA signal shall be suitable for use as an input to DDCMIS, linear in proportion to vibration velocity or displacement. Raw buffered signal(s) shall be suitable for archiving and analysis. Monitor shall provide vibration indication calibrated in velocity units along with provisions of changing to displacement unit (field-programmable) for each measurement point in both horizontal & vertical planes. The generation of alarm and trip signals is not envisaged in vibration monitoring system, the same shall be derived in DDCMIS. However in case of vibration initiated protection of equipments, OEM standard and proven practices shall also be considered.			
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	2	Accuracy	± 0.060 % of calibrated range (minimum) for calibrated range greater than 400 mmwc. +0.065% of calibrated range (minimum) for calibrated range greater than 250 kg/cm2. ± 0.10 % of calibrated range (minimum) for calibrated range less than 400 mmwc.	
	3.	Stability	0.25 % of calibrated range for 10 years for calibrated range greater than equal to 400 mmwc on standard conditions of manufacturer. 0.2 % of calibrated range for 1 years for calibrated range less than 400 mmwc on standard conditions of manufacturer. 0.15% of calibrated range for 5 years for DPT with static pressure greater than 250 kg/cm2.	
	4	Turn down	50:1 for greater than or equal to span of 400mmwcl. 20:1 for span below 400mmwcl. 10:1 for span greater than 250 kg/cm2 (Above mentioned (2,3,4) parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only).	
	5	Housing	Weather proof as per IP-67, metallic housing with durable corrosion resistant coating	
	6.	Electrical connection	½” NPT(F) FOUNDATION Fieldbus/PROFIBUS PA compatible	
	7.	Process connection	½” NPT (F)	
	8.	Operating Ambient temperature	85 deg C without display. 70 deg C with display.	
		Overpressure	150% of max operating pressure	
	9	Accessories	-Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition. -2 valve manifold for absolute & gauge pressure transmitters, -3-valve for DP and 5 valve manifold for level/flow applications. -The valve manifold shall be non-integral type. -For hazardous area, enclosure as described in NEC article 5.	
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	10.	Mounting	2 inch pipe mounting with Enclosure/Rack/Canopy.	
	11.	Diagnostics & display	Self-Indicating feature and digital display on transmitter	
	Notes			
	- For primary air/ secondary air/flue gas/ furnace pressure applications, DP type transmitters shall be provided for pressure measurement below 2000 mmwc. - LVDT type is not acceptable. - Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.			
16.02.00	Temperature Transmitter			
16.02.01	Single Input /Dual Input Temperature transmitter			
	Temperature transmitter shall be provided which shall be fully compatible with thermocouples and RTDs being provided by the contractor. Temperature compensation for thermocouples shall be performed in the temperature transmitter itself. Transmitters shall be capable of withstanding ambient temperature up to 85 deg C.			
	Following specifications are applicable for dual input/single input temperature transmitter.			
	S No.	Features	Essential/Minimum Requirements	
	1.	Output	FOUNDATION fieldbus /PROFIBUS PA	
	2.	Input	Same transmitter shall be capable to handle Pt-100 RTD, Thermocouples –K, R & ,S types	
	3.	Housing	Weather proof as per IP-67, metallic housing with durable corrosion resistant coating	
	4.	Electrical connection	½" NPT(F) FOUNDATION Fieldbus/PROFIBUS PA compatible	
	5.	Diagnostics display	& Self-Indicating feature and digital display on transmitter	
	6.	Operating Ambient temperature	85 deg C without display. 70 deg C with display.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	7. Mounting 2 inch pipe mounting with Canopy. 8. Accessories As required by service and operating condition. 9. Composite Accuracy (Refer note 2) RTD =<0.25% of 0-250 deg C span T/C-K type =<0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C			
	Notes: 1. In case of failure (open or burn-out) of RTD/thermocouple, transmitter shall provide low temperature output. 2. Dual input temperature transmitter shall have bump less changeover facility to second sensor in case first sensor fails. This changeover is to be alarmed. 3. Composite accuracy is to be calculated as summation of all applicable accuracies of temperature transmitter for converting sensor input to output (e.g., basic accuracy, digital accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of temperature elements specified. All such accuracy/ temperature effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures. All temperature transmitters shall be interchangeable (i.e. can be used for either RTD or thermocouple) and composite accuracy shall be met for each type of input as specified above. 3. Above mentioned parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only. 4. Dual input temperature transmitters can also be accepted in place of single input TT.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	CONTROL DESK & PANELS			
1.01.00	GENERAL			
1.01.01	All control desk, panels, LVS panel etc. shall be furnished fully wired with necessary provision for convenience outlets, internal lighting, grounding, ventilation, space heating, anti vibration pads, internal piping & accessories as required for completeness of the system.			
1.01.02	All panels, desks, cabinets shall be free standing type & have bottom / top entry for cables to be finalised application wise during detailed engineering stage. The bottom of desk & cabinets shall be sealed with bottom plate, compression cable glands (double for field and single for inside rooms) and fire proof sealing material to prevent ingress of dust and propagation of fire. Sufficient number of power receptacles with disconnect switches shall be installed within all panels/desk.			
1.01.03	Exterior steel surface shall be sand blasted, ground smooth, filled, primed, sanded and smooth enamel painted to give a good finish subject to minimum paint thickness of 65-75 microns for sheet thickness of 3 mm and 50 microns for sheet thickness of 2mm. The exact color shall be finalised during detailed engineering.			
1.01.04	The design shall conform to the EN ISO 11064 (Ergonomical design of control room), Part-1,2 and 3.			
2.00.00	CONTROL DESK & PANEL			
2.01.00	GENERAL			
2.01.01	The exact dimensions, material, construction details, grounding, general arrangement etc. of Control Desk etc. shall be as per the actual requirement and shall be finalised during detailed engineering and subjected to Employer's Approval.			
2.01.02	For control desk mounted instruments/ devices etc., which are to be powered from UPS, all required conversion of interface equipments / accessories to make such devices compatible with UPS supply shall be provided. All necessary hardware like Input switches/ fuse unit for each feeder as well as switch fuse unit for each instrument/ device on the power supply line shall be provided. From UPS, redundant feeders shall be provided with suitably rated MCB and provision of fast auto changeover of UPS feeders.			
2.02.00	Control Desk (CD)			
2.02.01	Control desk shall be Modular, non-welded construction free standing table top type with front & back cover constructed of 1.6 mm thick CRCA steel plates. The tabletop of the control desk shall be arc-shaped for mounting TFT monitors & mice. The work surface of control desk shall be 30mm thick with the top 12mm of Acrylic Solid Surface (ASS) and the remaining 18mm of laminated medium density fiber board. Work surface shall be made of two different colors at same level and seamlessly joined in each section. The structure frame shall consist of extruded aluminum top and bottom horizontal beams and vertical support tensioned together to form an integrated, finished curvilinear shaped frame. Vertical & Horizontal supports, minimum 2.5mm and 2mm thick respectively, have to be provided for the structure frame. Extreme side legs shall be illuminated type and should complete the			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	overall form and aesthetics of the desk. It shall have concealed cable & wire way management system. Telephone sets shall be mounted on the control desk. Sliding keyboard trays shall be provided on the CD. The exact profile of the desk, dimension and the radius of curvature shall be finalised during detailed engineering stage.			
2.02.02	All operator monitors & mice shall be mounted on this CD.			
2.02.03	The cabling / wiring between OWS & CPU's, power supply cables etc. shall be aesthetically routed and concealed from view.			
2.03.00	Internal Panel/Desk Items			
	Equipment and devices mounted within the panels/desk shall be mounted on suitable racks/brackets and shall be arranged for convenient access for adjustment and maintenance work.			
2.04.00	Furniture			
	Bidder shall provide following industrial grade furniture items as a minimum from reputed manufacturers/suppliers meeting International Standards. The furniture shall be modular and latest with ease of operational features. The furniture shall be modern, aesthetically designed, modular, flexible, space saving and future safe. Each module shall have transparent cover and adjustable partition. It shall have locking provision for security. The components shall be suitable for integration/fabrication without any welding technology.			
	1. Work Station furniture Modular work station furniture, suitable for mounting servers & historians, programmer stations, PC based systems, printers (inkjet or A4 laser) etc. is to be provided..			
	2. Server Rack Server rack shall be provided to mount programmer stations, PC based systems (of rack type and tower type), Matrix KVM switcher, Mini UPS etc. Suitable arrangement for Ventillation and cooling shall be built in-			
	3. PC rack PC rack shall be provided to mount CPUs of work stations/PCs of OWS/LVS etc in Control Room.			
	4. Chairs Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back.			
	5. Tables			
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CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC		
	a Industry standard computer tables shall be provided & shall be as approved by Employer during detailed Engineering. 6. Almirahs Steel Almirahs shall be provided for keeping documents in the documentation room. 7. Keypad Keypads shall be provided for the storing of keys of relevant areas in the respective control rooms 8. Lockers Suitable lockers shall be provided in the room adjacent to the control room for storing of personal articles of control room personnel & also for documents.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	DISTRIBUTED DIGITAL CONTROL, MONITORING AND INFORMATION SYSTEM (DDCMIS)			
1.01.00	General Requirements			
1.01.01	The requirements for Distributed Digital Control Monitoring and Information System (DDCMIS) are indicated on functional basis in this specification. Contractor shall be responsible for engineering, selection and connection of all components and sub-systems to form a complete system whose performance is in accordance with functional, hardware, parametric and other requirements of this specifications. It is not the intent or purpose of this specification to specify all individual system components since the Contractor has full responsibility for engineering and furnishing of a complete system.			
1.02.00	System Configuration			
	DDCMIS shall basically consist of the following:			
1.02.01	Control System (including its Measurement system).			
1.02.02	Human-Machine Interface and Plant Information System (HMIPIS)			
1.02.03	System Programming & Documentation Facility			
1.02.04	Data Communication System			
1.02.05	Integrated OWS based Annunciation functions			
1.02.06	Time synchronization with Master clock			
	The basic configuration of DDCMIS shall be as indicated in the DDCMIS configuration drawing No. 0000-151-POI-A-013.			
	Contract Quantities of the C&I System shall be as per Part-A.			
1.03.00	System Expandability			
1.03.01	Modular System design shall be adopted to facilitate easy system expansion. The system shall have the capability and facility for expansion through the addition of controller modules, I/O cards, peripherals like operator workstations (OWS), printers etc. The system shall have the capability to add any new control loops, groups/subgroups logics in control system.			
1.04.00	On-Line Maintenance			
1.04.01	It shall be possible to remove/replace various modules online (like I/O module, interface module etc.) from its slot for maintenance purpose without switching off power supply to the corresponding rack. System design shall ensure that while doing so, undefined signaling and releases do not occur and controller operation in any way is not affected. Further, it shall also be possible to remove/replace any of the redundant controller module without switching off the power to the corresponding rack and this will not result in system disturbance or loss of any controller functions for the other controller. The on-line removal/insertion of controller, I/O modules etc. shall in no way jeopardize safety of plant and personnel.			
1.05.00	Fault Diagnostics			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
1.05.01	The DDCMIS shall include on-line self-surveillance, monitoring and diagnostic facility so that a failure/malfunction can be diagnosed automatically and reported/indicated remotely on OWS/Programmer station. The failure/ malfunctions to be reported shall include: (a) Module level faults of control system. (b) Failure of HMIPIS bus/unit LAN, system bus, Local/Remote comm. Bus. (c) Power supply faults (Over voltage, under voltage, loss of input) for each feeder of power supply for system / marshalling/ relay and HMIPIS cabinets. (d) Software faults. These faults shall typically be reported as color change on system status display and messages on programmer station/ OWS as well as through local indication. The diagnostic system shall ensure that the faults are detected before any significant change in any controller output has taken place. Failure of any I/O modules, Controller etc. shall be annunciated to OWS. For I/O modules, these alarms shall be grouped, while for controller, comm. controller, power supply, these shall be individual. In case the faults are not acknowledged / rectified within certain interval, then the same shall be reported to predefined users through messaging system described subsequently in this subsection. The exact strategy of the messaging system shall be elaborated and finalised during detailed engineering. HMIPIS shall include on-line self surveillance, monitoring and diagnostic facility so that a failure/malfunction in any of the nodes, networking device as well as communication medium can be diagnosed on the programmer/engg. Work station/OWS.			
1.06.00	Fault Tolerance & Controllability			
1.06.01	The DDCMIS shall provide safe operation under all plant disturbances and on component failure so that under no condition the safety of plant, personnel or equipment is jeopardised. Control System shall be designed to prevent abnormal swings due to loss of Control System power supply, failure of any Control System component, open circuits/short circuits, instrument air supply failure etc. On any of these failures the control system output shall either remain in last position before failure or shall come to fully open/close or on/off state as required for the safety of plant/personnel/equipment and as finalised during detailed engineering. System shall be designed such that there will be no upset when Power is restored.			
1.06.02	I/O modules shall have protection so that any fault in sensor & its wiring upto I/O module like open/short circuit, earth fault affects only that channel of I/O module. Other channels of that I/O module or other modules or other parts of system shall not be affected in any way.			
1.06.03	No single failure either of equipment or power source shall be capable of rendering any part/system/sub-system of DDCMIS inoperative to any degree. No single failure in HMIPIS shall lead to non-availability of more than one OWS. In such an event i.e., single failure leading to non-availability of any OWS, it shall be possible to operate the entire plant in all regimes of operation including emergency conditions from each of the other available OWS.			
1.06.04	☐ In order to achieve above, following shall be redundant with automatic change-over (including the associated software), as a minimum:			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	☐ Controller, Comm. Controllers, HMIPIS bus/Unit LAN, System bus, Local/Remote communication bus. ☐ Power supply arrangement (feeders/modules) ☐ Output modules. (for which redundancy is specified in part-A-Contract quantities for DDCMIS). ☒ Servers/information work stations ☐ However, following need not be redundant: ☐ I/O bus, (if it is a backplane bus & extension/joining of such backplane buses cabinet/adjacent cabinet) and input modules.			
1.06.05	The system design shall ensure that no single failure, whatsoever in any part of DDCMIS result in loss of communication except communication between HMI and control system, for which loss of communication upto a maximum of five seconds is acceptable. However, during this period, the control system shall remain fully functional and this event shall not create any disturbance/malfunction whatsoever (e.g., accumulation of control commands, issue of spurious commands/signals etc.).			
1.06.06	DDCMIS shall meet all requirements stipulated under other Sub-sections/sections of the specification including Sub-Section-IIIC, Part-A, (including the requirement Authorization to shipment test ATST) Quality assurance (Part B, Section VI of technical specifications) & General Technical Requirements (Part C Section VI of Technical Specifications).			
1.07.00	Signal Exchange All the signal exchange between various functional groups of each control systems shall be implemented through redundant system bus.			
1.08.00	System Spare Capacity			
1.08.01	For Control system spare capacity, refer Control System Spare Capacity as mentioned in Part A, Section VI of technical specification. For HMIPIS spare capacity, refer Appendix-I to part A, Section VI of technical specification.			
1.08.02	NOT USED.			
1.08.03	NOT USED.			
1.08.04	NOT USED			
1.09.00	NOT USED.			
1.10.00	NOT USED.			
1.11.00	DDCMIS shall meet system performance and parametric requirements as stipulated under Part-A, Section-VI of specifications.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.00.00	SYSTEM DESCRIPTION			
2.01.00	The DDCMIS shall include following main constituents. (Also refer DDCMIS configuration drg.no. 0000-151-POI-A-013). The DDCMIS shall work in full integration and conjunction with field equipment/drives like pumps, motors, valves, actuators, dampers, hydraulic control systems and field instruments.			
2.02.00	Control System			
2.02.01	The Control system along with its measurement system shall perform functions of closed loop control, sequence control, interlock & protection of the Plant and auxiliaries in all regimes of its operation.			
2.02.02	The measurement system of control system shall perform the functions of signal acquisition, conditioning and signal distribution of various types of inputs/outputs like analog, (4-20 mA DC- either from pressure / DP/ flow / level transmitters, analysers etc. as well as from temperature transmitters for all temperature) measurements from thermocouple, RTD to be connected to this system), binary, pulse, digital transmission through serial port, bus connection etc. (from remote I/O etc., Through various industry standard protect including MODBUS/FIELDBUS/PROFIBUS, prefabs freed and Ethernet etc. The inputs, which are required for only information & monitoring purposes, shall be distributed suitably in various groups plant area-wise.			
2.02.03	The control system shall also perform logic & computation for annunciation functions.			
2.02.04	The control system hardware (controllers, modules/cards etc.) shall be housed in cabinets located in respective control equipment room (CER) unitised and offsite except for the remote I/O cubicles (as specified in Part-A) which shall be located in respective areas.			
2.03.00	Human-Machine Interface and Plant Information System (HMIPIS)			
2.03.01	Functionality/features mentioned for HMIPIS in this specification are also applicable for unified HMIPIS. The HMIPIS shall perform control, monitoring and operation of the Plant and auxiliaries in all regimes of its operation, interacting with the Control System. For this, HMIPIS shall primarily perform following functions:			
2.03.02	Operator interface for Control System			
2.03.03	Plant Supervisory functions like displays, alarm monitoring & reporting, reports & logs, calculations, trend recording, historical and long term data storage & retrieval, etc.			
2.04.00	System Programming & Documentation Facility			
2.04.01	The programmer stations shall be provided for On-line configuration & tuning of Control System and On-line program development/modifications in HMIPIS.			
2.04.02	A work-station based system documentation facility shall be provided to generate retrieve store & all system documentation, logic, control loops, cable interconnection, etc. to achieve paperless documentation for the complete plant.			
2.05.00	Data Communication System (DCS)			
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2.05.01	The Data Communication System shall be provided for communication between Control System and HMIPIS, communication & signal exchange between various functional groups as well as communication between various units & off site / off line systems.			
2.06.00	Annunciation System The annunciation logic will be implemented as a part of DDCMIS and annunciation shall be made available on all OWS.			
2.07.00	Power supply:			
2.07.01	Power supply of control system shall be based on 24V DC. The Power supply along with its associated circuitry is intended to provide the following functionalities (a) Isolation between input & output side and distribution. (b) Multiple voltages as required by various modules as well as integration/supply voltage to field devices. (c) Auctioneering of dual voltages. (d) Providing stabilized/regulated power to Control System, taking care of input power supply variations.			
2.07.02	The Control System shall be fed from 24V DC power supply system (please refer power supply section of specification). The complete Control System, including power supply for various modules & field interrogation, shall be through regulated power supply using power supply modules/packs. Further, the monitoring of individual feeders of input power supply shall be done as specified at clause 1.05.01 (c) of IIIC-05.			
3.00.00	MEASUREMENT FUNCTIONS OF CONTROL SYSTEM			
3.01.00	The input / output modules employed in the Control System shall be separate from controller hardware.			
3.01.01	The functions listed below shall generally be performed in I/O modules. However, some of the functions can be implemented in the controllers .			
3.01.02	FIELD BUS ((Foundation Fieldbus/ Profibus) Interface For interfacing fieldbus compatible field devices/ actuators, Foundation Fieldbus/Profibus interface modules, power supply, field cables(armoured) and other accessories shall be provided. The design of fieldbus interfacing scheme, from field to Controller shall comply with all requirements of latest version of standards for Foundation Fieldbus/Profibus viz. IEC 61158. All required libraries to execute various tasks like data acquisition, control/protection etc shall be provided. Redundant host/ master card and redundant power supply along with diagnostic module shall be provided. For detailed fieldbus design guidelines, refer Annexure-IIIC-02K, Part-B, Section-VI. The Contractor shall present complete implementation scheme, including wiring scheme during detailed engineering stage for review & approval by Employer.			
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3.02.00	Analog signal conditioning & processing			
3.02.01	The conditioning and processing functions to be performed as a minimum for the analog inputs coming for control and information purposes are: 1. : Galvanic isolation of input and output signals for which power supply source is other than the measurement system of the control system. 2. : Transmitter power supply with per point fuse protection or current limiting and power supply monitoring. 3. : Monitor sensor wire break/open circuit/short circuit and take suitable actions in logic/loop. (This will include blocking of trip signals in case of RTD failure).			
3.02.02	All analog signals for control purpose shall be acquired, validated, processed and their respective Controller data base updated at a maximum interval of 250 milli seconds except for some fast-acting control loops for which the above-referred time shall be as per process requirement. For signals required for information only, the above functions shall be performed at an interval of 1 seconds. The HMI database updation shall not take more than one (1) second. The validated analog inputs shall be converted into engineering units on a per point basis. Analog input processing (scanning to alarm checking) shall be performed once every scan cycle. It shall be possible to manually disable any analog input either through deleting from scan or substitution from HMI.			
3.02.03	For Unit DDCMIS, the analog 4-20 mA input cards shall have input resistance >= 250 ohm inside the card/FTA (as applicable) for interfacing transmitters/analysers/temp. signals (through temp transmitters) giving 4-20mA analog signal along with superimposed HART interface signals. 4-20 mA DC signal will only be used for control purpose and superimposed HART signal will be used for configuration, maintenance, diagnostic and record keeping facility for electronic transmitters and Analysers etc			
3.03.00	Binary signal conditioning & processing			
3.03.01	The binary inputs shall be wired either in form of changeover type contacts (i.e. 'NC' + 'NO' together) or non-changeover type Contact ('NC' or 'NO') depending on the requirement, as defined in Part-A of specification.			
3.03.02	The conditioning and processing functions to be performed as a minimum for the binary inputs coming for control and information purposes are: 1. : 24 VDC power supply for contact interrogation for all potential free contacts with per point fuse protection or suitable current limit feature/ isolation through opto-coupler. 2. : Contact bounce filtering. (The field contact which is changing state must remain in the new state for the filter delay time to be reported as one event). The filter delay time should be suitable for the field input & its scan rate. 3. : Facility for automatic pegging the binary signal to logic one/zero or last correct value in case of failure of binary input module. 4. : All binary signals shall be acquired validated, processed, alarm checked and their data base updated within one second.			
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	5. : It shall be possible to manually disable any binary input either through deleting from scan or substitution from HMI. 6. : The non-coincidence monitoring shall be provided for binary inputs for all changeover signals.			
3.04.00	Multiple Measurement Scheme			
3.04.01	Triple / Dual measurement schemes shall be provided for triple / dual redundant sensors used in closed loop and open loop controls.			
3.04.02	The triple / dual measurement schemes for closed loop control shall provide median / average outputs. The operator shall be able to select any of the transmitters or the median/average value from the OWS.			
3.04.03	The sensors for multiple measurement schemes for open loop controls shall always be in service (except when gone Bad) and operator shall not be able to select / deselect any of the sensors. Further, measurement scheme shall be implemented considering safety / availability aspects.			
3.04.04	Individual transmitter signals, their status and selected value for control/ measurement and shall be available on OWS in the CLCS displays and the popups			
3.05.00	Wiring Scheme for inputs to control system			
3.05.01	Each of the triple redundant binary & analog inputs shall be wired to separate input modules. Similarly each of the dual redundant binary & analog inputs shall be wired to separate input modules. Implementation of multiple measurement schemes of these inputs will be performed in the redundant hardware. Loss of one input module shall not affect the signal to other modules. Other channels of these modules can be used by other inputs of the same functional group. No single failure in any component of the control system shall lead to unavailability of more than one of dual/triple redundant input signals to control system. Similarly, no single failure in any component of the control system shall lead to unavailability of more than one of dual/triple redundant Output signals from the control system.			
3.05.02	The single (i.e. non-redundant) binary & analog signal required for control purposes shall be wired as follows: 1. The on-off status of HT drives and synch type breakers shall be wired to two input modules in parallel. 2. Triple/dual analog sensors are required both in CLCS and OLCS for control purpose, then all of these triple/dual sensors shall be wired to the controller where CLCS loop is configured. If based on the same set of sensors, any protection action is required in OLCS (e.g., protection stop of drive) in another controller(s), then CLCS Controller shall provide three digital outputs for each such controller from three separate output modules (at defined LVM-Limit Value Monitor blocks inside Controller). The three			
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3.08.00	The following requirements shall be met for analog/binary input/output modules as applicable.			
3.08.01	Input filters to attenuate noise shall be provided.			
3.08.02	All analog outputs shall be short circuit proof.			
3.09.00	The Control Desk mounted hardwired devices & stations shall be interfaced through the I/O modules. No signal multiplication shall be done at marshalling end input termination end.			
4.00.00	CONTROL SYSTEM REQUIREMENTS			
4.01.00	The control system shall be broadly divided into the followings:-			
4.01.01	(i) Close Loop Control System (CLCS) - Modulating control functions for various applications including individual control and operation of modulating drives. (ii) Open Loop Control System (OLCS) - Binary control functions pertaining to sequence / interlock / protection of plant auxiliaries for various applications including individual control and operation of binary drives. (iii) Other functions as per various requirements specified in Part-A of specification. (iv) Performing logic & computation for annunciation functions & other miscellaneous Controls, signal processing etc.			
4.01.02	The number of Functional Groups (FGs) which are derived from the above mentioned guideline are the minimum required. For each of the FGs, separate sets of controllers, I/O modules, communication controllers, power packs/ modules etc. shall be provided. Mixing of hardware of two or more FGs shall not be acceptable. However, splitting of any functional group in more than one FGs due to any limitation in Contractor's system (e.g. limitation in handling number of inputs/outputs including spare capacity, limitation in implementation of number of functional blocks including spare blocks etc.) shall be acceptable, subject to Employer's approval. It may be noted that after splitting of the functional groups, each FG must have its own set of controllers, I/O modules, etc. It shall be ensured that failure of any set(s) of hardware of any FG does not affect other FG(s) and data communication between other FG(s) and HMIPIS. Each FG can have one or more set of controllers, if supported by standard design of the offered system.			
4.01.03	The Contractor shall provide all hardware/software, whether or not specifically indicated in this specification to fully meet operational/maintenance/ safety requirement as well as statutory/international standard and proven practices.			
4.01.04	The Control System shall function reliably under the environmental conditions as specified in Sub-Section:- Basic Design Criteria of this specification. It shall be immune from the interference resulting from disturbances in power supply feeders, signals lines, inputs, outputs etc. as experienced in a coal fired power station. It shall be able to withstand power line disturbances.			
4.01.05	The Control System shall have on-line simulation & testing facility.			
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4.01.06	The system shall have the flexibility to easily reconfigure any controller at any time without requiring additional hardware or system wiring changes and without disabling other devices from their normal operation mode. Modifications shall not require switching off power to any part of the system.			
4.01.07	Power supply to individual functional group shall be from redundant 24V feeders with diode auctioneering and further sub-distribution.			
4.01.08	The assignment of I/O channels for Inputs/Outputs, arrangement of modules within cabinet etc. shall be identical for all units except those inputs/outputs which are common for all units. Further uniformity should be maintained for redundant stream of process equipment within a unit.			
4.01.09	The application programs for the functional controllers shall be software based which shall be maintained even through power supply failure.			
4.01.10	Independent and dedicated controllers (main and its 100% standby) shall be provided for each of the functional group (FG) of Control System except for the cases where triple redundant controllers are to be used as per this specifications. All the 100% hot redundant backup controllers shall be identical in hardware and software implementation to their corresponding main controllers and shall be able to perform all its tasks. The backup controller shall track its corresponding main controller. There shall be an automatic and bumpless switchover from the main controller to its corresponding backup controller in case of main controller failure and vice versa without resulting in any change in control status. In case of switchover from main controller to the 100% hot backup controller, the back-up controller shall work as the main controller. Further, when only one controller is working and other controller is inserted on line (for example after repair/replacement), there should not be any degradation in the function of the working controller & control operation.			
4.01.11	The loop/logic reaction time (from change of input to input module to the corresponding control command output) shall be suitable to match actual process requirements, subject to minimum requirement wherever specified.			
4.02.00	Binary Controls/Open Loop Control System (OLCS) Functions			
4.02.01	These clauses are applicable for all the Binary controls of DDCMIS included in Contractor's Scope.			
4.02.02	The OLCS shall include sequence control, interlock & protection for various plant auxiliaries/valves/dampers/drives etc. The sequence control shall provide safe and automatic startup and shutdown of plant and of plant items associated with a plant group. The interlock and protection system shall ensure safe operation of plant/plant items at all times and shall automatically shut down plant/plant items when unsafe conditions arise.			
4.02.03	The OLCS shall be arranged in the hierarchical control structure consisting of unit level, group level, subgroup level & drive level (as applicable).			
4.02.04	The group level shall control a set of functional sub-groups of drives. Appropriate start-up and shut down commands shall be issued to the sub-group control and various check-backs shall be received from sub-groups or drives. Each sub-group shall execute the sequential			
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4.02.05	start-up and shut down programs of a set of inter-related drives along with system interlocks and protections associated with that sub-group as well as basic interlocks and protections related to individual drive falling under that sub-group. The drive level shall accept commands from the sub-groups, push buttons (wherever provided), etc., and transmit them to the respective drive, after taking into account various per missives and protections of that particular drive. For HT and other critical drives, first-up logic shall be incorporated to indicate the cause of protection/trip.			
	Sequence Control (a.) A sequence shall be used to move a set of groups, sub-groups from an initial steady state (for instance 'OFF') to a final steady state (for instance 'ON'). The sequence initiating command for the unit & group level shall be issued from OWS. (b.) A sequence shall be made of steps. The steps shall be executed in predetermined order according to logic criteria and monitoring time consisting of the interlock & protection requirements and check back of previous step which shall act as preconditions before the sequence control can execute the command for that step. (c.) Each step shall have a "waiting time" implying that the subsequent step would not be executed unless the specified time elapses. A monitoring time shall also be defined as the maximum time required in executing the commands of any step and the time required for appearance of check back signals. In case, this is not completed within the specified time, a message shall be displayed and program will not proceed further. (d.) Manual intervention shall be possible at any stage of operation and the sequence control shall be able to continue at the correct point in the program on return to automatic control. Protection commands shall have priority over manual commands, and manual commands shall prevail over auto commands. (e.) Open or close priority shall be selectable for each drive. (f.) The sequence startup mode shall be of the following types. i) Automatic Mode ii) Semi-Automatic Mode iii) Operator Guide Mode/Test Mode			
4.02.06	For the drives, the command shall be provided through O/P module to the coupling relays in MCC/SWGR/Actuator/Relay Cabinets as applicable and inputs (status, SWGR & process) shall be acquired through input modules. Redundancy in drive outputs shall be provided for drives, as quantified in Part-A). The failure of one of the redundant, output module shall in no way affect the function of the other output module, wherever redundancy is provided.			
4.02.07	The output modules shall have the feature that ensures that in case of failure, all the outputs are driven to zero. The 24V DC command outputs to drives for ON/OPEN, OFF/CLOSE shall be separate and independent and inverted outputs shall not be employed. Live +24V DC outputs shall be provided to MCC/SWGR/ actuator as applicable when command is to be issued. Keeping +24V DC extended to the relays for these outputs continuously & extending			
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	ground/negative when command is to be issued, is not acceptable except some of the auxiliary plants as to be decided during detailed Engineering.			
4.02.08	For inching type of drives, position transmitter power supply and monitoring of position transmitter signal shall be provided.			
4.02.09	The sequence interlock & protection requirements shall be finalised during detailed engineering and the same shall be subject to Employer's approval.			
4.02.10	The drive function i.e. basic interlock & protection logic of the drive shall be implemented in redundant controllers. The drive function shall ensure that protection signals for the safety of the drive shall be effective under all conditions and under all modes of operation. The different commands shall be performed according to the priority of protection 'Off', Protection 'On', manual and automatic. The standard functions like running time monitoring, status signaling, alarm/drive annunciation, etc. shall be performed in drive function. The drive function shall prevent hunting of the actuator in the presence of both open & close commands for actuators of the valves & dampers. The drive function shall be implemented in dedicated standard software functional block (drive macros).			
4.02.11	It shall be possible to control all common system drives (i.e. common for more than one units), from all or some of the units.			
4.03.00	Modulating Controls/Closed Loop Control System (CLCS) Functions			
4.03.01	This Clause is applicable for all analog controls of DDCMIS.			
4.03.02	The CLCS shall continuously act on valves, dampers or other mechanical modulating devices such as hydraulic couplings etc., which alter the plant operation conditions. The system shall be designed to give stable control action in steady state condition and for load changes in step/ramp over the load range of 60% to 100% MCR. The system shall have the following minimum features :			
4.03.03	The controller capability shall, as a minimum, include (i) P, PI, PD and PID control functions and their variations (ii) cascade control (iii) feed forward control (iv) On-Off control, (v) Ratio and bias control, (vi) Logical operation. Other advanced control strategy like adaptive & predictive control etc. can be considered for important loops like Furnace Draft, combustion control, FW flow control etc. in addition to SH/RH temperature control.			
4.03.04	The control loop shall have enough flexibility and various features to perform feed forward, balancing of controller, increasing the response to achieve the desired process parameter within prescribed time frame.			
4.03.05	The control system shall be bumplessly transferred to manual on the conditions of Control power supply failure, Failure of redundant controllers, Field input signal not available, Analog input and / or deviation exceeding preset value, etc. as a minimum and as finalised during detailed engineering.			
4.03.06	Any switch over from auto to manual, manual to auto and switchover from OWS operation to H/A station operation and vice versa shall be bumpless and without resulting in any change			
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	in the plant regulations and the same shall be reported to the operator and recorded automatically.			
4.03.07	Analog output (positioning signal) of 4-20mADC shall be provided from CLCS to the respective microprocessor based positioner E/P converters / electrical actuators as applicable. Redundancy in drive outputs shall be provided for drives as quantified in Part-A. The failure of one of the redundant, output module shall in no way affect the function of the other output module, wherever redundancy is provided. CLCS shall also provide all the necessary outputs for indicators and other devices as specified in Part-A with output loop resistance of 500 ohms for each channel of the output module.			
4.03.08	The System being supplied shall be such that when permissible limits are exceeded, an automatic switchover from an operation governed by maximum efficiency, to an operation governed by safety and availability is affected.			
4.03.09	For safety reasons, switchover logics associated with the modulating control loops shall be performed within the same controller. Modulating control loops shall be provided with standard features to interface overriding commands from OLCS/SG/TG Protection System like open, protection open etc.			
4.03.10	All controllers shall be freely configurable with respect to requisite control algorithms.			
5.00.00	HUMAN-MACHINE INTERFACE AND PLANT INFORMATION SYSTEM (HMIPIS) REQUIREMENTS			
5.01.00	Operator interface to the Control System			
5.01.01	The following functions shall be provided as a minimum: All OWS of the HMIPIS shall be fully interchangeable i.e. all operator functions including control, monitoring and operation of any plant area or drive shall be possible from any of the OWS at any point of time without the necessity of any action like downloading of additional files.			
5.01.02	Further, simultaneous operation (availability of popup window/faceplate) of multiple drives of control system shall be possible from a single display.			
5.01.03	The system shall have built-in safety features that will allow/disallow certain functions and entry fields within a function to be under password control to protect against inadvertent and unauthorised use of these functions. Assignment of allowable functions and entry fields shall be on the basis of user profile. The system security shall contain various user levels with specific rights which shall be as finalized by the Employer during detailed engineering. However, no. of user levels, no. of users in a level and rights for each level shall be changeable by the programmer (Administrator). The users created for a particular user level shall be specific to a DDCMIS. Hence, a user of one DDCMIS shall not be able to exercise the same privileges in other DDCMIS(s). The rights of each user shall contain two types of privileges as follows :- a) Privileges for the DDCMIS b) Privileges for the Operating System features.			
5.01.04	Typically following user levels shall be available:			
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5.01.05	a)	Operator		
	b)	Supervisor		
5.01.05	c)	Maintenance Engineer		
	d)	Programmer		
	e)	Shift Incharge/Station Incharge/other Monitoring Users.		
The system shall have functionality to configure view only privilege of any sub-system from HMI of any other sub-system. In case Cross HMI operation is applicable as per Part-A, it shall be possible to enable/disable operation of any valve or drive or area belonging to any sub-system from the HMI of any other sub-systems by a supervisory command through station LAN. Such control shall be based on a pre-engineered list and as per pre-predefined priority hierarchy. In case, cross HMI operation privilege is not available for a particular drive/area and still an operation is attempted for the drive/area then a suitable regret message should be displayed in HMI to the operator. It shall be possible to modify the list at site under Maintenance Engineers/ Administrator's right. The Contractor shall implement all necessary logics & selection facility in Control System/HMIPIS for the same with safeguard to prevent multiple operations simultaneously. Status & other signals related to the drive and the selection by any other user shall be made available to other users.				
5.02.00	The following functions shall be provided:			
5.02.01	a)	Calculations: Basic calculations like time of max./min., number of transgression of a point in a band etc. shall be provided. Same can be implemented in control system also. These calculated points shall be capable of being assigned to any functions like any other scanned point.		
	b)	Displays such as mimics, bar chart displays, X-t plots with various update rates using the data from historian, X-Y plots (with superimposed operating curves).		
	c)	Control related displays like faceplates for different types of drives, sequence displays, drive level displays (pop-ups giving details of auto/ protection/ permissive condition/ faults), control type display (giving details of A/M selection, tagout / maintenance mode, process value, set point, deviation, command output, position feedback etc). Further, CLCS displays giving the single line diagram of the control loop shall be provided.		
	d)	System status displays: This will provide an indication of the faults in a graphical form.		
5.02.01	OWS Annunciation Display			
The OWS annunciation will replicate in software the salient features of conventional hardware annunciations facia (for permanent viewing i.e., not operator changeable) while presenting more flexibility. This annunciation shall include both the process alarms as well as system alarms. The top area of the OWS (around 20-25%), shall be reserved for these display.				
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	The annunciation system shall be implemented as an in-built function of DDCMIS. The field contacts shall be acquired through DDCMIS only. The annunciation points will be presented on topmost area of mimics display. The annunciation area will be divided in three (3) “alarm bands”. The annunciation sequence shall be as discussed and finalized during detailed engineering. Bidder shall implement the annunciation functionality as described below as a minimum. There will be one alarm for each alarm window. Grouped alarms shall be provided only for pre-defined system / field faults like non-coincidence, monitoring etc. The alarm text is to be displayed only when that alarm is present. A “tool-tip” will be associated with each alarm window, which will show tag no. of alarm point when cursor is brought over alarm window. Hooters/Speakers of different audio types shall be available for reporting new alarms and resetting of alarms (corresponding to slow flash) etc shall be available. All flashing windows shall flash together (synchronized) in any screen. Suitable means shall be provided to distinguish new alarms and return to normal messages. Annunciation points shall be distributed on various stations based on process area. That is, each annunciation point will be assigned screen no.(s) and an alarm band no. A particular point can be assigned more than one station also. No fixed space will be reserved for any alarm on any of the band. Once a particular alarm band is full, the new alarm in that band will be reported by automatic shifting of the older alarm(s) on left side of band one by one in FIFO fashion. Scroll buttons shall be provided on both the sides to view the alarms in a particular band after the particular band is full. The scroll button will fast flash when scrolled alarms are fast flashing, will slow flash when alarms are slow flashing and will be steady when alarms are steady. When scrolled alarms are of mixed type, the scroll bar will flash with highest flashing rate of scrolled alarms. When operator right clicks on alarm area, he will get a menu with following options (i) acknowledge all- to acknowledge all new alarm(s) (ii) reset all- to reset all alarm(s) returning to normal (iii) acknowledge point- to acknowledge the particular point in alarm (iv) reset- to reset the particular point in alarm (v) Root Cause – To link to Alarm Analysis result for that particular tag (vi) “configuration utility”- to view and edit alarm list, tag nos., etc of all points in all stations (vii) closing the annunciation display. This menu can be dragged & placed anywhere on station screen. The actions (i), (ii), (iii), (iv) and (v) can be done by operator but action (vi) & (vii) will be permitted only to Programmer. The hooter sounds will be different for each of the Unit of power plant, when there is common control room for multiple Units. Bidder shall provide suitable “configuration utility” for viewing and modifying list of all alarms (process and system) to be displayed on all annunciation area, band color, text color, flashing color and frequency, font, etc.			
5.02.02	Facility of separate individual pop-up window for 30 critical alarms (to be decided during detail engineering) over the active mimic display, in OWS is to be provided. The pop-up window should require operator intervention to close. Pop-up window of one critical alarm should not overlap with any other critical alarm pop-up. The size of the pop-up window, colour of description and size of font shall be decided during detail engineering.			
5.03.00	Facility of time activated logs (Daily & Shift logs), event activated logs (Post trip log) shall be provided. At any point of time, log/ report can be demanded by operator. Maintenance data log shall be provided for total running timer & other maintenance related statistics. This shall also include standby running hours.			
5.04.00	Historical storage and retrieval system (HSRS)			
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	Complete HSRS functionality shall be implemented in server/information work station (Please refer Part-A for redundancy requirements). The data shall be saved online on hard disk and transferred to the portable storage device like DVD periodically for long term storage. Provision shall be made to notify the operator when the portable disk is required to be replaced with a fresh disk. The Hard disk capacity shall be sufficient to store at least One(1) year data Suitable facility for retrieval of data shall also be provided. The data to be stored in the above system shall include alarm and event list, periodic plant data (tags computed in control system as well as computed in HMIPIS) including data required for Residual life assessment, logs/reports etc. The data/information to be stored & frequency of storage and retrieval shall be as finalized during detailed engineering.			
6.00.00	PROGRAMMER'S STATION (PROGRAM DEVELOPMENT/ MODIFICATION, SYSTEM MAINTENANCE AND DOCUMENTATION FACILITY)			
6.01.01	The structuring/configuration/modification of Control loops/logics in Control system and program development/modification in HMIPIS shall be possible from fully graphic displays using familiar & conventional functional blocks.			
6.01.02	Any modification done in Control System and HMIPIS shall be suitably logged so that it can be traced to the user log-in ID and time of change.			
6.02.00	Control system structuring/configuration/tuning facilities			
6.02.01	Structuring/configuring and tuning facilities shall be provided for structuring/ modification, storing/loading, testing, tuning, monitoring, etc. of all the microprocessor-based controllers of the control system.			
6.02.02	It shall be possible to configure the system with ease without any special knowledge of programming or high level languages.			
6.02.03	On-line tuning of the control loops shall be possible without causing any disturbance in the execution of the control loops. Provision to store and retrieve on immediate and long term basis the system configuration, data base etc. on some device such as floppy disk shall be included. Facility shall be provided to reload/down-load the system or controller module from the already stored data, on-line.			
6.02.04	Facility for modification shall be user-friendly. For example, modification of logics/loops etc., zooming for better display, stretching etc. should be possible. It shall be possible to add/modify, delete blocks in logics/loops on-line			
6.03.00	System Documentation Facility			
6.03.01	The system shall have the facility to generate the associated documentation for both the Control System & HMIPIS with all required software and hardware tools for viewing and printing drawings and documents..			
7.00.00	DATA COMMUNICATION SYSTEM (DCS)			
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7.01.00	The Data Communication System shall include a redundant System Bus for major subsystems with hot back-up. Other applicable bus systems like cubicle bus, local bus, I/O bus etc shall be redundant except for backplane buses which can be non-redundant. The system shall have the following minimum features:			
7.01.01	Redundant communication controllers shall be provided to handle the communication between each functional group of controllers of Control System and the System Bus.			
7.01.02	Failure of one bus and changeover to the standby system bus shall be automatic and completely bumpless.			
7.01.03	The following buses shall be fiber-optic only. (a) System bus from locally mounted control system cabinets/OWS to central location. (b) I/O Bus from remote I/Os to centrally located system cabinets.			
7.01.04	The redundant buses shall be physically separate and shall be routed separately.			
8.00.00	POWER SUPPLY, GROUNDING, CABINET/PANELS, ETC.			
8.01.01	Power Supply			
8.01.02	Contractor shall provide totally reliable & quality power supply for DDCMIS.			
8.01.03	Wherever hot backup or redundant equipment likes controllers, processors, I/O modules, etc. have been specified and provided, the same shall be powered through separate power supply feeders.			
8.02.00	Grounding All panels, desks, cabinets shall be provided with a continuous bare copper ground bus, bolted to the panel structure on bottom on both sides. The bolts shall face inside of panels. Further, for connection of shields of the field instrumentation cables, a separate shield bus independent of the ground bus shall be provided, which shall be connected to the earth risers by means of independent cables.			
8.03.00	System Cabinets/Panels			
8.03.01	All DDCMIS system modules, power supply components, other control devices (except field mounted sensors/transmitters) which are required for completeness of the system shall be housed in cabinets furnished by the Contractor. All equipment and dedicated cabinets required for termination, marshalling and proper interface within Contractor's system and also with other systems shall also be provided by the Contractor.			
8.03.02	The cabinet mounted equipments shall be fully assembled, installed in mounting racks, wired and fully tested as per specification requirements and Employer approved drawings in the			
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8.03.03	manufacturing works of a qualified manufacturer prior to shipment to the project site. The Contractor shall ensure that the cabinets are complete and ready for installation before dispatch from manufacturing works. The installation work at project site for these cabinets should only involve connections through multi pair cables from marshalling cabinets (wherever provided) to system cabinets and inter-cabinet/cabinet to Control Desk/UCP. The DDCMIS cabinets shall be grouped into physically separate cabinets as follows: (a.) Control System Cabinets (b.) Marshalling cabinets (c.) Relay cabinets (d.) HMIPIS cabinets However, in case Bidder's system design requires the termination cabinet independent from system cabinet, the marshalling cabinets can be combined with the termination cabinet. In case, the termination arrangement is part of the system cabinet, independent marshalling cabinets shall be provided. The HMIPIS cabinets can be clubbed with Control System Cabinets for small areas where only 24V dc power supply is used. Contractor may make a special note that termination of field cables directly to control system cabinet is not acceptable.			
8.03.04	Hardware like network components, power supply distribution etc. shall be suitably housed in cabinets/enclosures. In network cabinets suitable arrangements shall be provided to ensure that the network components are visible in door closed condition (e.g. Glass doors etc), as approved by Employer			
8.03.05	Relay cabinets (or marshalling / termination cabinet cum relay cabinets, as the case may be) shall house all the interfacing relays in the system.			
8.03.06	Marshalling All the incoming / outgoing signals shall be grouped as per their origin / destination and will be terminated in the marshalling cabinets (or marshalling cum termination cabinet as the case may be). The grouping of these signals shall be subject to Employer's approval. The Contractor may make a special note that termination of field cables directly to the system cabinet (whether on TBs or on the pins on I/O modules) is not at all acceptable. System cabinet(s) and corresponding marshalling and termination cabinet(s) shall be a single shipping section, so that the internal wiring from field terminal to the module is done completely at the factory itself. The system cabinets shall be furnished with side panels even within a shipping section.			
8.03.07	Contractor shall design the cabinet internal arrangement, floor cutout and cable gland plate such that all the cables entering or leaving the cabinet can be properly glanded in the gland			
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	plate. In case, glanding is not possible Contractor shall indicate in his proposal his suggested procedure for cable entry and securing the cable at place.			
8.03.08	The type of termination and terminal blocks to be used in the relay cum termination/ Field Termination cabinets shall be as per requirements specified under Sub-Section-Inst. Cable. The terminals used for terminating the spare cores/ pairs of field cables shall not be employed for terminating the spare channels of I/O modules/ FTMs. The following are the guidelines for termination: a. 8 level cage clamp type of termination block shall be used in marshalling/ termination panel b. Minimum 4 pair Instrumentation Cables shall be used for connection between field/JB and DDCMIS marshalling cabinet and all the cores of 4 pairs or its multiples to be terminated in the marshalling panel (including spare cores) sequentially as per color coding philosophy indicated in the corresponding Tender Drawing. When more than 4 pair cable is used, the same is to be terminated in consecutive marshalling posts. No core/ bundle shall be left un terminated in the marshalling panel. c. In MFT and Turbine protection and governing system, Contractor's standard and proven practice for cable type and cable termination scheme shall also be acceptable.			
8.03.09	The protection class of cabinets and environmental rating shall be as defined in Basic Design Criteria. The Contractor shall ensure that the packaging density of equipment in these cabinets is not excessive and abnormal temperature rise, above the cabinet temperature during normal operation or air-conditioning failure, is prevented by careful design. Temperature rise inside cabinet shall not be more than 10 deg C with respect to ambient temperature in any condition. Dual blowers/fan with blower/fan failure alarm shall be provided in each cabinet with proper enclosure. Suitable louvers with wire mesh shall be provided on the cabinet. Contractor shall furnish detailed calculation of heat dissipation of various components housed in the cabinet like power supply, controller, I/O cards etc., cooling fans/ blower capacity and component density in cabinets, during detailed engineering to ensure that temperature rise is limited as specified above. Further, temperature sensor (RTD) shall be provided in each system cabinet to monitor temperature inside cabinet and suitable alarms shall be configured to indicate high temperature inside the cabinet.			
8.03.10	The cabinets shall be totally enclosed, free standing type and shall be constructed with minimum 2 mm thick steel plate frame and 1.6 mm thick CRCA steel sheet or as per supplier's standard practice for similar applications, preferred height of the cabinet is 2200 mm. The cabinets shall be equipped with full height front and rear doors. The floor mounting arrangement for other cabinets shall be as required by the Employer and shall be furnished by the Contractor during detailed engineering.			
8.03.11	Front and rear doors shall be provided with locking arrangements with a master key for all cabinets. If width of a cabinet is 600 mm or above, double doors shall be provided.			
8.03.12	Two spray coats of inhibitive epoxy primer-surface shall be applied to all exterior and interior surfaces. A minimum of 2 spray coats of final finish color shall be applied to all surfaces. The final finished thickness of paint film on steel shall not be less than 65-75 micron for sheet thickness of 2 mm and 50 microns for sheet thickness of 1.6 mm. As an alternative, single			
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	coat of anodic dip coat primer along with single textured powder coating with epoxy polyester meeting the thickness requirement is also acceptable. The Bidder shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory applied painted surface of each item of equipment. The finish colors for exterior and interior surfaces shall conform to following shades: Front & Rear-RAL 9002; End panel side- RAL 5012. Internal color shall be same as external color. Paint films which show sags, checks or other imperfections shall not be acceptable.			
8.03.13	Cabinets shall be designed for a grounded installation on the building structure. Any isolation from the building ground which is required by equipment design shall be provided internal to the cabinet.			
8.03.14	All alarm contacts located within cabinets as well as inputs/outputs from other related system shall be suitably terminated in the cabinets.			
8.03.15	The Contractor may submit details of his standard wiring practice for similar application for consideration and approval of Employer.			
8.04.00	Relays			
8.04.01	All the relays provided by Contractor shall be suitable for control supply of 24V DC. Each relay shall have 2 changeover type contacts & the rating of contacts shall be 5 Amp at 240V AC & 0.2A at 220V DC. The VA burden of relays shall be suitable to match the capacity of output modules (however, it shall not be more than 2.5 VA). Each relay shall be provided with a freewheeling diode. The relays shall be mounted in relay cabinets except for cases where number of relays is very less . In the cases where the number of relays is very less, the same can be mounted in termination / marshalling cabinets. All the contacts of relays shall be wired upto the cabinet terminal blocks.			
9.00.00	SYSTEM SOFTWARE REQUIREMENTS			
9.01.00	The Contractor shall provide all licensed software packages required by the system for meeting the intent, functional and parametric and performance requirements of the specification.			
9.02.00	All licenses shall be valid for the continuous service life of the plant. The software licenses shall be provided for the project (e.g. organisation or site license) and shall not be hardware/machine-specific, except the operating system licenses, in the event of non-machine specific license not being supported by the operating system supplier. Necessary documentary evidence to establish the same shall be submitted by the DDCMIS supplier			
9.03.00	As a customer support, the Contractor shall periodically inform and upgrade the Anti-Virus / IPS/IDS software of the workstations/servers/switches/firewall till completion of the warranty period.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
9.04.00	DDCMIS supplier to qualify operating system patches/ service packs and software patches of other third party software (like Office, Adobe etc as applicable, except antivirus and IPS/IDS) for use on its system during the continuous service life of the plant, subject to availability of the same by the manufacturer of the software.			
9.05.00	DDCMIS supplier should periodically inform and provide software patches for all DDCMIS software till continuous service life of the plant.			
10.00.00	SYSTEM DOCUMENTATION			
	The Contractor shall furnish detailed system and equipment documentation. It shall include detailed system and components description covering the installation, operation, care and maintenance of all system components. All final system documentation for DDCMIS hardware and related software shall be furnished. The same shall be complete, accurate and fully representative of the supplied system and its elements. All documentation/catalogues etc., shall be furnished in English language. In addition to the hard copies, CD ROM based documentation system shall also be provided. The same should be compatible to the On-line document generation facility indicated above.			
10.01.00	Hardware documentation			
10.01.01	Detailed technical literature, reference manuals, user's guide/manuals for the complete hardware like control system hardware, HMIPIS hardware, I/O hardware, bulk memory units, peripherals and their controllers, communication hardware including controllers, man-machine interfaces programmers unit, power supply modules etc., shall be furnished by the Bidder.			
10.01.02	Operation and Maintenance manuals			
	The operation and maintenance manuals shall include all information required for trouble shooting, repair and maintenance information regarding all equipments furnished for the completeness of the system. For details refer Part-C, General Technical Requirements.			
10.02.00	Software Documentation And Software Listings			
10.02.01	All technical manuals, reference manuals, user's guide etc., in English required for modification/editing/addition/deletion of features in the software of the DDCMIS shall be furnished. The Bidder shall furnish a comprehensive list of all system/application software documentation after system finalisation for Employer's review and approval.			
10.02.02	The software listings shall be submitted by the Bidder for source code of project specific application software and all special-to-project data files			
11.00.00	NOT USED			
12.00.00	WARRANTY			
12.01.00	The Bidder shall provide an unlimited warranty on all equipment and software during the Defect liability period. This warranty shall include repair, replacement or correction of identified software or hardware discrepancies at no cost to Employer.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
12.02.00	NOT USED.			
12.03.00	The Bidder shall provide warranty spares and an exhaustive list of warranty spares including components for system hardware and instrumentation and peripherals based on (and keeping adequate margin over) normally experienced failure rate shall be submitted by the Bidder for Employer's review regarding adequacy of the same. The warranty spares as per the list mentioned above will be dispatched by the Bidder along with the main equipment consignment. The Bidder shall also provide expandable items for the warranty period. This shall include printer ribbon, ink/tonner cartridge print head etc. Excluding floppy disk, M.O. Disk, tape cartridge and paper. Unused spare/consumable shall be contractor's property and taken back.			
12.04.00	In case of any hardware failure which hampers normal operation, the Bidder during the warranty period must provide on-site technical expertise to repair/rectify the problem within a week and if any component is not available at site, the Bidder must arrange to supply these components at site within additional 48 hours. If a software problem is identified, this problem shall be corrected within two weeks.			
12.05.00	After six months of DDCMIS operation the Bidder shall provide the list of parts and expendables utilized for the period. The same information will be provided at the conclusion of the warranty.			
12.06.00	In order to discharge the warranty responsibility, the bidder shall include in his proposal lumpsum price for the provisions of a team of service personnel at Site who will be fully qualified to perform the required duties throughout the warranty period of one year. The Bidder shall deploy at least one engineer, one supervisor and two technicians in the team. The Employer shall approve the exact nos. & composition of team members. In case, the team is unable to rectify hardware or software problems, the Bidder shall depute and/or station additional specialist to rectify the problem to ensure 99.7% availability of system. The availability of system shall be calculated as per Sub-section-IV, Part-A, Section-VI of specifications.			
13.00.00	ANNUAL MAINTENANCE CONTRACT (AMC)			
13.01.00	The Bidder shall provide maintenance services of complete DDCMIS System under a comprehensive Annual Maintenance Contract (AMC) for period of Three years after Warranty period.			
13.02.00	The AMC shall cover total maintenance of all hardware & software coming under the scope of DDCMIS and shall include free repair/replacement of all cards/ modules/ peripherals/ cables/ components etc., correction of software problems and supply of expendable items. The Bidder shall ensure 99.7% availability of the system with the AMC. For that purpose, contractor may maintain adequate no. of staff at site as per his own assessment if considered necessary to ensure availability.			
13.03.00	Further, Bidder may note that during the AMC he will be allowed to use Employer's mandatory spares and has to replenish the same within three months time or before completion of AMC period whichever is earlier. However, if in the opinion of the Bidder, more			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
13.04.00	spares than those included in the mandatory spare list are required to meet the availability requirement, then Bidder shall stock the same. The Bidder shall prepare detailed list of faults corrected and parts, expendables utilised during AMC period and shall furnish the same to Employer, properly documented at the end of AMC period. Further, during AMC period the details as required by Employer/ Project Manager shall be made available by Bidder's personnel.			
14.00.00	REMOTE SERVICE CENTRE Bidder shall provide the necessary hardware & software required for connecting the DDCMIS system to Bidder's remote service centre, through which the diagnostics & fault analysis of the DDCMIS system can be carried out. This shall include the control system and HMI, however the diagnostic of bought out items like LAN switches, etc are excluded. The method of connection shall be as per Bidder's standard practice. However, it is preferred to have the connection through a single point in the FGD DDCMIS system. The fixed charges & running cost till warranty period shall be included in the Quoted Price. The running cost thereafter shall be included in the AMC price. Connection for Remote access to the DDCMIS for diagnostics shall be through firewall. Virtual Private Networks(VPN) technology shall be used for data integrity and confidentiality. The type of VPN (SSL,IP Sec, SSL) ,no. of bits for encryption etc shall decided during detailed engineering. Further, this access shall be strictly under request control & record of such access shall be made available to the Employer's designated personnel. Also, it should be ensured that the hardware at the other end of the Remote access connection (i.e. at the contractor's works) shall be standalone/isolated (i.e. not connected to any network).			
15.00.00	TESTING AND COMMISSIONING TOOL The testing and commissioning tool is intended to be used for test operation of any drive in absence of DDCMIS during initial commissioning (e.g. fan trial run, etc.) While the tool shall be used for all type of drives envisaged in the specification, it is designed to be operated for one drive at a time. Portable trolley mounted system completed with necessary hardware for operating the drives and monitoring its parameter shall be supplied.			
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1.00.00	Requirements for HMI Hardware (Refer sub section- scope of supply & services for applicability of this annexure)	
1.01.00	HMIPIS Hardware	
1.01.01	All the peripherals shall conform to the following minimum requirement but the exact make & model shall be as approved by Employer during detailed engineering.	
1.01.02	The Servers/Worstations/PCs/Laptop to be provided by the Contractor should be latest available in the market at the time of supply to prevent early obsolescence and shall be subject to Employer's approval. The software packages to be included with the PCs shall also be the latest version available at the time of supply.	
1.01.03	The actual size of the Main and Bulk Memory shall be sufficient to meet the functional and parametric requirements as specified with 25% additional working memory and 50% additional bulk memory over and above the memory capacity required for system implementation.	
1.01.04	Power Fail Auto Restart (PFAR) facility with automatic time update shall be provided.	
1.01.05	For Servers and Historians / Station LAN Server/ Programming station/NMS Server the hardware shall conform to the following minimum requirements:	
	HARDWARE REQUIREMENTS	
	- Min three no. redundant; hot swappable; Hard Disk with RAID 5 implementation. Usable Hard disk capacity shall be sufficient for the application and to store at least one (1) year historical data, wherever required. - Redundant Hot swappable Power supply - Quantity of Monitor, Keyboard and Mouse (as indicated in Part-A, appendix) has to be supplied in total for the stations placed in Programmer room of Unit Area. For all other stations Monitor Keyboard and mouse are provided as per Bidder's standard Practice. - One intelligent SNMP manageable mini-UPS (online) for 30 minutes backup shall be provided, with all accessories and software for remote monitoring facility, with each station. - Additional external graphics card with dual output ports (apart from onboard graphics card) suitable to display full HD resolution in Programmer room.	
	SOFTWARE REQUIREMENTS	
	- Application software as per the functional requirement. - Anti-Virus Software with IPS#	
	# if anti-virus software cannot be provided as per standard practice of the DCS OEM suitable mitigating controls like whitelisting to be provided.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS	Annexure IIIC-05G
1.01.06	For Operator workstations/ Other workstations/ Documentation station (in case not part of prog. Stn.) HARDWARE REQUIREMENTS 1. Standard Hardware as recommended by the Bidder shall be acceptable. 2. Individual Monitors shall be supplied for all stations (except LVS OWS) 3. Additional external graphics card with dual output ports (apart from onboard graphics card) suitable to display full HD resolution in control room. SOFTWARE REQUIREMENTS 1. Application software as per the functional requirement. 2. Anti-Virus Software with IPS# # if anti-virus software cannot be provided as per standard practice of the DCS OEM suitable mitigating controls like whitelisting to be provided.	
1.01.07	For PC Station HARDWARE REQUIREMENTS 1. Standard Hardware as recommended by the Contractor shall be acceptable. 2. One intelligent SNMP manageable mini-UPS (online) for 30 minutes backup shall be provided, with all accessories and software for remote monitoring facility, with each PC Station. SOFTWARE REQUIREMENTS 1. Application software as per functional requirement 2. Latest MS OFFICE (Word, Excel, PowerPoint, Outlook) 3. Microsoft Visual Studio (only for Programmer PC) 4. Adobe Acrobat 5. Anti-Virus Software with IPS# # if anti-virus software cannot be provided as per standard practice of the DCS OEM suitable mitigating controls like whitelisting to be provided.	
1.01.08	Specification for Lap-Top (Note-Book) PC The screen size of the laptops should be 15 – 17 inches.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS				Annexure IIIC-05G
1.01.09	All the Laptop will also be used as pluggable temporary programmer's station and operator station functionalities of the programming stations mentioned in the specifications shall be provided (including requisite license).				
1.01.10	Not used				
1.01.11	Printers				
	Sr. No	Features	Colour Laser Printer	Colour Laser Printer	Line Impact Dot Matrix Printer
	1	Paper Size	A3	A4	132 column continuous fan fold type
	2	Printing Speed (min.)- in normal mode for A4 size paper	6 ppm (Color) 24 ppm (B&W)	4 ppm (color) 16 ppm (B&W)	1000 LPM
	3	Type	Heavy duty, at least 50000 pages/month	Heavy duty, at least 30000 pages/month	Heavy duty, at least 50000 pages/month
	4	Resolution (black) (min.)	600 dpi	600 dpi	-
	5	First page out time (with full graphic display)	=<1 min for color, <45 sec for BW	=<1 min for color, <45 sec for BW	
	6	Paper input capacity (min.)	500 sheets	500 sheets	Continuous paper feed
	7	Additional features	Automatic Duplex Printing		With printer Stand & sound proof enclosure (<60 dB)
	8	Additional Cartridge/toner/ ribbon of each type as used in printer with each printer	1	1	100
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CLAUSE NO.	TECHNICAL REQUIREMENTS	Annexure IIIC-05G	
1.01.12	Switches : Layer-3 switches shall have the following features: ☐ Minimum 15 nos. Fiber Gigabit Ethernet Port. 20% spare ports are to be provided over and above the total ports used ☐ 10/100/1000 Base TX ports (STP) as per requirement with 20% spare ☐ SNMP v1, v2, v3, RMON, VLAN, Multi link Trunk support (IEEE 802.3ad – Link Aggregation) ☐ Broadcast/multicast storm control ☐ Non-Blocking wire speed ☐ Hot swappable dual redundant Power Supply ☐ RIP, OSPF, BGP ☐ VRRP ☐ PIM and DVMRP Multicast Routing ☐ IPV4and IPV6 ready ☐ Support MACsec in hardware (IEEE 802.1AE) ☐ 10 GB module support for future upgradeability Expandability/stackability through a dedicated high speed expansion port. Routable, remotely manageable, configurable. One intelligent SNMP manageable mini-UPS for 30 minutes backup shall be provided with all accessories and software. Secondary switches shall have the following features: ☐ 10/100/1000 Base TX ports (STP) as per requirement with 20% spare ☐ Gigabit Ethernet Port as per requirement with 20% spare ☐ SNMP, RMON, VLAN, Multi link Trunk support. ☐ Support for stacking with high throughput ☐ Broadcast/multicast storm control		
1.01.13	Firewall : Firewall appliance should facilitate multi-vendor, multi-application environment and should support third-party products on open alliance. It should support Active-Active configuration.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS	Annexure IIIC-05G
	The firewall should contain following features: (a)Stateful inspection of packets. (b)NAT functionality, including dynamic and static NAT translations (c)Latest version of SNMP The firewall must send log information to a separate log server via an encrypted connection. Firewall logging must not impact firewall performance. Remote network access to the firewall should only be possible through the administration interface. Firewall should also meet the following requirements. The firewall must not support any unencrypted means of access to the firewall. It should Monitors ALL network traffic-traffic at Firewalls (Internet and external networks), in the DMZ and detect known threat through deep packet inspection. Detects unknown threats via anomaly scanning. Detect unknown threats via behavior pattern to protect from zero day attacks. Keeps up-to-date on new threats and vulnerabilities.	
1.01.14	IPS/ IDS Features : In order to inspect all inbound and outbound network activity and identify suspicious patterns that may indicate a network or system attack from someone attempting to break into or compromise a system on the NTPC Station LAN Network, the IDS/IPS will be provided as per the Station LAN configuration.	
1.01.15	Network Management Software (NMS) : The network management software should contain the below mentioned features. Graphical user interface (GUI) management. Automated discovery and display of Ethernet topology and devices. Monitor traffic flow through the device View a device image indicating which ports are active and which modules are installed. It a particular network device is down, it should give the tools like ping/telnet options in the same screen to further diagnose the problem. Real-time activity and utilization statistics and graphical trends. Facility of providing pre-defined actions like e-mail, SMS etc. upon any event generated in the network.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS	Annexure IIIC-05G	
	☐ Facility of viewing logical graphs of devices like routers, web servers, according to the needs. ☐ The following parameters should be monitored. ☐ Device status ☐ Port Status ☐ CPU utilization ☐ Memory Utilization ☐ All port utilization including uplink ports. For monitoring the parameters mentioned above, the NMS workstation should be connected to all HMIPIS switches/firewalls through management LAN which is a separate LAN from the redundant Station LAN.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS	Annexure IIIC-05J	
	Security Policies/Procedures and Security Audits : In order to enforce network security in the Station LAN & the HMI of all DDCMIS, security policies and procedures are to be followed by the Contractor during the tenure of the Contract & by Employer's site personnel thereafter. For checking compliance to the above security policies & procedures ,periodic security audit by a certified auditor (as per CERT-IN panel or CERT of country of origin of DDCMIS supplier)) is to be arranged by the Contractor during ATST, at the time of trial operation/PG test of C&I package and every year during AMC period. This shall include vulnerability assessment of the workstations/ servers and penetration testing of the Station LAN through the firewall from a node outside the network. Suitable actions based on the findings of the security audit shall be carried out by the Contractor. These security policies/procedures envisages formation of an Information Security team which shall comprise of vendor's personnel deputed at site during tenure of the contract and NTPC personnel thereafter. All the responsibilities of information security team have to be discharged by vendor's team during tenure of the contract and NTPC team thereafter. Even though different roles have been identified for the individual members of the information security team more than one role can be performed by the same person. It may be noted that following policies/procedures are only the operation guidelines and advisory steps to ensure maximum data security. The following security policies shall be followed. Details of the same shall be provided during detailed engg. 1. Information Security Policy a) Information Security Team Policy b) Firewall Policy c) Information Identification and Classification Policy d) Security Policy Review Policy e) Information Labeling and Handling Policy f) System Planning and Acceptance Policy g) Capacity Management Policy h) Media Handling Policy i) Information Security Awareness Policy j) Third Party Access Policy k) Change Control Policy l) Anti Virus Policy m) System Access Policy n) Monitoring Policy o) Incident Handling Policy p) Information Backup and Restoration Policy q) Network Access Policy r) User Access Management Policy		
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	SUB-SECTION - IIIC-05 DDCMIS ANNEXURE IIIC-05J	PAGE 1 OF 1

CLAUSE NO.	TECHNICAL REQUIREMENT	Annexure IIIC-05K			
1.00.00	GENEREAL REQUIREMENTS FOR FIELDBUS INSTRUMENTS AND ACTUATORS This section provides the basic guidelines for the design and implementation of Fieldbus (Foundation Field Bus/ Profibus) based control system.				
1.01.00	The requirements given herein are minimum requirements to be considered by Contractor to ensure uniformity in basic design and shall not be considered as final requirements. The Fieldbus design shall be further validated by contractor and approved by Employer during detailed engineering and any variation/ changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by contractor without any implications.				
1.02.00	The fieldbus segment design shall be finalized and validated based on functional requirements as per: • Process requirements (P&IDs/ operational requirements). • Loop response time of different loops device communication time i.e. cycle time for fast and slow loops with scheduled and unscheduled organization as per project. • Area classification requirements (e.g. hazardous or safe). • Fieldbus devices specifications (maximum current drawn from bus, block execution speeds, power conditioner suitable for field barrier, etc.) • Length of segments. • Instrument location plans with elevation details. • Host-system documentation showing configuration rules or restrictions. • For Foundation Fieldbus & Profibus PA chicken foot/ branch/ or combination of both topology shall be provided. For Profibus DP, Bus/ Line topology in Redundant mode shall be provided. That is, for Profibus DP redundant cables connected to redundant ports of devices shall be provided. Suitable field bus segment design shall be considered keeping the safety & integrity of the system intact so that the cabling, marshalling, junction boxes and system performance shall be optimized.				
1.03.00	However, all such segment device allocation, topology shall be decided during detailed engineering. Any modification shall be carried out by contractor without price implication. Contractor to provide all standard functional blocks for all Foundation Fieldbus/ Profibus devices as per latest FF/ Profibus version and standard guidelines. Fieldbus components including power supply, terminators, isolators, etc. provided by Contractor shall comply to IEC 61158 and other standard Fieldbus guidelines.				
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CLAUSE NO.	TECHNICAL REQUIREMENT		Annexure IIIC-05K																			
1.04.01	Redundant host/ master card and redundant power supply along with advance diagnostic module shall be provided. All required libraries to execute various tasks like data acquisition, control/protection etc. shall be provided.																					
1.04.02	In fieldbus system following spare capacity in each FG shall be provided :																					
	<table><tr><th>Item</th><th>Sub Item</th><th>Spare capacity</th></tr><tr><td>Controller</td><td>Software Blocks</td><td>30%</td></tr><tr><td></td><td>Host</td><td>30%</td></tr><tr><td>Host/ Power supply</td><td>Installed spare capacity</td><td>10%</td></tr><tr><td>Host/ Power supply space</td><td>Only spare space</td><td>20%</td></tr><tr><td>Segment spare capacity</td><td></td><td>40%</td></tr></table>				Item	Sub Item	Spare capacity	Controller	Software Blocks	30%		Host	30%	Host/ Power supply	Installed spare capacity	10%	Host/ Power supply space	Only spare space	20%	Segment spare capacity		40%
Item	Sub Item	Spare capacity																				
Controller	Software Blocks	30%																				
	Host	30%																				
Host/ Power supply	Installed spare capacity	10%																				
Host/ Power supply space	Only spare space	20%																				
Segment spare capacity		40%																				
	If in a FG, conventional and fieldbus system both are implemented then above spare capacity shall be in proportion to fieldbus/ conventional system implementation.																					
1.04.03	The contractor shall present complete implementation scheme, including wiring scheme during detailed engineering stage for review and approval by Employer.																					
1.05.00	Fieldbus cable (specifically used for Foundation Fieldbus/ Profibus PA and Profibus DP) shall be Individually shielded twisted pair, with round steel wired armour (SWA) complying to IEC 61158, Type A. The cable construction shall meet EN 50288-7 standard for physical properties and the outer sheath shall be of PVC-TM53 as per EN 50290-2-22. Continuous operating temperature of Fieldbus cable shall be minimum 90 Deg C. For laying of fieldbus cables, cable trays envisaged for instrumentation cable with all the accessories shall be used by the contractor. Minimum 300 mm spacing to be kept between the fieldbus trays and other high voltage cables to avoid any interference.																					
	SS Junction boxes specially designed for fieldbus application shall be provided on as required basis. These SS JB's shall house field mounted fieldbus components like distributors, tee, etc. These SS JB's shall have suitable cover and gasket and shall have protection class of IP-66 or better. SS Cable glands and blind plugs shall be provided by the Contractor.																					
1.06.00	Comprehensive Fieldbus Maintenance and Diagnostic software shall be provided. This software shall be capable of collecting complete diagnostic information from fieldbus network and all fieldbus devices and presenting in user friendly interface for detailed diagnostic and troubleshooting of the system. It shall be possible to completely configure parameters of fieldbus network and fieldbus devices from centralized system through this software. This software shall have feature of providing data related to maintenance of																					
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		BID DOCUMENT NO.: CS-0011- 109(1A)-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-B	SUB-SECTION - IIIC-05 DDCMIS ANNEXURE IIIC-05K																		
				PAGE 2 OF 3																		

CLAUSE NO.	TECHNICAL REQUIREMENT Annexure IIIC-05K
1.07.00	fieldbus devices as available through fieldbus system. This system/ software shall have provision to get updated to latest version/ release of various fieldbus devices. During FAT suitable arrangement shall be made by Contractor to test Fieldbus modules including field devices as per approved FAT procedure.
1.08.00	The contractor shall use fieldbus segment design tool / software to design complete network verifying various design parameters like device voltage, total cable length, spur length, system power requirements etc. the contractor shall provide device voltage calculations for all segments, based on calculation in software package. All these calculations shall be handed over during detailed engineering in electronic format in a way that Employer can thoroughly verify design basis/ calculations carried out by Contractor.
1.09.00	Suitable short circuit protection, surge protection, grounding requirements shall be provided for all devices, so that fault in one device shall not impact the availability of other devices in the segment.
1.10.00	All required diagnostic and configuration tools/ hand held devices shall be provided for configuration and troubleshooting of devices and network.
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	ELECTRICAL POWER SUPPLY SYSTEM			
	General Requirements			
	The requirements of Electrical Power Supply system are specified herein on system basis. The Contractor shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification including tender drawings and Employer approved drawings during detailed engineering. All equipment and accessories required for completeness of this system shall be furnished by the Contractor whether these are specifically mentioned herein or not. All the equipments and sub systems offered shall be from reputed experienced manufacturers. All system cabinets, enclosures, & distribution boards shall be manufactured, assembled, wired and fully tested as a complete assembly as per the requirements of this specification at the manufacturer’s works.			
	The Contractor shall furnish all required equipment cubicles and wiring required for conversion and/or stabilization of the power sources provided by the Employer to all other levels which may be necessary for meeting the individual requirement of equipment/system furnished by him including the panel/desk mounted equipment.			
	24 V DC power supply system shall be provided as below:- i) 24V DC power supply system for DDCMIS based control system shall comprise of two sets, each set shall consist of 1 x 100% microprocessor controlled, intelligent, modular rectifier banks, Controller – one for each rectifier bank, 1 x 100% Nickel - Cadmium batteries for one (1) hour duty, 1 X 100% DC distribution board. 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS)–common for both the sets. Necessary redundant transformers shall be provided by the contractor to derive the power supply from 415V, 3 phase, 3 wire incomers for above.			
1.01.00	POWER SUPPLY SYSTEM FOR DDCMIS BASED CONTROL PANELS			
1.01.01	Microprocessor based, Intelligent, Modular Power Supply.			
1.01.02	Microprocessor based, intelligent, modular power supply shall be sized to meet connected load requirements and keep the connected battery full charged in Float/ Boost mode. A provision of 10% design margin shall be kept over and above the load requirement. Either of the bank of rectifier modules shall be able to recharge fully discharged battery within 8 hours. It shall also be possible to discharge batteries periodically manually. Each rectifier bank shall have N+1 rectifier modules for all applications. The exact sizing of the rectifiers in one bank shall be as approved by			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	PART-B SUB-SECTION-III-C-10 POWER SUPPLY	PAGE 1 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	Employer during detailed engineering. While selecting the components and finalizing the cooling arrangements, Bidder to note that these rectifier modules are required to operate at 30-40 % of the rated load for most of the time. While sizing, the temperature derating factor as applicable, is to be considered for arriving at the rating of the modules as per Bidder's manufacturing standard if the modules are rated for lower than the 50 deg. C ambient. For the rectifier bank, matching controller along with applicable software shall be provided to meet system requirements under all modes of operation.”			
1.01.03	The rectifier module shall be microprocessor controlled, IGBT/Power MOSFET based, high frequency with active load sharing, designed for single and parallel operation with battery and shall have automatic voltage regulators for a close voltage stability even when AC supply voltage and DC load fluctuates, effective current limiting features, front access design, programmable temperature compensation feature for battery charging and filters on both input and output to minimize harmonics. The rectifier module output regulation shall be +/- 1% or better from no load to full load with an input power supply variation of +/- 10% in voltage and +/- 5% in frequency. In addition to indications / display on rectifier panel, alarms along with relevant analog measurements shall also be provided by employing RS 485 Port Modbus Protocol / Ethernet TCP/IP protocol for use in DDCMIS system. Further isolated 4-20 mA signals shall be provided for important parameters like rectifier bank voltage, rectifier bank current, battery voltage, battery current, DCDB Voltage, DCDB current etc. The list of alarm output & 4-20 mA signals shall be as approved by Employer during detailed engineering. Necessary provision shall be done in DDCMIS end also.			
1.01.04	“Float / Boost” charge functions shall be provided with alarm / indications.			
1.01.05	Each rectifier bank shall be rated for 100% load requirement and keep the connected battery full charged and one spare rectifier module.			
1.01.06	The rectifier module circuitry shall be of fail-safe design and failure of any component should not result in any rectifier bank output voltage to increase beyond acceptable limits of the C&I system being fed from it.			
1.01.07	The rectifier module shall be current limited for circuit protection and protection of battery from overcharge. The current limit shall be continuously programmable.			
1.01.08	The rectifier module shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.			
1.01.09	The rectifier module shall be fed from 415 V AC, 50 HZ, 3 phase, 3 wire system. Bidder shall provide all required power cables & other accessories etc. from 415 V AC power supply system to his electrical power supply system.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.01.10	The full load efficiency of rectifier module at nominal input and output shall be 90%. The ripple content shall be limited to +/- 0.5% of output voltage.			
1.01.11	Bidder shall furnish the equipment complete in all respect along with rectifier module rating & voltage drop calculations, supporting curves / data etc.			
1.01.12	The Controller shall be intelligent, microprocessor controlled for monitoring & control of rectifier modules with features viz. auto / manual battery discharge test, battery reserve time prediction, energy management, float / boost mode control etc.			
1.01.13	All software as required for smooth operation and monitoring of rectifier modules in conjunction with controller & BHMS shall be provided by the Contractor.			
1.02.00	Batteries for DDCMIS system			
1.02.01	The batteries shall be heavy duty Nickel-cadmium type and shall be sized for one hour of full load operation during non-availability of AC supply / chargers. The Ni-Cd batteries shall conform to IS: 10918. The batteries shall be sized as per relevant IEEE Standards. For sizing calculation, an aging factor of 0.8 and a temperature correction factor as per manufacturer's standard at 4 deg. C electrolyte temperature (Based on temperature characteristics curve to be submitted by the Contractor at a temperature of 4 deg. C). Capacity factor, Float Correction Factor, as per Battery Supplier Standard, shall be taken into consideration, if applicable and ambient temperature shall be considered as the electrolytic temperature. The sizing of the battery shall be as approved by Employer during detailed engineering. However, Contractor shall consider a suitable voltage drop of 2V from battery room to DCDB and DCDB to load, while sizing the battery.			
1.03.00	DC DISTRIBUTION BOARD (DCDB) Redundant DC feeders (one from each DCDB) shall supply each of the connected panels. From DCDB / panel to driver/load feeder shall be in scope of Bidder. The exact design, rating & number of feeders of the each redundant DCDB shall be as finalized during detailed engineering and as approved by Employer. However, 25% spare feeder (min. 1 no.) with fuses for each rating shall be provided in each DCDB.			
1.04.00	Battery Health Monitoring System (BHMS) BHMS, wherever applicable, shall include microprocessor based hardware and software to monitor the condition of each battery cell of 24 V DC systems on-line. With BHMS it shall be possible to measure & analyze the minimum and maximum voltage values of each battery-cell so that any damage to battery shall be prevented			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	PART-B SUB-SECTION-III-C-10 POWER SUPPLY	PAGE 3 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS				
1.05.00	by pro-active maintenance. BHMS shall communicate with the charger/DDCMIS and provide alarms as finalized by Employer during detailed engineering.				
	The UPS Power Supply for various systems shall consist of one or more of the following configurations.				
	Bidder shall clearly bring out in the proposal the configuration diagram, single line diagram and datasheets etc. & this shall be finalized subject to employer's approval during detail engineering.				
	Configuration B :				
	UPS system shall consist of 1 x 100% charger and inverter with input isolation transformer, 1 x 100% Ni Cd Battery Bank for 1 hour, Bypass Line Transformers and Voltage Stabilizer, static switch, manual bypass switch, 2 x 100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS) and other necessary protective devices and accessories.				
1.06.00	The specifications for this UPS configuration shall be as per Cl.No. 1.06.00 to 1.06.05 and specifications for Battery shall be as per Cl. No 1.06.06 for Ni-Cd type Batteries.				
	Configuration C : On line UPS with remote monitoring having a battery backup of 30 min. The batteries for UPS System shall be Sealed Maintenance Free type and shall be as per Control System Vendor's standards.				
	UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM				
	The minimum capacity of the UPS at load factor of 0.8 lagging inclusive of 10% design margin at 50 deg c.				
	The UPS system shall meet the following requirements as a minimum.				
1.06.01	If UPS KVA rating is applicable at a lower ambient temperature than specified 50 deg.c, the bidder shall consider a derating factor of at least 1.5%/deg.c for arriving at the specified UPS capacity at 50 deg.c ambient. The UPS shall have an overload capacity of 125 % rated capacity for 10 minutes and 150 % rated capacity for 10 seconds. The inverter shall have sufficient capability to clear fault in the maximum rated branch circuit, limited to 8 percent of finally selected ups capacity.				
	Chargers				
1.06.01.01	The chargers shall be self regulating, solid state silicon controlled, full-wave rectifier type designed for single and parallel operation with battery and shall have automatic voltage regulators for close voltage stability even when AC supply voltage fluctuates,				
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	effective current limiting features and filters to minimise harmonics. The charger should be capable to fully charge the required batteries as well as supply the full rated load through inverter. Furthermore the charger should be able to re-charge the fully discharged battery within 8 hours. The charger output regulation shall be $\pm 1\%$ from no load to full load with an input power supply variation of $\pm 10\%$ in voltage and $\pm 5\%$ in frequency. In addition to indications/display on charger panel, alarms along with relevant analog measurements shall also be provided by employing RS 485 Port Modbus Protocol / Ethernet TCP/IP protocol for use in DDCMIS. The list of alarm output & 4-20 mA signals shall be as approved by Employer during detailed engineering.			
1.06.01.02	The charger shall be current limited for charger circuit protection and protection of battery from overcharge shall also be provided. The current limit shall be continuously adjustable. The chargers shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energised.			
1.06.01.03	The chargers shall be fed from 415V AC, 50 HZ, 3 phase, 3 wire system. Charger design shall ensure that there is no component failure due to fluctuations of input supply or loss of supply and restoration.			
1.06.01.04	The minimum full load efficiency at nominal input and output shall be 90%. The ripple content shall be limited to $\pm 2\%$ of Charger output voltage.			
1.06.01.05	The UPS battery shall have sufficient amp-hour capacity to supply the steady state KVA rating of the UPS specified for 60 minute, irrespective of the actual load on UPS.			
1.06.01.06	The UPS system shall be capable of operating without D.C. battery in circuit under all conditions of load and the performance of various components of UPS like inverter, charger, static switch etc. shall be guaranteed without the battery in circuit.			
1.06.01.07	The UPS system design shall ensure that in case of failure of mains input power supply to one of the chargers, the other charger whose mains input power supply is healthy, shall feed to one or both the inverters as the case may be as per manufacturer's standard practice & continue to charge the D.C. battery at all load conditions. The Bidder should note that this situation should not in any way lead to the discharge of the D.C. Battery.			
1.06.02	Static Inverters The static inverter shall be of continuous duty, solid state type using proven Pulse Width Modulation (PWM)/Quasi square wave/step wave technique. Ferro-resonant types Inverters are not acceptable. The nominal voltage output shall be 230 Volts. single phase ,50 Hz. The inverter equipment shall include all necessary circuitry and devices to conform to requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization etc. The steady state voltage regulation shall be $\pm 2\%$ and transient voltage regulation (on application/removal of			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	PART-B SUB-SECTION-III-C-10 POWER SUPPLY	PAGE 5 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS		
1.06.03	100% load) shall be +/-20%. Time to recover from transient to normal voltage shall not be more than 50 mSec. Frequency regulation for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination shall be better than ± 0.5% (automatically controlled). The total harmonic content shall be 5% maximum and content of any single harmonic shall be 3% maximum. The inverter efficiency shall be at least 85% on full load and 80% on 50% load. The synchronisation limit for maintenance of synchronisation between the inverter and stand by AC source shall be 48-52Hz, field adjustable in steps of 1 Hz. Static Switch and Manual Bypass Switch The static switch shall be provided to perform the function of transferring UPS loads automatically without any break from (i) faulty inverter to healthy inverter in case of failure of one of the two inverters and (ii) from faulty inverter to standby AC source in case of failure of both the inverters. The transfer time shall be ¼ cycle maximum in synchronous mode. Manual bypass switch shall be employed for isolating the UPS during maintenance. Continuous and overload capacity of the switches shall be equal to 100% of the continuous and overload rating of each inverter. Peak Capacity shall be 1000% of continuous rating for 5 cycles.		
1.06.04	Step Down Transformer and Voltage Stabiliser One 415V three phase to 230V, single phase transformer along with associated voltage stablizer shall be furnished with each UPS system. The transformer and stablizer combination shall convert Employer furnished 415V ± 10% three phase plant auxiliary AC supply to 230 V ± 2%, single phase standby AC Power Supply source. The transformer shall be of low impedance air-cooled type and its KVA rating and percentage impedance should be selected so that extremely fast fault clearance is achieved. The overload capacity of the transformer and voltage stabilizer shall not be less than 300% for 200 millisecond duration. The voltage stabilizer shall employ servo-controlled circuitry and shall maintain the specified output voltage for 0-100% load with maximum input voltage variations as indicated above. The efficiency of the stabiliser shall be 95% or better. The type and other details shall be subject to Employer's approval.		
1.06.05	AC Distribution Board (ACDB) The details of the AC distribution board, i.e. exact, rating and number of feeders etc. of the 2x100% ACDB shall be designed to cater to the requirements of Contractors systems. 25% Spare feeders of each type and rating to be provided in each ACDB.		
1.06.06	The batteries shall be heavy duty Nickel-cadmium type and shall be sized for one		
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	hour of full load operation during non-availability of AC supply / chargers. The Ni-Cd batteries shall conform to IS: 10918. The batteries shall be sized as per relevant IEEE Standards. For sizing calculation, an aging factor of 0.8 and a temperature correction factor as per manufacturer’s standard at 4 deg. C electrolyte temperature (Based on temperature characteristics curve to be submitted by the Contractor at a temperature of 4 deg. C). Capacity factor, Float Correction Factor, as per Battery Supplier Standard, shall be taken into consideration, if applicable and ambient temperature shall be considered as the electrolytic temperature. The sizing of the battery shall be as approved by Employer during detailed engineering. However, Contractor shall consider a suitable voltage drop from battery room to ACDB and ACDB to load, while sizing the battery.		
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-0011-109(1A)-2	PART-B SUB-SECTION-IIIC-10 POWER SUPPLY
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			एनटीपीसी NTPC
	CONTROL AND INSTRUMENTATION SYSTEM			
1.00.00	GENERAL			
1.01.00	a) The Contractor shall provide Independent Control & Instrumentation system for control, monitoring and operation of associated drives and auxiliaries in FGD system including Limestone grinding & handling system, Gypsum Dewatering & handling system and other systems being provided under the contract, in all regimes of operation in safe and most efficient manner. The Contractor shall provide all systems, equipment, accessories and associated equipment, which are included in Contractor's scope, in a fully operational condition acceptable to the Employer. b) The Contractor shall provide all material, equipment and services which may not be specifically stated in the specifications but are required for completeness of the equipment/systems furnished by the Contractor and for meeting the intent and requirements of these specifications. The work shall be consistent with modern FGD based power plant practices and shall be in compliance with all applicable codes, standards, guidelines and safety requirements in force on the date of award of the contract. c) The scope of work shall also include all material, equipment and services so as to make a totally integrated Instrumentation and Control System together with all accessories, auxiliaries and associated equipment ensuring operability, maintainability and reliability. d) The Contractor shall also provide all the instruments along with cables, JB etc. for equipments / drives and services which may not be specifically stated in this specifications but are required for completeness of the FGD Control system shall be furnished by the Contractor and for meeting the intent and requirements of these specifications. e) The Bidder scope shall include design, manufacture, engineering, inspection & testing at supplier's works, packing, forwarding to site, unloading, erection, testing & commissioning. The following clauses describe the brief scope of supplies. Scope shall be as described briefly in the following clauses but not limited to it. The detailed technical specifications are stipulated under Part - B, Section-VI of the specification as well as in various other Parts of the Technical Specifications. f) In this project fieldbus(FF/Profibus) based instruments(PT/DPT/TT), Fieldbus based Non-intrusive Electrical actuators are also envisaged which shall be connected to the DDCMIS. The protocol of fieldbus (FF/Profibus) for non-intrusive electric actuators and fieldbus based instruments shall be matching with fieldbus			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
1.02.00 1.02.01	protocol of FGD System DDCMIS, and the same shall be subject to Employer's approval. g) Scope defined in PART-A read in conjunction with PART-B has to be provided for each station (i.e. 11 sets for 11 stations) under LOT-1A package. The scope detailed hereunder in the following clauses is for one set. In this package fieldbus based controls and conventional controls (hardwired 4-20mA/DI/DO) both are envisaged. Fieldbus based control system for fieldbus based actuators and fieldbus based instruments (PT/DPT/TT) shall be provided for all applications. In case non fieldbus based actuator or transmitters are required for few applications then the same shall be discussed and finalized during detailed engineering. A. For fieldbus based instruments/ actuators following guidelines shall be followed: a. Actuators which are in main and standby line shall be wired to separate host/master of FF/Profibus. b. Dual/Triple redundant PT/DPT/TT shall be wired to separate segments. B. Loop Reaction Time (time between field acquisition to field output in control system) : a. For Fast Closed loop controls of conventional system, loop reaction time shall be 250ms or better as per process requirement. b. For other Closed loop controls, conventional/ fieldbus based/ mixed, loop reaction time shall be 500 ms or better as per process requirement. c. For Fast Open loop controls of conventional system (Tie/ trip selection), loop reaction time shall be 100ms or better. d. For other Open loop controls, conventional/ fieldbus based/ mixed, loop reaction time shall be 1 Second or better as per process requirement. The above shall be suitably demonstrated by the contractor. C. For Foundation Fieldbus & Profibus PA chicken foot/ branch/ or combination of both topology shall be provided. For Profibus DP, Bus/ Line topology in redundant mode shall be provided. That is, for Profibus DP redundant cables connected to redundant ports of devices shall be provided. Specific approval of Employer shall be taken before finalization of protocol of Fieldbus for DDCMIS and for the fieldbus based equipments being connected to DDCMIS like PT/DPT/TT and actuators. Further, the grounding scheme of fieldbus system shall be as recommended by FF/ Profibus standards and Contractor shall submit the detailed scheme at the start of engineering for Employer's approval.		
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	mentioned systems shall be included in the common system. Details of control blocks with respect to process blocks shall be finalized during detailed Engineering: FGD DDCMIS consisting of following: (a) Unitized process blocks: i. Unit-1 absorber and associated system ii. Unit-2 absorber and associated system - iii Unit-3 absorber and associated system . . . n) Unit-n absorber and associated system where n is the number of generating unit per stage (b) Common system process blocks: i. Gypsum De watering Handling common system block. ii. Lime stone preparation and handling common system block. iii. Other associated common system. In addition to monitoring and control from the FGD control room, the systems indicated at (a) & (b) shall also be monitored and controlled from each Unit control room. 2.02.02 In order for fast, trouble-free and smooth execution and support during Operation and Maintenance period as specified elsewhere in the specification, Bidder/ Contractor/Sub-Contractor or its group of company of the offered DDCMIS system should have a well-established DDCMIS hardware and software service center in India working for at least 5 years from the date of bid opening. 2.02.04 Depending on the cable distance between FGD control room and FGD sub systems such as Gypsum handling system, Limestone handling system etc, requirement of Remote Input Output (RIO) shall be finalized during detail engineering, In such cases, contractor to provide RIO on as required basis. Contractor shall place RIO cabinets inside building with air conditioning environment. Building, Air conditioning, power supply for RIO cabinets shall be in contractor's scope. 2.02.05 The Bidder shall provide software license for all software being used in Bidder's System. The software licenses shall be provided for the organization i.e. it should not be site-specific and shall also not be hardware/machine-specific. That is, if any hardware/machine is upgraded or changed, the same license shall hold good and it shall not be necessary for Owner to seek a new license/renew license due to up gradation/change of hardware/machine in Bidder's System at site. All licenses shall be valid for the continuous service life of the plant. 2.03.00 The above system(s) shall include their respective measurement system for signal acquisition, conditioning and signal distribution of various types of inputs/outputs,			
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2.04.00 2.04.01 2.04.02 2.04.03 2.04.04	meeting specification requirements including respective Hardware requirements as stipulated in Sub-section -DDCMIS, Part-B, Section-VI of Technical Specification. The DDCMIS also envisages fieldbus (Foundation fieldbus/ Profibus) complying with IEC61158 for control and signal acquisition from fieldbus compatible actuators and instruments. Field-bus interface modules shall be provided in each FG. Human - Machine Interface & Plant Information System (HMIPIS) HMIPIS configured around latest state-of-the art servers/Workstations with open architecture supporting OPC/TCP/IP protocols, etc. shall be provided. Control, operation and monitoring of FGD and associated system being provided under the contract is primarily envisaged from Contractor's OWS placed in FGD common control room. In addition to above, it is also envisaged to control, operate and monitor FGD and associated system remotely from main plant Central Control Room (CCR) using OWS placed in CCR. The HMIPIS will include the following as a minimum: Operator Work Station (OWS) in Central Control Room (CCR) and FGD common control room. NTPC shall provide 02 nos. of UPS power feeder per unit from employer's ACDB, for powering FGD OWS located in CCR. Cabling from ACDB to FGD OWS (located in CCR) shall be in bidder's scope of supply. Processing Stations (Servers/Workstations) in redundant configuration including RAM, dual bulk memory etc. Removable storage Media shall be used for historical storage and retrieval and long term storage and retrieval of data. Redundant LAN for communication between various OWS, between OWS and processing stations and OWS. A redundant station-wide LAN for connecting the unitized and common systems of FGD DDCMIS as well for connecting to Employer's Station LAN through firewall. This shall include all cables and accessories required for connecting Contractor's system upto the Employer's systems such as Station LAN, etc. Alternatively, Bidder's standard & proven solution, which is functionally equivalent to redundant system bus and single fault tolerant, shall be acceptable. Adequate measures shall be provided for the security of the DDCMIS including the interface to Employer's Station LAN as detailed at Part-B, subsection DDCMIS. This includes Redundancy in firewall, Connection to Contractor remote service center through VPN technology, etc. Suitable hardware/software for interfacing of FGD DDCMIS with following systems (i) Employer's Station LAN.		
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(ii) Remote diagnostic station for FGD DDCMIS at OEM end. 2.04.05 2.05.00 2.06.00 2.07.00 2.08.00 2.08.01 2.08.02	DDCMIS vendor shall upgrade/ update all DDCMIS system along with release of DDCMIS system software/ patches, meeting the system software requirements as mentioned in DDCMIS chapter, Part-B, SECTION-VI. This shall include the latest supported OS and its corresponding latest version/ release of DDCMIS system software/ patches. The upgrade/ update shall be carried out in the penultimate year of AMC (In case of one year AMC, third month from the date of commencement of AMC). Any change in hardware required for the same shall also be carried out by the contractor within the contract price. Data Communication System System Bus connecting Control System and HMIPIS. Other bus systems for connecting various systems/subsystems of DDCMIS like Cubicle Bus, Local Bus, I/O Bus (Including Remote I/O Bus) soft links (including those from Field Bus based temperature transmitter) as well as within systems/sub-systems of DDCMIS. All the bus systems shall be redundant except for back plane buses which can be non-redundant. Remote Input/ Output Modules Remote input / output modules and cubicles for specified locations in the plant for the signals, which are used for information and Control / Interlock purpose, are to be provided. Annunciation Function The annunciation system shall be built as a part of the control system of the DDCMIS. System programming, diagnostics & documentation facility The programmer station shall be provided for configuration /tuning/structuring of control system and program development /modification of HMIPIS. A Workstation based system documentation facility for automatic generation of system documentation shall be provided to achieve paperless documentation for the project. The diagnostic system shall have elaborate diagnostics facility giving details of fault in I/O modules, other modules and cabinets on OWS in form of display and text messages. Software for determining optimum controller settings for control loops shall be supplied as per subsection DDCMIS, Part-B, Section VI for each unit.		
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2.09.00 2.10.00 2.11.00	Power Supplies Redundant power supply modules/packs for powering the systems described above in system cabinets with necessary auctioneering and distribution. Cabinets (a.) System cabinets housing electronic modules and power pack supplies of system described above. (b.) Marshalling cabinets separate from system cabinets for terminating inputs from field, MCC/SWGR etc., for further wiring to control system and for terminating outputs from control system to MCC/SWGR etc. In case Bidder's system design requires the termination cabinet independent from system cabinet, the marshalling cabinets can be combined with the termination cabinet. In case, the termination arrangement is part of the system cabinet, independent marshalling cabinets shall be provided. (c.) Relay cabinet-housing relays for providing contact outputs by control system to other system wherever contacts are used in circuit/scheme of Control supply/power supply of more than 24 V and in cases where the VA burden is more than the VA burden the Output module can drive. Alternatively, these relays can also be mounted in termination/marshalling cabinets also. It may be noted that relays cannot be mounted in system cabinets. (d.) NOT USED (e.) In case DDCMIS supplier can provide system cabinet with suitable partition to create separate marshalling area on the rear side of the system cabinet, ensuring that dust ingression does not take place in system area, the same can also be accepted subject to Employer's approval during detailed engineering stage. (f.) The design of control system cabinets with fieldbus components shall be finalized during detailed engineering stage. The contractor shall propose suitable design of these cabinets keeping in view, ease of operation and maintenance and minimizing entry of dust to cabinets for Employer's approval. Warranty and Annual Maintenance Contract		
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	Warranty and Annual Maintenance Contract (AMC) for DDCMIS, as per Sub-section DDCMIS, Part -B, Section-VI of Technical Specification.			
2.12.00	Representative of OEM shall also be required to be present during Factory acceptance testing (Authorization to shipment test ATST) of respective DDCMIS for testing of finally implemented control system. Logic/HMI implementation for various DDCMIS system shall be done in Uniform way and documents of these shall be furnished in uniform format, as approved by Employer.			
2.13.00	Control System Spare Capacity			
2.13.01	Over and above the equipment and accessories required to meet the fully implemented system as per specification requirements, DDCMIS shall have spare "Usable" capacity and necessary hardware/ equipment/ accessories to meet following requirement for future expansion at site:			
2.13.02	10 % spare channel shall be provided in each functional groups for each type of input / output fully wired up to the marshalling/ termination TBs.			
2.13.03	Wired-in "usable" space for 20% modules along with Field Terminal assemblies, PCB/Connectors (if any in the offered system) in each of the system cabinets for mounting electronic modules shall be provided by the Contractor for future use.			
2.13.04	Each controller shall have 20% spare functional capacity to implement additional function blocks, over and above implemented logic/ loops. Further, each controller shall have spare capacity to handle minimum 30% additional inputs/ outputs of each type mentioned in clause 2.13.02 & 2.13.03 above, over and above implemented capacity. Each of the corresponding communication controllers shall also have same spare capacity as that of controller.			
2.13.05	Ten (10) percent spare relays of each type and rating, mounted and wired in relay cabinets. All contacts of relays shall be terminated in terminal blocks of relay cabinets. In each of the relay cabinets, 10 % spare terminal blocks shall be provided so that additional relays can be mounted and wired.			
2.13.06	Twenty (20) percent spare terminal blocks in each marshalling cabinets.			
2.13.07	The spare capacity as specified above shall be uniformly distributed throughout all functional groups. The system design shall ensure that above mentioned additions shall not require any additional controller/processor/ peripheral drivers/ cabinets in the system delivered at site. Further, these additions shall not deteriorate the system parametric requirements like response time / duty cycle, etc. from those stipulated under this specification and shall meet other redundancy / functional requirement.			
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2.13.08	The above mentioned requirements are generally applicable for conventional system. For fieldbus based system refer Annexure IIIC-02K of Part-B for spare requirements. In FGs where mix of conventional and fieldbus based system is used, the spare shall be in the respective proportion.			
2.14.00	The contractor has top provide kks codes for instrument and drives in the P&ID and other related document.			
2.15.00	Output redundancy is applicable for 10% of drives distributed in various functional groups. Exact application shall be finalized during detailed engineering.			
2.16.00	Complete wiring / cabling from field devices to panels / MCC and vice versa including conduits / trays / fixtures etc. shall be in bidders scope.			
3.00.00	MEASURING INSTRUMENTS			
	The following shall be provided as a minimum, meeting specification requirements of Sub-section - MEAS INST of Part-B, Section-VI of Technical Specification.			
3.01.01	Primary instruments like Microprocessor based transmitters employing HART/ Fieldbus protocol, thermocouples & RTDs along with temperature transmitters, pressure/diff. pressure/temperature/flow (Ultrasonic/electromagnetic) transmitter & gauges, flow sensing elements (orifice plates, flow nozzles etc), Ultrasonic, Radar type level transmitters, density meter (Coriolis type. In case the bidder proposes other type of density meter as per the bidder standard and proven practice, the same shall also be acceptable except Nucleonic type density meter), pH analyser, SO2 analyser, Flue Gas flow transmitter, vibration monitoring system (VMS) etc. for: (a) FGD plant and other system being provided under the contract, as indicated in enclosed tender diagrams (Part E) of this specification. (b) All Instruments which are Integral to equipment like pumps, motors etc. / skid mounted instruments and are not indicated in enclosed drawings (as applicable) or in BOQ etc. included in relevant sub-sections, but are required for control, monitoring and operation of the equipment/plant/ Systems are to be provided by the Contractor to meet actual system requirements meeting redundancy and other requirements specified under technical specifications subject to Employer's approval. Specification / type of instruments shall be as per standard and proven practice of equipment supplier. However, for temp elements including bearing / winding temp of motors / pumps temp transmitters shall be provided. (c) For Binary and analog inputs required in major equipments of FGD system protection, triple-sensing devices shall be provided. Binary and analog			
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	1	HNE10CQ005	SO2 in stack emission	0-100 /0-1000 mg/Nm3 (SELECTABLE)	CHIMNEY	
	2	HNE10CQ001	NOX in stack emission	0-100 /0-1000 mg/Nm3 (SELECTABLE)	CHIMNEY	Refer note-2
	3	HNE10CQ002	CO2 in stack emission	0-25% (Selectable)	CHIMNEY	
	4	HNE10CQ004	CO in stack emission	0-100/ 0-1000 mg/Nm3 (SELECTABLE)	CHIMNEY	
	5	HNE10CQ003	Particulate Matter (Dust Density) in stack emission	0-50 mg/Nm3 / 0 – 300 mg/Nm3 (PROGRAMMABLE)	CHIMNEY	
	6	HNE10CQ006	Mercury (Hg) in stack emission	0 - 35 microgram/Nm3	CHIMNEY	
	7	HNE10CQ007	Flue Gas flow at stack	To be Decided during Detail Engineering.	CHIMNEY	
	NOTES: 1. SO2, NOX, CO2 and CO analyser are shown separately for the purpose of input only otherwise SO2, NOX, CO2 and CO analyser may be supplied as a single unit/ Combined Unit (s) meeting specification requirement. 2. Direct measurement of NO and NO2 shall be done. Total NOx values shall be reported as NO2 i.e. NOx = NO + NO2 = NO X 1.53 + NO2 = NOx as NO2. 3. Oxygen (O2) measurement in stack emission based on Paramagnetic/ Zirconia type instrument shall be provided by the Contractor for correction of SO2, NOx and Particulate matter value corresponding to the standard/reference O2. 4. CEMS Parameters shall be normalized for temperature, pressure, moisture (applicable in case of wet measurement techniques), etc.. This facility shall be available in the respective analysers. Necessary measurement shall be provided by the Contractor for these parameters. All the CEMS parameters shall be reported on dry basis. 5. CO2 Measurement at stack and at instrument end shall be provided in case dilution techniques are used. 6. Offered CEMS should comply with latest CPCB/regulatory requirement prevailing at the time of award of the contract even if same is not explicitly indicated in the technical specification, without any cost implication to the Employer. 7. Offered CEMS shall be fully proven for the actual flue gas parameters at stack. Reference list and user feedback of offered CEMS in similar applications shall be furnished to NTPC for review during detailed engineering					
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stage. 8. These are per unit quantities. 9. Analyzers mentioned in S.No. 1 to 5 of the above <i>list of flue gas analyzers for CEMS</i> are not applicable for BARH-I project. However, Oxygen (O₂) measurement in stack emission based on Paramagnetic/ Zirconia type instrument shall be provided by the Contractor for BARH-I project for correction of SO₂, NO_x and Particulate matter value corresponding to the standard/reference O₂. 3.03.02 3.03.03 3.03.04 3.04.00 3.04.01 3.04.02 3.05.00	CEMS analysers/instruments shall be provided with provision for bidirectional connectivity over Modbus/RS-232/RS-485 with Employer's central cloud server for real time data monitoring, remote diagnostics & remote calibration checks, etc., complying with CPCB IT Division document "Protocol for real time (Emission & Effluent) data management from industries version 1.2 (10.6.2015), CPCB Guidelines July-2017 on CEMS or the latest regulatory requirement prevailing at the time of award of the contract. All necessary hardware and software required at instrument end shall be provided by the Contractor. Necessary details like scheme, register addresses of analyzer, etc. shall also be provided by the Contractor for implementation of above. The Contractor shall fully assist NTPC's agency involved in implementation of above connectivity. For CEMS - In addition to above requirement, 4-20 mA connectivity to DDCMIS shall be provided by the Contractor. Comprehensive Annual Maintenance Contract (AMC) for three (03) years after warranty period shall be provided by the contractor for CEMS and Analysers of FGD System. SERVICES DURING DEFECT LIABILITY PERIOD FOR CEMS AND ANALYSER INSTRUMENTS OF FGD The Contractor shall provide an unlimited warranty on all equipments during the Defect liability period. This warranty shall include repair, replacement, replenishment of consumables (for e.g. reagents, calibration gases etc. as applicable) and correction of identified discrepancies including Analysers, Sample Handling System, Transmitters, (as applicable) etc. at no cost to Employer. The Contractor shall provide warranty spares including components for each system based on (and keeping adequate over margin) normally experienced failure rate. Exhaustive list of all such items shall be submitted along with Datasheet for Employer's review and approval during details Engg stage regarding adequacy of the same. The warranty spares as per the list mentioned above will be dispatched by the Contractor along with the main equipment consignment. However for items which have a limited shelf life shall be dispatched in a phased manner during the warranty period. Unused spares/consumables shall be Contractor's property after expiry of warranty period and shall be taken back. SERVICES DURING ANNUAL MAINTENANCE CONTRACT (AMC) PERIOD FOR CEMS AND ANALYSER INSTRUMENTS OF FGD		
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3.05.01	The Contractor shall provide complete maintenance services for each System under comprehensive Annual Maintenance Contract (AMC) for period of three years after the Warranty period.			
3.05.02	The AMC shall cover total maintenance of all Analysers, Sample Handling System, Transmitters etc. coming under the scope of each system and shall include free repair/replacement of each items, replenishment of consumables, correction of problems (if any) and supply of expendable items.			
3.05.03	Further, Contractor may note that during the AMC he will be allowed to use Employer's mandatory spares, but has to replenish the same within three months' time or before completion of AMC period whichever is earlier.			
3.05.04	The Contractor shall prepare detailed list of faults corrected and parts, expendables utilized during AMC period and shall furnish the same to Employer, properly documented at the end of AMC period. Further, during AMC period the details as required by Employer/ Project Manager shall be made available by Contractor's personnel.			
3.05.05	Contractor shall also provide a list of all required AMC spares which shall be finalized along with datasheet during detail Engineering stage. These spares will be dispatched by the Contractor at the beginning of AMC on yearly requirement basis. However for items which have a limited shelf life shall be dispatched in a phased manner during the AMC period. Unused spare/consumable shall be Contractor's property after expiry of AMC period and shall be taken back.			
3.06.00	DEPUTATION OF ENGINEER/ TECHNICAL EXPERT FOR CEMS AND ANALYSER INSTRUMENTS OF FGD			
3.06.01	Contractor shall depute Technical Experts of the OAM /OEM/OES/ (Original Analyser Manufacturer/Original Equipment Manufacturer/Original Equipment supplier) for each of the above system at Site, who will be fully qualified to perform the required duties, supervision of maintenance, repair etc. for a period of six month. Employer will intimate the contractor two weeks advance notice for start of deputation period.			
3.06.02	After expiry of above six month period, Technical expert for each system shall visit site on monthly basis for monitoring the performance and rectify the problem (if any) for each system for the remaining warranty period and during entire AMC period. In the event of any malfunction/fault/failure in the system or any component thereof contractor shall depute Technical expert of respective system to reach site within 48hrs of call raised by site during the remaining warranty period and entire AMC period.			
3.07.00	Material Codification of C&I items in NTPC SAP system: a. Contractor to provide detailed catalogue with complete part number of all the instruments, Electronic cards, accessories, JB's, Panels, etc. to Site Erection			
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	b) All power supply distribution cables required for directly connecting two equipment / systems devices in contractor's scope shall be provided by the contractor. All these cables shall be FRLS & as per IS-1554 Part – I latest edition. c) Above cables shall be provided along with necessary laying & termination accessories, hardware etc. meeting requirements specified under Sub-section INST CABLE, Part -B, Section-VI of Technical Specification. All sub trays along with supporting, connecting hardware etc. required for laying of instrumentation, control, power and other cables etc. up to main cable trays are under Bidders scope. d) Cables required for interfacing FGD DDCMIS with Employers DDCMIS (both SG and BOP) located in CER shall be in bidder's scope. e) Cables for connectivity of CEMS signals to Employer's Unit DDCMIS located in unit CER shall be in bidder's scope. f) Junction boxes with requisite terminals shall be provided on as required basis. Grouping, Assignment, Sequence of termination of various field instruments /drive signals (if applicable) to Local junction boxes shall be subject to Employer's approval during detailed engineering.		
6.00.00	CONTROL VALVES & ACTUATORS		
6.01.00	Control valves, actuators and accessories, shall be provided on as required basis for meeting requirements specified under Sub-section CONTROL VALVE, Part-B, Section-VI of Technical Specification. Specially designed valves/trims to prevent cavitations and limit noise and control outlet velocity, shall be provided.		
6.02.00	Microprocessor Based Electronic Positioner is to be provided on as required basis with all the Control valves and all control dampers being provided by the contractor.		
7.00.00	ELECTRICAL POWER SUPPLY		
	Microprocessor based modular 24V DC power supply system shall be used for powering the control systems including its network devices. 24V DC power supply system for DDCMIS based control system shall comprise of two sets, each set shall consist of 1 x 100% microprocessor controlled, intelligent, modular rectifier banks, Controller – one for each rectifier bank, 1 x 100% Nickel - Cadmium batteries for one (1) hour duty, 1 X 100% DC distribution board. 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS)–common for both the sets.		
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	Contractor shall provide UPS of suitable capacity for the intended application meeting the requirements of Technical Specifications as stipulated under Part B, Section VI. Contractor shall provide Mini UPS for each server station as minimum. Contractor to note that UPS of configuration C is acceptable only upto 5 KVA. In case the consolidated load requirements exceeds 5 KVA, Contractor to provide UPS with Configuration B in place of Configuration C as per Technical Specifications as Part B, Section VI. Bidder shall provide power supply distribution panels/cabinets/boxes for sub distribution of DC/Main UPS/Utility feeders on as required basis. The power supply distribution box shall include change over circuitry, switch fuse units, MCBs, terminal blocks etc. suitable for application. For detailed requirements of FGD system, refer Sub-Section III-C, Part B Section VI of technical specifications. 8.00.00 TYPE TEST REQUIREMENT The type tests to be conducted for C&I systems & equipments shall be as detailed out in Sub-Section-C-06 Type Test Requirements, Part-B, Section-VI of Technical Specification. 9.00.00 TOOLS & TACKLES The Contractor shall furnish a complete new set of all special tools and tackles of reputed make and model which are required for erection, ease in maintenance to have minimum down time, testing and calibration of all the equipments and systems to be provided by the Contractor under this specification for C&I systems. 10.00.00 Interfacing with Employer's DDCMIS 10.01.00 Hardwired Signal exchange: Hardwired signal exchange between BOP DDCMIS/ CHP DDCMIS (under Employer's scope) and FGD DDCMIS (under Contractor's scope) like bypass damper status, inlet and outlet gates status, ID Fans status, ESPs status, Boiler Load Index (BLI), MFT etc. shall be provided on as required basis, for implementation of protections and interlocks. Contractor shall provide one Remote Input Output (RIO) per unit, placed in Central Equipment Room (CER) for the same. However, contractor to consider IOs and cables for minimum number of hardwired signal exchange per unit as follows DI – 130, DO – 130, AI – 50 and AO – 50. NTPC shall provide 2 (Two) nos. of 24V DC power supply feeders per unit from employer's DCDB, for powering RIO panel located in CER. Cabling from DCDB to RIO panel (located in CER) shall be in bidder's scope of supply.		
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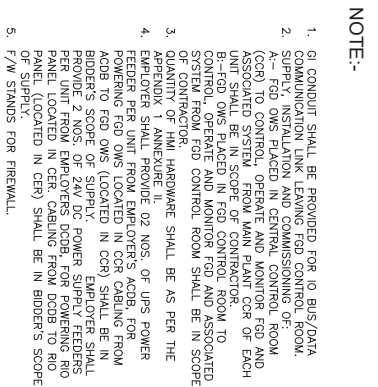
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10.02.00	The Contractor shall provide all assistance to the BOP C&I (in Employer's scope) supplier including co-ordination and flow of required information etc.			
10.03.00	Contractor shall provide complete logics for FGD and associated system such as booster fan blade pitch control, FGD bypass damper control, FGD inlet and outlet gate control etc. FGD OEM shall furnish recommendations, if any, for implementation in employer's DDCMIS for boiler control.			
10.04.00	Contractor to refer the General Layout Plan (GLP) to estimate the distance between FGD control room and Employer's CCR/CER.			
11.00.00	Grounding System Suitable electronic grounding is to be provided by the contractor for all C&I equipments/panels/desk in the scope of the contractor. The exact scheme shall be as finalized during detailed engineering. Also refer Sub-Section titled "Basic Design Criteria" in Part-B, of this Technical Specification.			
12.00.00	Electric Actuators Fieldbus based Non-Intrusive Electrical Actuators with integral starters along with associated accessories etc. shall be supplied on as required basis for Valves / Dampers to meet the functional and the other specification requirements specified elsewhere in the Technical specification. For detailed specification refer chapter "Electric Actuator", Part B, Section-VI. These actuators shall comply the common requirements of actuators as specified at clause 2.00.00 and specific requirements of Non-Intrusive fieldbus actuators as specified at clause 4.00.00. Specific requirements of Non-Intrusive hardwired actuators specified in clause no. 3.00.00 are not applicable for this project. For Blade pitch actuators specification clause no. 5.00.00 shall be complied. The protocol of fieldbus based non-intrusive electric actuators shall be matching with fieldbus protocol of FGD System DDCMIS, and the same shall be subject to Employer's approval. For erection and commissioning of above specified actuators, qualified and experienced engineers of actuator manufacturer shall be deputed at site. After successful commissioning of actuators, minimum one qualified and experienced engineer of main package supplier/ actuator manufacturer shall be continuously available at site up to completion of defect liability period (warranty) of actuators, for troubleshooting and maintenance of actuators and proper interfacing with DDCMIS. Qualified and experienced engineers indicated above shall have expertise in all aspects of non-intrusive actuators along with fieldbus protocol and interfacing with DDCMIS.			
13.00.00	CONTROL DESK , PANELS AND FURNITURES			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, BID DOC. NO.: CS-0011-109(1A)-2	PART-A SUB-SECTION-III-C (C&I)	PAGE 17 OF 19

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	Contractor shall provide control desk placed in FGD common control room, Central Control Room (CCR) meeting specification requirements stipulated under sub section Control Desk, Panels and Furniture PART-B, Section VI of technical specification. Contractor shall provide control desk in CCR of each generating unit, of length 2 meter aesthetically matching with the existing control desk of main plant Central Control Room (CCR) for placing FGD OWS in main plant CCR. The minimum quantity of furniture per generating unit, envisaged in FGD control room is as mentioned below: a) Chair-3 nos. b) Printer table- 1 no c) Computer table- 2 no. d) Key pad- 1 no. e) Locker set -1 no Server rack, PC rack and workstation furniture shall be provided on as required basis. 14.00.00 SCOPE OF SERVICES 14.01.00 The Contractor or his sub-vendor(s) / associate(s) / engineering firm(s) shall have established engineering setup including skilled & experienced manpower, engineering software(s) and other required resources for carrying out basic and detailed engineering of control and instrumentation systems of FGD System. The Control and Instrumentation engineering shall include the following as a minimum. a. Preparation of basic logic / loop diagrams (not just the implementation), I/O list, Drive list, instrument list etc for each of the plant areas of the complete plant including offsite systems based upon the flow schemes / write ups by the OEM's. b. Engineering of power supply system for DDCMIS, Process connection and piping, Control valves etc. c. Instrumentation, cable engineering including preparation of interconnection cable diagram, cable schedule etc. d. The contractor shall deploy certified and experienced engineers in the system design of fieldbus during engineering and commissioning of fieldbus		
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, BID DOC. NO.: CS-0011-109(1A)-2	PART-A SUB-SECTION-III-C (C&I)	PAGE 18 OF 19

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	system. Further, the certified fieldbus engineers shall be available during commissioning of fieldbus instruments and actuators. Protocol will be signed with NTPC site engineer for successful commissioning of fieldbus instruments, actuator along with control system. The name(s) of such certified fieldbus commissioning engineer's shall be approved by Employer and for this the contractor shall submit CV/ experience details of proposed engineers. Further, the contractor shall provide training to employer's personnel on following aspects of fieldbus (i) Hardware & Software features (ii) System design, diagnostic and testing (iii) maintenance, troubleshooting and fault analysis. This training shall be provided by certified training agencies of foundation fieldbus/ Profibus foundation and it shall be provided before approval of basic design and engineering document. The block logics shall be in the format as approved by NTPC during detailed engineering stage. For other services refer relevant sections of bidding documents.		
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, BID DOC. NO.: CS-0011-109(1A)-2	PART-A SUB-SECTION-III-C (C&I)	PAGE 19 OF 19

A Operating Devices & their locations						
	Flue Gas Desulphurization (FGD) HMI					
	Units	Qty per unit	Qty-Common	Location	Areas for which Primary Operating Point	Areas for which Secondary Operating Point
OWS for operation from Main plant Units	No	2		In each Unit Control Room		Absorber and associated systems of respective Unit, Gypsum dewatering handling, Lime Stone preparation & handling and other systems being supplied under the contract.
OWS for FGD common control room	No		4 (applicable for project with one generating unit/stage) 5 (applicable for project with two generating unit/stage) 6 (applicable for project with three generating unit/stage) 7 (applicable for project with four generating unit/stage)	FGD common control room	Absorber and associated systems of respective Unit, Gypsum dewatering handling, Lime Stone preparation & handling and other systems being supplied under the contract.	
	Flue Gas Desulphurization (FGD) HMI					
	Units	Qty per unit	Qty-Common	Location	Remarks	
Servers / Information Workstations	No		2	FGD Common Control Room	These shall function in redundant mode. OWS functionality is to be merged with Servers / Information Stations.	
Programmer cum Documentation Station (Refer note-2)	No		1	FGD Common Control Room		
Laser jet colour printer (A4 size)	No		1	FGD Common Control Room		
	Hardware for connectivity with Employer's Station LAN					
Station wide redundant LAN	set		1			

Hardware Firewall in failover mode	Nos				2		
Network Management Software	set				1		
Test Server alongwith requisite Software	set				1		
Mini UPS (1 no. for each Server Grade Machine)							
HMIPIS Cabinets: Cabinets for mounting network components & power supply distribution equipment (for each DDCMIS, Station LAN etc.)		On as required basis					
1. Not used							
Not used							
2. (i) In case, separate control system programming device is required, same shall be provided for each DDCMIS system.							
(ii) For each of the non-DDCMIS based controls being provided for any system, 1 set of programming tool for each such system shall be provided to view & change logic/program/settings.							
3. Redundant master clock are located in CER. Interconnecting cables shall be on as required basis.							
4. Software for DDCMIS meeting requirements specified under item "SYSTEM SOFTWARE REQUIREMENTS" sub-section DDCMIS, Part-B, Section-VI of technical specifications shall be on as required basis for all the DDCMIS.							
5. Data communication system shall be on as required basis. One set of suitable interfaces and links for connectivity between FGD unit LAN, FGD common LAN and employer's Station LAN shall be provided per DDCMIS, as applicable. Cubicles for mounting networking components and power supply distribution equipment shall be provided on as required basis.							
6. Not used							
7. Not used							
8. Not used							
9. Not used							
10. Not Used							
11. Spare Capacity for HMIPIS							
Each Sub-system HMIPIS shall be provided with capacity to handle at least 30% of each type of peripherals/equipments, additionally, like OWS, printers, etc, over and above already specified, without any additional hardware or software. Further, the Data communication system (including Main system Bus and other bus system), HMIPIS database, Server/Information workstation etc. shall be able to handle 30% extra signals over and above all process as well as calculated (at controller level) signals including the tag nos./process variables being acquired from other DDCMIS sub-system through various links meeting the specification requirements. Usable space of 20% shall also be kept in network panels of each HMIPIS for mounting network components.							



एन टी पी सी
NTPC

NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

TYPICAL THERMAL POWER PROJECT

TITLE:- STANDARD CONFIGURATION DIAGRAM FOR CONTROL SYSTEMS

[illegible]

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC	
	CONTAINERISED ROOM (PORTABLE CABIN)				
1.00.01	Enclosure rating & Design - For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% shall be considered. The equipment shall operate in a highly polluted environment. - CONTAINERISED ROOM (PORTABLE CABIN) shall be designed for outdoor application.				
1.00.02	General Description The Containerised room shall meet all requirements of analysers and analyser panels. - Containerised room would be closed type, weather proof and made of CRCA steel construction. - It shall withstand heavy monsoon, heavy rain and heavy wind condition. - Doors would be equipped with hydraulic door closer. - Each door shall be fitted internally with "panic" bar exit handles and externally with key lockable handles. Exterior handles will be of stainless steel. - Door will be provided with heavy-duty latches, hinges, door stop and pad lock. - Personnel doors would be provided with canopy with necessary rubber gaskets to prevent the entry of water. - The Containerised room shall be air-conditioned to maintain an air temperature less than 27°C. - The Containerised room shall be designed as multiple modular transportable units; they shall be modularized for ease of separation for transport and quick re-assembly at site. - Split Modules shall be designed for lifting as single piece along with equipment's. - Lifting lugs should be designed to carry the weight of the Containerised room including all the Electrical panel boards. - Suitable lifting provisions and accessories shall be provided along with Containerised room.				
1.00.03	Structural Arrangements 1) Frame The pre-fabricated enclosure(s) frame shall be constructed as a rigid, self-supporting steel structure. Structural steel design and fabrication shall be in accordance with AISC Manual of Steel Construction. Construction Materials * Steel: load bearing members: IS 10748; Grade IV * Structural Steel: IS 2062. * Side-end walls & roof panels: IS 2062.				
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		BIDDING DOC. NO.: CS-0011-109(1A)-2	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B	SUB-SECTION-IIIC-11 CONTAINERISED ROOM (PORTABLE CABIN)	PAGE 1 of 4

CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC
	* Square/Rectangular hollow sections: JIS STKR-41 / IS 1161 The roof framing and the columns shall be designed to support any additional dead load suspended from the roof such as air conditioning duct, false ceiling, cable trays, light fixtures, and piping. The pre-fabricated enclosure(s) floor framing (skid) shall be fabricated from ASTM A36/ JIS 3101 or Equivalent steel members to form a rigid rectangular frame. The frame shall be braced with cross members as required to support the equipment installed in the building. The pre-fabricated enclosure(s) shall be analyzed to resist both dead and live loads expected during construction, transportation, installation, and operation. The pre-fabricated enclosure(s) shall be designed for the maximum in-place Structural loading consisting of the structure, equipment dead weight, all operating loads, and the maximum environmental loads 2) Shell and Base frame The outer shell of the Containerised room shall be manufactured with 1.6mm sheet. The main load bearing members such as posts, base members, bottom and top side rails, end rails headers are selected based on approved structural analysis. Lifting hooks shall be provided at minimum at corners. The adequacy of the same shall be verified by structural analysis. Adequate number of doors with reinforced framework and locking device shall be provided as per requirement. The door has to be effectively sealed against water ingress in closed condition. The shell structure is to be rigid enough to withstand rough handling rigorous transportation hazards etc. and able to stand flexing/distortion even when placed on uneven ground. Base members are to be made from press formed steel sections of appropriate Geometry of required thickness. Base frame design shall be accommodating the panels provided inside the room. Panel mounting structure shall be fabricated and drilled with holes for fixing bolts for the site erection panel during site erection. 16 gauge galvanized sheet for cable protection at the bottom sheeting plate. 3) Side & End Walls External walls are to be vertically corrugated 1.6 mm thick GI/CRCA conforming to IS 2062/IS 513. The corrugated panels shall form entire side wall and the assembled side wall shall be assembled with the peripheral frame members. 4) Roof				
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	BIDDING DOC. NO.: CS-0011-109(1A)-2	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B	SUB-SECTION-IIIC-11 CONTAINERISED ROOM (PORTABLE CABIN)	PAGE 2 of 4	

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	The roof has to be manufactured from 1.6 mm thick GI/CRCA conforming to IS 2062. The roof will have sloping arrangement for effective drainage. 5) Flooring System Floor plating shall be covered with a non-skid surface. The exposed floor shall be covered with a insulating material as per statutory requirement. 6) Insulation Containerised room will be insulated on sides, end walls, roof & doors with 50mm thick Glass Wool/Rockwool insulation. Densities should be 48 kg/m3 7) Inner Paneling Interiors of the Containerised room shall be aesthetically finished so as to give a pleasing appearance with high quality workmanship. All joints shall be neatly finished. For side, roof and end walls paneling will be done with 1.6mm thick Galvanized sheet. 8) Doors All exterior doors shall be of weather-proof construction with four sided frames. All exterior hardware shall be stainless steel, including, but not limited to hinges. Hinges shall be concealed type. If non concealed type then the hinge should be tamper proof arrangement. Doors shall be fabricated from aluminum with SS panic hardware. Doors shall be lockable with one key for all doors. Provide four keys total. Two doors of Aluminum shall be provided unless otherwise specified. One equipment door and one personnel door shall be provided. The size of equipment door shall be as per equipment sizing. One personnel door minimum 1.2M x 2.5M shall be provided. Doors shall be of 4 hours fire rated. 9) Protective Coating Procedure All steel structure members shall be cleaned prior to finishing. Standard interior finish shall be white. After welding do abrasive blast – SA 2 1/2 thereafter below process to be adapted A) Internal Panels Painting (Walls & Roof) :- Powder Paint Sheet ➤ Surface Preparation/Primer :Intercure 200HS Min 150 um ➤ Finish : Interthane 990 Min 50 um ➤ Total Minimum DFT shall be 200 um B) Exterior Panels Painting (Walls, Roof & Base structure) : Powder Paint Sheet ➤ Surface Preparation/Primer : Interzinc 52 Min 75 um ➤ Coating : Interguard 475HS Min 200 um			
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	BIDDING DOC. NO.: CS-0011-109(1A)-2	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B	SUB-SECTION-IIIC-11 CONTAINERISED ROOM (PORTABLE CABIN)	PAGE 3 of 4

CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC
	➤ Finish : Interthane 990 Min 50 um ➤ Total Minimum DFT shall be 325 um Both Interior and exterior panels, roof and base frame will be painted in colour shade of RAL 5012. 10) Grounding Internal Earthing inside enclosure with suitable cross sectional GI flats. The building shall be furnished complete with ground pads which shall bond of electrical equipment enclosure frames and ground buses to the building frame at the exterior base in two locations and at opposite ends of the building so as to provide a continuous path to ground. The Grounding system shall connect to each end of the ground bus in each assembly of installed equipment. 11) Lighting The lighting system shall maintain minimum levels as given below: Lux level shall be 200 inside the Containerised room and outside platforms/ stairs shall be 100 Lux. All luminaries shall be suitable for industrial duty and provided with IP65 housings for outdoor enclosures and IP54 for indoor enclosures. All fittings shall be weatherproof and able to withstand direct hosing. The wiring for lighting shall be routed through GI conduits either concealed or the wall of the enclosure External light around Containerised room only shall be considered. All Light Fixtures shall be high efficiency LED type only. 12) Lifting Tools and Tackles Suitable lifting system shall be designed and furnished. The system will consist of a spreader bar, slings, shackles and other tools to lift the equipment building in one piece A lifting system installation & operational diagram shall accompany all shipping documents.				
LOT-1A PROJECTS, FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	BIDDING DOC. NO.: CS-0011-109(1A)-2	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B	SUB-SECTION-IIIC-11 CONTAINERISED ROOM (PORTABLE CABIN)	PAGE 4 of 4	

Mauda TPP**SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration	: 0.17g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.043
b)	For special concentrically braced steel frames designed and detailed as per IS:800	: 0.032
c)	For special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.026
d)	for RCC chimney	: 0.085
e)	For Liquid retaining tanks	: 0.051
f)	for Steel chimney, Absorber tower, Vessels	: 0.064
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.043
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.085

Note:

1. g = Acceleration due to gravity
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015

KUDGI STPP

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.15g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.038
b)	For special concentrically braced steel frames designed and detailed as per IS:800	: 0.028
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.023
d)	for RCC chimney	:0.075
e)	For Liquid retaining tanks	:0.045
f)	for Steel chimney, Absorber tower, Vessels	: 0.056
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.038
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.075

Note:

1. g = Acceleration due to gravity
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015

GADARWARA STPP**SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.18g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.045
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.034
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.027
d)	for RCC chimney	: 0.09
e)	For Liquid retaining tanks	:0.054
f)	for Steel chimney, Absorber tower, Vessels	: 0.068
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.045
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.09

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

DARLIPALI STPP**SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.10g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.025
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.019
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.015
d)	for RCC chimney	:0.05
e)	For Liquid retaining tanks	:0.03
f)	for Steel chimney, Absorber tower, Vessels	: 0.038
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.025
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.05

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

SOLAPUR STPP

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.16g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d)	for RCC chimney	:0.08
e)	For Liquid retaining tanks	: 0.048
f)	for Steel chimney, Absorber tower, Vessels	: 0.06
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

TANDA STPP**SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.16g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d)	for RCC chimney	:0.08
e)	For Liquid retaining tanks	: 0.048
f)	for Steel chimney, Absorber tower, Vessels	: 0.06
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

MEJA STPP

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.12g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.03
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.023
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.018
d)	for RCC chimney	: 0.06
e)	For Liquid retaining tanks	: 0.036
f)	for Steel chimney, Absorber tower, Vessels	: 0.045
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.03
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.06

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

NEW NABINAGAR STPP

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.16g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d)	for RCC chimney	: 0.08
e)	For Liquid retaining tanks	: 0.048
f)	for Steel chimney, Absorber tower, Vessels	: 0.06
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration	: 0.16g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	For special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b)	For special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d)	for RCC chimney	:0.08
e)	For Liquid retaining tanks	:0.048
f)	for Steel chimney, Absorber tower, Vessels	: 0.06
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration	: 0.24g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	For special moment resisting steel frames designed and detailed as per IS:800	: 0.06
b)	For special concentrically braced steel frames designed and detailed as per IS:800	: 0.045
c)	For special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.036
d)	for RCC Chimney	: 0.12
e)	for Liquid retaining tanks	: 0.072
f)	for Steel chimney, Absorber tower, Vessels	: 0.09
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below in general (excluding special structure/ configuration/materials)	: 0.06
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.12

Note:

1. g = Acceleration due to gravity
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.16g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d)	for RCC chimney	:0.08
e)	For Liquid retaining tanks	: 0.048
f)	for Steel chimney, Absorber tower, Vessels	: 0.06
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.



BH No.: 53

PROJECT: Geotechnical Investigation work for the proposed Super Thermal Power Project at Lara, Raigarh, CH.

RL: 203.250

Date of start : 13/02/2012

Depth of Water table : 4.50 m

Date of finish : 20/02/2012

Project No. 1930
Location: Chinmev
Co-Ordinates: 152E, 1957S

Location: Chinmev

152E, 1957S

[illegible]



SOIL ENGINEERING CONSULTANTS

PROJECT: Geotechnical Investigation work for the proposed Super Thermal Power Project at Lara, Raigarh, CH.

Co-Ordinates: **152E, 1957S**

Job No: **1930**

Location: **Chinmey** BH No.: **53** DEPTH : **35.00 m** Depth of Water Table : **4.50 m**

Date of Start : **13/02/2012**

Date of Finish : **20/02/2012**

REDUCED LEVEL	DEPTH	LITHOLOGY		Size of core pieces	STRUCTURAL CONDITIONS		PERCENT CORE RECOVERY	RQD	SIZE OF HOLE	GROUT	CASING OTHER SIZES mmNX BX AX	DEPTH OF WATER LEVEL	WATER LOSS NO PARTIAL COMPLETE	PERCOLATION TEST			PERMEABILITY	REMARKS
		DESCRIPTION	LOG		TEST SECTION	BY APPLIED PRESSURE METHOD PRESSURE (kg/sq.cm)								LOSS(l/m)	BY FALLING HEAD METHOD DEPTH OF WATER LEVEL TIME INTERVAL			
195.150	8.10	Highly weathered disintegrated Rock		< 10 mm size													CR(CM)=Nil CR(%)=Nil RQD(%)=Nil N>100	
194.250	9.00			10 to 25 mm														CR(CM)=16 CR(%)=11 RQD(%)=Nil N>100
192.750	10.50			25 to 75 mm													CR(CM)=21 CR(%)=14 RQD(%)=Nil N>100	
191.250	12.00			75 to 150 mm					NX								CR(CM)=43 CR(%)=29 RQD(%)=Nil N>100	
189.750	13.50	Highly weathered highly fractured grey to pinkish color Limestone		> 150 mm													CR(CM)=22 CR(%)=15 RQD(%)=Nil N>100	
188.250	15.00									NX								CR(CM)=10 CR(%)=7 RQD(%)=Nil N>100
186.750	16.50																CR(CM)=19 CR(%)=13 RQD(%)=Nil N>100	
185.250	18.00																CR(CM)=32 CR(%)=21 RQD(%)=Nil N>100	
183.750	19.50								NX								CR(CM)=34 CR(%)=23 RQD(%)=Nil N>100	
182.250	21.00																CR(CM)=15 CR(%)=10 RQD(%)=Nil N>100	
180.750	22.50																CR(CM)=15 CR(%)=10 RQD(%)=Nil N>100	



SOIL ENGINEERING CONSULTANTS

PROJECT: Geotechnical Investigation work for the proposed Super Thermal Power Project at Lara, Raigarh, CH.

Co-Ordinates: **180E, 1957S**

Job No: **1930**

Location: Space for FGD II BH No. : 54 DEPTH : 45.00 m Depth of Water Table :5.25 m Date of Start : 02/01/2012 Date of Finish : 10/01/2012

REDUCED LEVEL	DEPTH	LITHOLOGY		LOG	STRUCTURAL CONDITIONS	PERCENT CORE RECOVERY	RQD	SIZE OF HOLE	GROUT	CASING OTHER SIZES	DEPTH OF WATER LEVEL	WATER LOSS	PERCOLATION TEST				PERMEABILITY	REMARKS
													TEST SECTION	BY APPLIED PRESSURE METHOD	BY FALLING HEAD METHOD	TIME INTERVAL		
		DESCRIPTION	Size of core pieces		DESCRIPTION					mmNX BX AX		NO PARTIAL COMPLETE	PRESSURE (kg/sq.cm)	LOSS(l/m)	DEPTH OF WATER LEVEL			
193.190	10.00		< 10 mm size			0												
191.690	11.50		10 to 25 mm			20												
190.690	12.50	Highly weathered disintegrated Rock	25 to 75 mm			35												CR(CM)=Nil CR(%)=Nil RQD(%)=Nil N>100
189.190	14.00		75 to 150 mm			25		NX										CR(CM)=49 CR(%)=33 RQD(%)=Nil N>100
187.690	15.50		> 150 mm			20												CR(CM)=32 CR(%)=21 RQD(%)=Nil N>100
186.190	17.00	Highly weathered highly fractured Limestone				20		NX										CR(CM)=21 CR(%)=14 RQD(%)=Nil N>100
184.690	18.50					25												CR(CM)=30 CR(%)=20 RQD(%)=Nil N>100
183.190	20.00					20		NX										CR(CM)=32 CR(%)=21 RQD(%)=Nil N>100
181.690	21.50					15												CR(CM)=14 CR(%)=9 RQD(%)=Nil N>100
180.690	22.50					10												CR(CM)=31 CR(%)=20 RQD(%)=Nil N>100

[illegible]

Refusal Strata

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[illegible]

[illegible]

BORE LOG

BH No.: 58

Depth : 25.00 m

Depth of Water table : 7.80 m

PROJECT: Geotechnical Investigation work for the proposed
Super Thermal Power Project at Lara, Raigarh, CH.

RL: 202.350

Date of start : 05/03/2012

Date of finish : 15/03/2012

Project No. 1930 Location: Space for FGD II Co-Ordinates: 257E, 1990S



Reduced Level	Depth (m)	Type of sample	Soil Classification	S.P.T Plot		Grain size (%)			Density (gm/cc)		W/C (%)	Limits (%)		Sp.Gr	Shear Parameters			Cc
				Observed		Gravel	Sand	Silt/Clay	r(wet)	r(dry)					Type of test	C(kg/sq.cm)	phi(degrees)	
202.350	0.00																	
201.050	1.30	SPT	Silty Clay of medium Plasticity (CI)	11														
199.550	2.80	SPT		3		8	11	81										
198.850	3.50	UDS																
198.050	4.30	SPT		41														
196.700	5.65	SPT		100														
195.050	7.30	SPT		78	13	22	65					39	22					
193.700	8.65	SPT		100														
192.350	10.00	SPT		100														
			Refusal Strata															

PROJECT: Geotechnical Investigation work for the proposed Super Thermal Power Project at Lara, Raigarh, CH

Job No: 1930

Date of Start : 05/03/2012 Date of Finish : 15/03/2012

[illegible]

BORE LOG

BH No.: 60

Depth : 35.00 m

Depth of Water table : 11.70 m

PROJECT: Geotechnical Investigation work for the proposed Super Thermal Power Project at Lara, Raiqarh, CH.

Project No. 1930 Location: Space for FGD | Co-Ordinates: **100E, 1991S**

RL: 203.745

Date of start : 23/02/2012

Date of finish : 27/02/2012

[illegible]

[illegible]

PROJECT: Geotechnical Investigation work for the proposed Super Thermal Power Project at Lara, Raigarh, CH

[illegible]

[illegible]

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
1.	VI/A	III-C	80 of 209	2.01.00 (c)	However, for vibration measurements and protection minimum 2 number (X and Y direction) sensors per bearing shall be provided.	Kindly confirm whether Vibration Monitoring System (VMS) is in the scope of this project? If yes, kindly provide the Detailed specification for VMS.	Vibration Monitoring System (VMS) is not the scope of the bidder. However, vibration measurement is envisaged for each vibration measurement point as indicated in a)Tender drawing "0011-109-POM-A-001" b) PART A, Clause 23.01.00 of sub section III-A1 c) PART-A, Clause 2.01.06 of sub section III-A5. It is further clarified that as per clause 1.07.00 of sub section III-C2 PART B of technical specification, vibration measuring instrumentation shall be as per the standard and proven practice of the bidder. Vibration measuring instrumentation output (4-20mA) shall be connected to FGD control system instead of vibration monitoring system.
2.	VI/A	III-C	82 of 209	2.06.01	Contractor shall depute Technical Experts of the OAM /OEM/OES/ (Original Analyser Manufacturer-	We presume that the CEMS Equipment supplier (OAM/OEM/OES/System integrator	Bidder's understanding is correct. However, as envisaged in the specification clause 2.06.01, technical

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
					er/Original Equipment Manufacturer/Original Equipment supplier) for each of the above system at Site, who will be fully qualified to perform the required duties, supervision of maintenance, repair etc. for a period of six month	etc.) is eligible for delivering the services of Comprehensive AMC (CAMC). Kindly confirm.	expert of Original Analyser Manufacturer/Original Equipment Manufacturer/Original Equipment supplier, fully qualified to perform the required duties, supervision of maintenance, repair etc. for supplied systems, shall be deputed to site for delivering the services of Comprehensive AMC (CAMC).

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
3.	VI/A VI/E	III-C B (Control & Instrumentation)	84 of 209 13 of 53	6.05.00 Drawing No. 0000-151-POI-A-013	The minimum quantity per unit of furniture envisaged in FGD control room is as mentioned below: Standard Configuration Diagram for PLC based Offsite Control systems	As per the description given in the specification, there is only one FGD Control room common for all the Units. We presume the quantity of furniture indicated in this clause is common for all the Units. Kindly clarify and confirm.	Bidder's understanding is not correct. Bidder to supply minimum quantity of furniture as mentioned in the specification on per generating unit basis . For example: In case of MOUDA-II (2x660MW) project, the quantity of furniture to be supplied shall be twice of the furniture quantity that is mentioned under clause 6.05.00 a) to e), Part-A, Sub Section III-C of the specification. Bidder shall comply with the specification.
4.	VI/A	III-C	84 of 209	6.03.00	For each equipment/drives/pumps where Local Operation is envisaged in addition to control system as mentioned in respective Mechanical Sections, Bidder to consider Local Push button station comprising following:	We understand no separate hard-wired back up consoles are required in FGD control room. The entire operation in FGD control room shall be through DCS/HMI. Kindly confirm.	Bidder's understanding is correct. However, bidder to refer the relevant clauses of specification where equipment/drives/pumps for which Local Operation is envisaged has been mentioned. Bidder to provide local push button stations accordingly.
5.	VI/A	III-C	85, 86 of 209	9.01.00	Hardwired Signal exchange: Hard-wired signal exchange betw. 'een BOP ODCMIS (under Employer's scope) and FGD PLC (under Contractor's scope) like....	Kindly provide the Tentative route length distance between the following: (i) RIO Panel and employer DCS. (ii) RIO Panel and 24 V DC feeder	It is clarified that i) RIO panel and employer's DCS are placed at the same location i.e. Central Equipment Room (CER). Tentative route length be-

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.		
					(Customer provided) (iii) FGD RIO Panel & FGD Control room for all the projects. Also modification and changes required at the Customer's DCS end/station LAN for FGD interface is also not in the scope of the Bidder. Kindly confirm.	tween RIO panel (Placed in CER) and employer's DCS shall be 200 meters approximately for all projects. ii) Tentative route length between RIO panel (Placed in CER) and 24 V DC feeder (NTPC scope) shall be 200 meters approximately for all projects. iii) For route length between FGD RIO panel (placed in CER) and FGD control room, bidder to refer clause 9.03.00, PART-A, Sub Section III-C, wherein it is mentioned that "Bidder to visit site to estimate the distance between FGD control room and Employer's CCR/CER". Other FGD RIO panel location shall be finalized during detailed engineering Bidder's understanding is correct that modification and changes required at the Customer's DCS end/station LAN for FGD interface is not in the scope of the bidder.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
6.	VI/A	VII	197 of 209	1.07.03	MANDATORY SPARES: 1.07.00 PLC CONTROLS SYSTEM 1.07.03 CENTRAL PROCESSOR UNIT: Bidder shall be required to ensure supply of spare parts for lifetime of the plant. In case, the Bidder feels that certain equipment/component is likely to become obsolete, the Bidder shall clearly bring out the same in his Bid and indicate steps proposed to deal with such obsolescence.	Kindly clarify what is Central processing Unit, does it mean the controller module of the DCS system? Kindly confirm.	Bidder's understanding is correct.
7.	VI/B	III-C1	6 of 103	3.04.00		Normally Electronic cards/module phased out in 8-10 years due to continuous up-gradation in technology, hence we request Customer to suitably modify the given clause as given below: <i>"Bidder shall ensure availability of Spares for 10 years. Beyond this period, in case of phasing out of production of spares parts, a notice of 12 months in advance regarding this shall be provided to Owner in order to enable them to order & stock bulk requirement of spares."</i>	With reference to clause 3.04.00, Part-B, Sub Section III-C1 of technical specification, it is clarified that lifetime of the plant is envisaged as 15 years for which bidder shall ensure supply of the spare parts. Bidder shall comply with the specification.
8.	VI/B	III-C4	55 & 56 of 103	5.00.00	Marshalling/Marshalling cum Termination cubicle	Customer is requested to consider Cable termination at marshalling cabinet or any other equivalent methodology being followed by the	Bidder's proposal is not acceptable. Bidder shall comply with the specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.		
9.	VI/B	III-C5	62 of 103	1.04.00	Notes: 4. For connection between field JB and DDCMIS marshalling cabinet PLC BASED CONTROL SYSTEM Contractor shall provide independent control systems for safe, efficient and reliable operation of each of the plant auxiliary systems.	manufacturer for several projects in the past may also be permitted to be adopted in this project. Kindly confirm. Bidder's in-house manufactured DCS which is field proven in power plants gives the Customer following advantages: (i) Better immunity to noise. (ii) Scalable and Flexible system (iii) Comprehensive Diagnostics (iv) Centralised alarms, events and historian (v) Faster inter communication (vi) Unified Information Management, (vii) Common engineering platform & Unified diagnostics, (viii) Single family hardware solution, Reduction of hardwired interface or soft links, (ix) Ergonomic and user friendly man-machine interface. (x) Effective spares and inventory management. (xi) Better response time. (xii) Single window for future expansion. It is clarified that in addition to the specification requirements, bidder's proposal is also acceptable subject to: i) Proposed DCS based control system for FGD fully meets functional requirements as mentioned in the specification. ii) Proposed DCS based control system for FGD is as per bidder's standard and proven practice. iii) The DCS based control system shall be reviewed and approved by employer during detailed engineering.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.		
					sion. (xiii) Better Spares Management & Inventory reduction. etc. (xiv) Supports renovation and modernization. Hence Customer is requested to accept DCS based controls also for FGD.	
10.	VI/B	III-C5	65 of 103	2.03.00	Bidder's in-house manufactured DCS has Flash EPROM for non-volatile configuration which does not require battery backup. Customer is requested to consider this option.	Bidder's proposal is acceptable in view of bidder's proposal to supply DCS based control system for FGD.
11.	VI/B	III-C6	91 of 103	1.01.01 (a)	Out of the tests listed, the Bidder/sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.	Bidder's understanding is correct. Bidder to further refer clause 1.01.01 b), PART-B, Sub Section III-C6 wherein the acceptance criteria for type test certificates has been mentioned. Bidder shall comply with the above mentioned clause while submitting the type test certificates for NTPC approval.

TENDER NO. : PSER:SCT:NBH-C2080:20

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIRE-MENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	Vol/SEC/ PART	SUBSEC.	PAGE NO.			

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	Vol/SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
12.	SEC-06 ,PART B	Sub sec.- II-E-10	Pg. 2 of 58	1.03.00	Spare capacity and future requirement All LV switchboard shall be provided with spare feeders/modules as specified in relevant clause of PART –A of technical specification.	We have not found requirement of spare feeders anywhere in PART A of tech. specification.. In the absence of the requirement of spare feeders in the specification, we will supply 10% spare feeders as per below:- a. Unidirectional and Bidirectional motor feeder: Spare feeders based on physical size of the module. b. Supply feeders: Based on SFU/MCCB rating. c. No spare breaker (ACB) feeder shall be provided except outgoing motor feeder. d. No spare feeders shall be provided for Incomer/Bus coupler (non-ACB) modules	This clause is DELETED. Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI)

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
13.	PART-A	III-A5	1 OF 6	1.01.00	Based on site visit, bidder shall submit layout for Limestone handling plant & Gypsum handling facilities along with their techno-commercial bid. Bidder shall bring out all necessary modification and relocation of existing facilities, if required, along with proposed Layout submitted with the bid	We understand any modification and relocation is not in the scope of this package. Please confirm	All required modification and demolition work of existing facilities shall be in the bidder's scope. However if any relocation of existing facility is required, the same shall be done by the employer.
14.	PART-A	III-A5	2 OF 6	2.01.01	Based on site visit, bidder shall submit layout for Limestone handling plant & Gypsum handling facilities along with their techno-commercial bid. Bidder shall bring out all necessary modification and relocation of existing facilities, if required, along with proposed Layout submitted with the bid	Request customer to furnish the drawings of the existing facilities to study the modification required in the existing facility.	Bidder shall refer the GLP drawing attached with the tender documents and shall also visit the site to study existing facilities that require modification.
15.	PART-B	IV-D	23 OF 69	5.07.00	Polycarbonate sheet of 3 mm thick....	We propose to use 2 mm thick polycarbonate sheets. Please confirm.	Bidder shall comply with technical specification requirement

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
16.	PART-B	IV-D	30 OF 69	11.00.00	Fencing around lime storage/ gypsum storage area.	We do not understand the requirement of any fencing in these areas. Kindly review the requirement and confirm.	Refer Scope of work. Refer clause 2.00.00, Section-VI, Part-A of technical specification.
17.	PART-B	IV-D	8 OF 69	3.07.00	Gypsum storage shed- Gypsum storage shed shall be of RCC –framed structure with steel structure framed structure-----	Details specified for gypsum storage shed is not clear. Please furnish the detail specification for the gypsum storage shed. We propose to use space frame structure with bolted joints. Please confirm.	Bidder to refer amendment in this regard.
18.	PART-A	III-A5	3 OF 6	2.01.07	Crushed limestone reclaim hopper(RH silo)Machinery hatch---	Please furnish the detail specification for the lime stone storage shed. We propose to use space frame structure with bolted joints. Please confirm.	Bidder to refer necessary amendment in this regard.
19.	PART-A	III-A5	3 OF 6	2.01.10	Suitable no. of motorized travelling tripper /flow diverter----feeding the crushed limestone to limestone shed	We understand that intermediate supporting trestle can be provided for the supporting of tripper conveyor gallery inside lime stone shed. Please confirm.	Confirmed. However adequate space for movement of dozer/payloader shall be provided.
20.	PART-A	III-A5	60F6	3.06.00	Suitable no. of motorized travelling tripper /flow diverter---	We understand that intermediate supporting trestle can be provided	Confirmed. However adequate space for movement of dozer/payloader shall be provided.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
					er---feeding the gypsum to gypsum shed.	for the supporting of tripper conveyor gallery inside gypsum shed. Please confirm.	er/payloader shall be provided.
21.	PART-B	IV-D	8 OF 69	3.07.00	Gypsum storage shed- Gypsum storage shed shall be of RCC –framed structure with steel structure framed structure-----	We understand that for the gypsum stock pile area no PCC/RCC paving is required. Only leveling and grading of gypsum stockpile area is needed.	Bidder to refer amendment in this regard.
22.	PART-A	III-A5	3 OF 6	2.01.07	Crushed limestone reclaim hopper(RH silo)Machinery hatch---	We understand that no retaining wall and peripheral drain needed around lime stone stock pile and gypsum stock pile please confirm.	Bidder's understanding is not correct. Retaining wall and peripheral drain around lime stone stock pile and gypsum stock pile along with suitable entry point for dozer entry with ramp need to be provided by the successful bidder.
BARH							
23.	VI/PART-A	II-A10	1 OF 30	1.05.00	Railway siding.	We understand that work of railway siding is not in the scope of bidder. Kindly confirm our understanding is correct.	Bidders understanding is correct.
24.	VI/PART-A	II-A10	10 OF 30	7.01.00	FGL generally corresponds to RL 46.20M-----to achieve the FGL as indicated above.	Please furnish the topographical survey drawing and contour drawings of the site.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
25.	VI/PART-A	II-A10	10 OF 30	7.01.00	FGL generally corresponds to RL 46.20M-----to achieve the FGL as indicated above.	We understand that FGD area marked in plot plan is already levelled and graded and now no further leveling and grading is needed. Please confirm.	Site levelling shall be done by Owner as per the levels specified in GLP in tender document. Only site clearance and minor grading is in bidder's scope.
26.	VI/PART-A	II-A10	10 OF 30	7.03.00	The foundation system to be adopted for different structures shall be as given below---	Please furnish the bore log details and drawings showing the locations of various bore logs.	Borelog have already furnished in the tender document. For, location of boreholes, co-ordinates indicated in borelog may be referred.
27.	Plot plan	-	-	9558/9560-999-POC-F-001/Rev. No.8-D0	ROAD AND DRAINS	Since FGD facilities are to be incorporated in the existing layout .Kindly furnish the road and drain layout for the present scope of work.	Kindly refer GLP of Barh project furnished with the tender document.
GADARWARA II							
28.	-	-	-	-	General layout plan	Kindly furnish the FGL to be adopted for the different systems/areas of FGD	FGL is indicated in GLP.
MOUDA II							
29.	-	-	-	-	General layout plan	Kindly furnish the FGL to be adopted for the different systems/areas of FGD	FGL is indicated in GLP.
NABINAGAR II							
30.	-	-	-	-	General layout plan	Kindly furnish the FGL to be adopted for the different systems/areas of FGD	FGL is indicated in GLP.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIRE- MENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
SOLAPUR							
31.	-	-	-	-	Geo- technical investigation Report	Kindly furnish geo technical report along with the Recommended SBC and foundation system to be adopted.	The geotechnical investigation report for the vicinity area will be made available for the Bidder’s study at the Owner’s office. However, for borelog data, bidder may refer Amendment .
32.	-	-	-	-	General layout plan	Kindly furnish the FGL to be adopted for the different systems/areas of FGD	FGL is indicated in GLP.
BRBCL							
33.	VI/PART-A	II-A11	3 OF 29	3.00.00	Railway siding.	We understand that work of railway siding is not in the scope of bidder. Kindly confirm our understanding is correct.	Bidders understanding is correct.
34.	VI/PART-A	II-A10	12 OF 29	7.02.01	General Requirement	Please furnish FGL to be considered in FGD area.	FGL is indicated in GLP.
35.	VI/PART-A	II-A10	11 OF 29	7.03.00	Geo technical data and foundation system for the respective project are enclosed at Annexure-III . The corresponding bore logs are enclosed at Annexure-IV.	Bore log details furnished in Annexure-IV are of ash handling area. Kindly furnish the bore log details of FGD area also.	Bidder may refer Clause No.7.00.02, as mentioned in Clause No. 7.00.02, the available borelog data is of vicinity to proposed structure and the same has already been furnished in the tender document for bidder’s guidance. Detailed Geotechnical Investigation shall be carried out by contractor.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
36.	Plot plan		0270-999-POC-F-001(Rev.No .6)		ROAD AND DRAINS	Since FGD facilities are to be incorporated in the existing layout .Kindly furnish the road and drain layout for the present scope of work.	Refer General Layout Plan. Road and drain drawing shall be provided after award.
DARLIPALLI							
37.	VI/PART-A	II-A4	1 OF 30	1.02.00	The main plant---railway siding---	We understand that work of railway siding is not in the scope of bidder. Kindly confirm our understanding is correct.	Confirmed.
38.	VI/PART-A	Annexure-III	19 OF 30		Natural ground level is varying as per enclosed contour/spot level	Please furnish FGL to be considered in FGD area.	FGL is indicated in GLP.
39.	VI/PART-A	II-A10	10 OF 30	7.00.01	Geo technical data and foundation system for the respective project are enclosed at Annexure-III .The corresponding bore logs are enclosed at Annexure-IV.	Kindly furnish annexure- IV as the same is not available with tender document.	Bidder to refer amendment in this regard.
40.	Plot plan		9549-999-POC-F-001		ROAD AND DRAINS	Since FGD facilities are to be incorporated in the existing layout .Kindly furnish the road and drain layout for the present scope of work.	Refer General Layout Plan. Road and drain drawing shall be provided after award.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
41.	SECTION-VI,PART-B	II-E15	-	-	-	Street lights shall only be provided for the roads newly constructed by Bidder, under the scope of the subject Tender package. Please confirm.	Confirmed.
42.	PART-B-II-ELECT-1	SUB-SECTION-II-E	7	2.04.00	All MV & LV circuit breakers shall be provided with Communicable Numerical Relays complying with IEC-61850 as specified in Sub-section II-E-09. These relays shall be integrated with Employer's Switchgear SCADA through Ethernet switches (to be supplied by Employer) mounted on each switchgear.	We understood that the DDCMIS system is the PLC based control system provided by the Bidder and switch gear SCADA system is provided by the Employer. As per clause 2.05.00 only 11 KV 3.3 KV & L T Incomers, Ties, Bus couplers, Transformer feeders shall be controlled from Switchgear SCADA and Motor feeders are controlled only from DDCMIS, Please clarify	This clause is deleted. Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI)
43.	PART-B-II-ELECT-1	SUB-SECTION-II-	7	2.04.00	The circuit breaker will normally be controlled from re-	Please clarify how simultaneous control from two different control system	This clause is deleted.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
		E			mote control panels (DDCMIS) through closing and shunt trip coils. The control of the breakers shall also be possible from the Employer's Switchgear SCADA system.	i.e. DDCMIS and Switch gear SCADA will be done through communication IEC-61850. We consider communication with Switch gear SCADA and hardware (DI/DO) interface with PLC.	Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI)
44.	PART-B-II-ELECT-1	SUB-SECTION-II-E	7	2.05.00	Control Philosophy The Control Philosophy shall be as follows: (a) All the 11 KV/ 3.3 KV & L T Incomers, Ties , Bus couplers, Transformer feeders shall be controlled from Switchgear SCADA and also from DDCMIS. (b) The motor feeders shall be controlled from the DDCMIS only..	We understood that only 11 KV 3.3 KV & L T Incomers, Ties , Bus couplers, Transformer feeders shall be controlled from Switchgear SCADA and Motor feeders are controlled only from DDCMIS	Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI) Control Philosophy The Control Philosophy shall be as follows: a) All switchgears and MCCs shall be controlled from PLC/DCS.
45.	PART-B-II-ELECT-III	SUB-SECTION-II-E	19	3.00.00	Control supply voltage - Trip and closing coils - 240V DC - Spring charging motor - 240V DC	This shall be decided by the Panel manufacturer, can be 220V DC, 110V DC etc. also.	Technical Specifications to be complied with.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
46.	PART-B-II-ELECT-III	SUB-SECTION-II-E	24	4.2.00	Outgoing breakers shall be suitable for switching transformers and motors at any load. They shall be capable of being used for frequent direct-an-line starting of squirrel cage induction motors of following ratings: 3.3KV - Above 160 kW up to 1500 kW (The contractor may adopt 415V/3.3KV for drives rated in the range of 160-210 kW) 6.6 kV - Above 200 kW 11kV - Above 1500 kW	As per PART-B-II-ELECT-1, Clause-1.06.00, page 4/46, it is mentioned as The voltage level for motors shall be as follows: a) Upto 0.2 KW - Single phase 240V AC / 3 phase 415V AC b) Above 0.2 KW and upto 200 KW - 3 phase, 415V AC c) Above 200 KW and upto 1500 KW - 3 phase, 3.3 kV AC d) Above 1500 KW - 11 kV The bidder may adopt 415V/3.3 KV for the drives rated in the range of 160-210 KW. Both are contradictory. We consider as per the PART-B-II-ELECT-1, Clause-1.06.00, page 4/46	Technical specification is clear. Either 6.6 kV Or (3.3 KV and 11 kV) exists in any particular project. All these three voltage level 3.3kV, 6.6 kV and 11 kV do not exist in any single project simultaneously. So there is no contradiction.
47.	PART-B-II-ELECT-III	SUB-SECTION-II-E	26	4.5.1	The circuit breaker contactor will normally be controlled from remote control panels (DDCMIS) as well as from Switchgear SCADA System (via Numerical Relays) through closing and shunt trip coils.	We understood that the DDCMIS system is the PLC based control system provided by the Bidder and switch gear SCADA system is provided by the Employer. Please clarify how simultaneous control from two different control system i.e. DDCMIS and Switch gear SCADA	Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI)

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
48.	PART-B-II-ELECT-III	SUB-SECTION-II-E	59	3.01.02	will be done through communication IEC-61850. We consider communication with Switch gear SCADA and hardware (DI/DO) interface with PLC.	Technical Specifications to be complied with.
49.	PART-B-II-ELECT-III	SUB-SECTION-II-E	59	3.01.03	Shall be decided during detailed engineering as per the panel manufacturer standards, Can be 220V DC also.	Technical Specifications to be complied with.
50.	PART-B-II-ELECT-III	SUB-SECTION-II-E	66	4.20.00	Shall be decided during detailed engineering as per the panel manufacturer standards. Control supply can be 230V AC also.	Please refer Amendment to Technical Specifications (Section VI).
51.	PART-B-II-ELECT-III	SUB-	76	18.03.00	A per 18.02.00, page 76/224, Control of circuit breakers shall be carried out from DDCMIS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.	This clause is deleted.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
	ELECT-III	SECTION-II-E			connected to the Ethernet switch (in Employers's scope) provided in the Switchgear through Cat5e Ethernet 'FO' cable. Ethernet Switches shall be connected through Fibre Optic cable to form a ring network.	cable from each relay to the Ethernet switch (employer scope) mounted inside the panel is in Bidder's scope. Connection of Ethernet switches through OFC ring to employer switch gear SCADA is under Employer scope.	Please refer Amendment to Technical Specifications (Section VI)

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
52.	VI/A VI/B	III-A.5 I-M6	6 OF 6 2 of 73	3.07.00 3.01.00	Unloading of Limestone and loading of Gypsum	We understand any type of Front end loader/ Payloader/ Dozer/ Truck/ Railway wagons/ any type of vehicle are not in bidder's scope. Please confirm	Confirmed.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
53.	VI/A	III-A.5	5 OF 6	2.01.28	Minimum one (1) no. Weighing Bridge for Road trucks / Tipplers shall be provided in Limestone unloading area and in Gypsum Loading area.	(1) Separate one number weigh bridge shall be provided for Lime Stone Handling area and for Gypsum Handling area. (2) Weigh bridge capacity shall be 100 MT.
54.	VI/B	I-M6	18 of 73 20 of 73	4.13.1 4.13.19	The dust control system to be furnished under this specification is required for control of fugitive dust emissions from dust generation points such as junction towers, truck un-loading points, crushers etc. For dust control in limestone storage shed ... trolley mounted dust collection hopper with bag filters shall be provided. Location: Belt feeder after crusher & Vibrating Screening Feeder at crusher house.	The areas to be covered by dust extraction system shall be truck unloading points, junction towers (limestone/gypsum discharge & receipt points), limestone/gypsum crusher house (including belt feeder & vibrating feeder) and lime stone/gypsum storage shed. Dust Extraction System shall comprise of bag filters, fans, bag filter & collection hoppers. The whole area shall be segregated in different groups and dedicated DE system for each group shall be provided. Necessary amendment in this regard shall be issued.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
55.					- FGD system to be considered only for Stage -1 for Barh project (3X660MW) & Stage -II excluded from scope - Gadarwara Stg-1 (2x800MW) considered & stg-2 excluded - Lara Stg-1 (2x800MW) considered & stg-2+3 excluded - Nabinagar JV Stg-1 (3X66MW) considered & stg-2 excluded Kindly confirm.	Bidders understanding is correct.
56.	VI/A	III-A.5	2 OF 6	2.01.01	Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tippers each of minimum 20T capacity to discharge Limestone on to Box Feeders Whether Truck Tippler is in scope of bidder or not.	Truck tippers of gross weight 60 MT capacity are in bidder's scope. Necessary amendment in this regard shall be issued.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
57.	VI/A	III-A.5	2 OF 6	2.01.01	1) Please inform project wise, which wagon tippler or Track hopper or any one of all wagon tippler and track hopper will be used for unloading limestone. 2) We request customer to finalize "tapping point" from existing conveyor/JT/CRH for further engineering. 3) We request customer to provide plan/ elevation drawing of said "tapping point" or GA drawing of that conveyor/JT to ascertain modification work involvement and further engineering.	(1) Either of Wagon Tippler or Track Hopper shall be used for unloading of limestone received using Indian Railways rakes as per availability. (2) Feed for uncrushed limestone shall be taken before existing crusher house of Coal Handling plant as specified in the reference clause. Final Tapping point shall be decided based on the layout of FGD system and existing facilities. (3) Please refer reply against S.No. 57(2) above.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
58.	VI/A	III-A.5	2 OF 6	2.01.04	1) Whether existing crusher House can be permitted for crushing. 2) Tapping/diversion can be taken after crushing in any junction tower afterwards if layout permits. 3) For limestone coming through roads, separate CH of suitable size may be provided at suitable location.	(1) Technical Specifications is clear in this regard. A separate Limestone Crusher House dedicated for the FGD plant shall be provided by bidder. (2) Technical Specifications is clear in this regard. In case of railway rake unloading tapping for limestone shall be taken before existing crusher house of Coal Handling Plant. All modifications in the existing CHP for the same shall be in bidder's scope. (3) Common limestone crusher house for both cases – unloading with road trucks and unloading with indian railways rakes, shall be provided.
59.	VI/A	III-A.5	6 OF 6	3.05.00	Query-1: Whether one common pump house is acceptable for complete FGD Query-2: Whether tapping from existing CHP water system is allowable nearer to Limestone handling plant gypsum handling plant for service, potable and dust suppression system.	Reply to Query-1: Acceptable. Reply to Query-2: Tapping from existing CHP water system is not acceptable.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
60.	VI/A	III-A.5	4 OF 6	2.01.19	One (1) number of passenger cum goods elevator with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of lime stone crusher house	Type of elevator is not mentioned in the tender specification. Vendor shall consider as per his choice. Please clarify. One (1) number conventional enclosure type passenger cum goods elevator having capacity of 16 persons (1088 kg) complying to IS:14665 (latest edition) with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of lime stone crusher house. Staircase access for machine room shall also be provided by the bidder.
61.	VI/A	VI	20 OF 24	5.00.00	Auxiliary Power Consumption	1) Power consumption for limestone & gypsum handling system is not included in list. Hence not considered. 2) If the power consumption is to be considered, then request customer to kindly furnish the list of equipment's to be considered for arriving at auxiliary power consumption along with duty factor.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
62.	VI/B	I-M6	10 of 73	4.6.2	The size given in the tender specifications seems to be on a higher side. We propose 500 dia MS pipe of thickness 6mm(min). Kindly confirm.	Bidder shall comply the technical specifications.
63.	VI/A	III-A.5	3 OF 6	2.01.04	One staircase is sufficient since elevator is envisaged in limestone crusher house. Kindly confirm.	Bidder shall comply the technical specifications.
64.	Plot Plan (Tender drawings)			GLP (Limestone handling system/Gypsum handling system)	Bidder requests customer to furnish the location of lime handling & gypsum handling facilities in the plot plan.	Technical Specifications is clear. Bidder is to propose the location of lime stone handling & gypsum handling facilities as per GLP and meeting the requirement of FGD plan layout.
65.	Plot Plan (Tender drawings)			GLP (Limestone handling system/Gypsum handling system)	The space shown in plot plan for limestone unloading & feeding to storage silo is not sufficient. Kindly review & confirm.	Bidder shall comply with the requirement of Technical Specification. However, the requirement for space will be deliberated with the Bidder during post commercial bid discussion.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
66.	(Tender drawings)				Limestone handling system/Gypsum handling system	Please furnish flow diagrams for lime stone handling and gypsum handling plants as same are not available along with tender specifications.
67.	(Tender drawings)				Gypsum/ Byproduct : Gypsum Storage Yard for Wet FGD	Please indicate the location of gypsum storage in the plot plan.
68.					Gypsum/ Byproduct : Gypsum Storage Yard for Wet FGD	Kindly furnish quantity of gypsum produced per hr. to decide the capacity of gypsum handling conveyor. Also clarify any design margin is to be considered over rated capacity.
69.					Limestone handling system/Gypsum handling system	Kindly Furnish limestone consumption rate for arriving stockpile capacity.
70.					Gypsum/ Byproduct : Gypsum Storage Yard for Wet FGD	07 days storage is required for both limestone & gypsum. But no sufficient storage space available at given plot plan. Kindly review & confirm
						Bidders query is not clear as limestone will be required in FGD Absorber which is in the scope of Bidder.
						Bidder to refer amended GLP for the same.

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
71.					Kindly furnish angle of repose for limestone & gypsum.	Angle of repose shall be considered as 38 deg for limestone and 35 deg for gypsum.
72.	SECTION-VI, PART-B,	SUB-SECTION-I-M6, LIME-STONE HANDLING PLANT	3.1.0	128 OF 274	Bidder is considering over ground truck tippler and dedicated limestone handling conveyor of capacity 150 TPH till limestone crusher. Please confirm.	Confirmed. However for unloading through existing WT/Track Hopper, the minimum stream capacity shall be 1200 MTPH.
73.	SECTION-VI, PART-B,	SUB-SECTION-I-M6, LIME-STONE HANDLING PLANT	3.2.0	128 OF 274	Bidder understands that the uncrushed limestone received from wagon tippler will be conveyed through existing coal conveyors and will be re-routed through new limestone conveyors till limestone crushers. After crushing, crushed limestone shall be conveyed to limestone storage shed. Please confirm.	Confirmed.

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
74.	SECTION-VI, PART-B,	SUB-SECTION-I-M6, LIME-STONE HANDLING PLANT	3.3.0 & 4.12.3	129 OF 274 144 of 274	Bidder is considering 1X100% crusher in crusher house for each incoming stream. Please confirm. Based on our experience, screens are not required below the crushers. Crusher is designed to have final product size (-) 20mm. Hence we are not considering any screen equipment below the crushers. Please check and confirm.	Bidder shall comply the technical specifications.
75.	SECTION-VI, PART-B,	SUB-SECTION-I-M6, LIME-STONE HANDLING PLANT	3.4.0	129 OF 274	Bidder understand that the crushed limestone (-20mm) shall be stored in a covered storage yard. However, use of travelling tripper and paddle feeders not understood. Please elaborate and review the requirement.	Travelling tripper has been envisaged to distribute crushed limestone along the length of limestone storage shed. Paddle feeders are provided to reclaim the stored crushed limestone and feed it to the outgoing limestone conveyors to store limestone FGD usage point.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	SEC/ PART	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
		SUBSEC.	PAGE NO.	CLAUSE NO.			
76.	SECTION-VI, PART-B,	SUB-SECTION-I-M6, LIME-STONE HAN-DLING PLANT				Bidder request customer to specify the maximum lime stone and gypsum pile height to be considered to arrive the size of storage area and shed to make all the bidders at par.	Maximum pile height shall be decided considering the availability of space during detailed engineering.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
77.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
78.	VI/B	IV-D	26 of 69	10.00.00	Site levelling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
79.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
80.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
81.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Type of cladding system if not specified in the technical Specification shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any).
82.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Extent and type of paving in FGD block shall be in accordance with Technical specification. However, any functional requirement of paving for FGD facilities not specifically mentioned in technical specification is also in the scope of bidder.
83.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
84.	VI/A	II-A5	22 OF 40	An-nex-ure-III, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. A minimum embedment of 5.0 m and 6.0 m into strata with SPT 'N' greater than 50 for 600 mm dia pile and 760 mm dia pile respectively before termination and at pile termination minimum SPT 'N' shall be 60, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby bore log data.	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU E NO.			
85.	VI/A	II-A5	14 OF 40	7.02.03 xv	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder to refer amendment in this regard.
86.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished.	Bidder to refer amendment in this regard.

TENDER NO. : PSER:SCT:NBH-C2080:20

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL-SOLAPUR

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/PART	SUB-SEC.	PAGE NO.	CLAU SE NO.			
87.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
88.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
89.	VI/B	IV-D	31 of 69	14.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
90.	VI/B	IV-D	41 of 69	21.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately
91.	VI/B	IV-D	24 of 69	7.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl. No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
92.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl. No.82
93.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		
94.	VI/A	II-A6	9 of 31	7.00.01	Geotechnical data and foundation system for the respective project are enclosed at annexure-III. The corresponding bore logs are enclosed at annexure-IV.	Annexure-IV is not available in the specification. Please provide the same.	Bidder to refer amendment in this regard.

CIVIL-MEJA

SL.	ENQUIRY SPECIFICATION	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



NO	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
95.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
96.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
97.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
98.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
99.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl. No. 81
100.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl.No.82
101.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		Refer Sl.No.82

TENDER NO. : PSER:SCT:NBH-C2080:20

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL-BARH						NTPC CLARIFICATIONS
SL. NO	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.	SPECIFICATION REQUIREMENT	
102.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing. Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.
103.	VI/B	IV-D	26 of 69	10.00.00		FGL is indicated in General Layout plan
						FGL is indicated in General Layout plan

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
104.	VI/B	IV-D	31 of 69	14.00.00		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
105.	VI/B	IV-D	41 of 69	21.00.00	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
106.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel superstructure with RCC floors/roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	Refer Sl.No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
107.	VI/B	IV-D	25 of 69	7.00.00	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
108.	VI/B	IV-D	25 of 69	7.00.00	Any suitable slope protection works can be provided. Please confirm	Excavation may be carried out by using either sheet piling/ diaphragm wall/ secant piling/ contiguous piling or their combination. Bidder to refer amendment in this regard.
109.	VI/A	II-A10	10 OF 30	7.02.00	For excavation 6 metres below FGL, sheet piling shall be provided.	Bidder to refer amendment in this regard.
110.	General	-	-	-	Topographical survey details is not available in the specification. Please furnish the same.	

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL TANDA

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
111.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.
112.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.
113.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
114.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
115.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).
116.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
117.	VI/B	IV-D	25 of 69	7.00.00	protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	
118.	VI/A	II-A7	22 OF 33	Annex-ure-III, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. A minimum embedment of 4.0m into the very dense sand strata with SPT 'N' value greater than 50 as observed in such bore log shall be ensured, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby bore log data. The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
119.	VI/A	II-A7	14 OF 33	7.02.03 xv	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder may conduct either static routine load test or high strain dynamic load test. Bidder to refer amendment in this regard.
120.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL NPGCPL NABINAGAR

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
121.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing. Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
122.	VI/B	IV-D	26 of 69	10.00.00		In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
123.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
124.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
125.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl.No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
126.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl.No.82
127.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		
128.	VI/A	II-A8	9 OF 31	ANNEX-URE-B	a) The basic wind speed "Vb" at ten	Kindly specify the basic wind speed.	The basic wind speed "Vb" at 10m height above the mean ground level for "NABINAGAR-I 3X660 MW" project shall be 47 metres/second. Also refer Amendment issued separately in this regard.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
129.	VI/A	II-A8	21 OF 31	Annex-ure-III, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. A minimum embedment of 4.0m into the very dense sand strata with SPT 'N' value greater than 40 as observed in such bore log shall be ensured, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby bore log data.	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
130.	VI/A	II-A8	13 OF 31	7.02.03 xv	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder may conduct either static routine load test or high strain dynamic load test. Bidder to refer amendment in this regard.
131.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished.	Bidder to refer amendment in this regard.

TENDER NO. : PSER:SCT:NBH-C2080:20

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.		
132.	General	-	-	-	Topographical survey details is not available in the specification. Please furnish the same.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL BRBCL NABINAGAR

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
133.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
134.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
135.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
136.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		
137.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer SI.No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
138.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
139.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		
140.	VI/A	II-A11	22 OF 29	Annexure-III, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. Pile shall be socketed into yellowish weathered sand stone. A socketing length of four (4) times the diameter of the pile into rock with rock core recovery $\geq 20\%$ shall be ensured for 600 mm & 760 mm dia piles.	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
141.	VI/A	II-A11	15 OF 29	7.02.03 xv	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder may conduct either static routine load test or high strain dynamic load test. Bidder to refer amendment in this regard.
142.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL BRBCL (MOUDA, SOLAPUR, MEJA, BARH, TANDA, NPGCPL NABINAGAR & BRBCL NABINAGAR)

SL. NO	SEC/ PART	SUBSEC.	PAGE NO.	ENQUIRY SPECIFICATION	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
143.							
144.	VI / A	V	8 OF 26		5.01.00 A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	The location of new Wet Chimney shall be near to Existing Chimney in the space provided clearing foundation interface. The design of Wet Chimney shall be done considering interface factor of existing chimney as determined by wind tunnel study. However, no design check or validation shall be done for existing chimney/structures/buildings. Kindly confirm.	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

TENDER NO. : PSER:SCT:NBN-C2080:20

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



C&I (MOUDA & BARH)

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIRE-MENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS	
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.				
145.	Section VI/Part -A	Sub-Section VII	Page 13 of 61	Clause 1.19.00	Mandatory spares- AC & Ventilation system (Control & Instrumentation)	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.		Refer amendment in this regard. The referred clause 1.19.00 stands deleted. Bidder to refer relevant amendment in this regard.
			Page 19 of 61	Clause 1.21.00				

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



146.	Section VI/Part -A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	Mandatory spares- (Control & Instrumentation)	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.	Refer amendment in this regard.

C&I (TANDA, NPGCPL NABINAGAR & BRBCL NABINAGAR)

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



147.	Section VI/Part -A	Sub-Section VII	Page 13 of 61	Clause 1.19.00 Clause 1.21.00	Mandatory spares- AC & Ventilation system (Control & Instrumentation)	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.	Refer amendment in this regard. The referred clause 1.19.00 stands deleted. Bidder to refer relevant amendment in this regard.
148.	Section VI/Part -A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	Mandatory spares- (Control & Instrumentation)	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.	Refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
149.	Section VI/Part-A	Sub-Section VII	Page 13 of 61 Page 19 of 61	Clause 1.19.00 Clause 1.21.00	Mandatory spares- AC & Ventilation system (Control & Instrumentation)	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.	Refer amendment in this regard. The referred clause 1.19.00 stands deleted. Bidder to refer relevant amendment in this regard.
150.	Section VI/Part-A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	Mandatory spares- (Control & Instrumentation)	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.	Refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



MECHANICAL PIPING & LAYOUT (MOUDA, SOLAPUR, MEJA, BARH, TANDA, NPGCL NABINAGAR & BRBCL NABINAGAR)

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.			
151.	Section -VI, Part-A	Sub Section- III-A1	Page 7 of 9	14.00.00 The contractor scope shall also include the provision of FGD trundle for routing of air & water lines, slurry lines, steam line, waste water, etc. required for the complete process operations.	It is understood that pipe racks need to be constructed in new area for FGD requirement. However, existing pipe racks shall be used for routing pipes related to FGD system wherever need to do so arises. Kindly confirm.	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section – VI, Part-A, shall be complied with w.r.t trestles.

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects

152.	Section -VI, Part-A	Sub Sec- tion-III-A1	Page 7 of 9	11.00.00	Buildings	Please clarify whether various Equipment Cooling Water Auxiliaries of FGD system are to be kept in Pump house or shed.	Bidder shall provide Pump house.

ELECTRICAL (MOUDA, SOLAPUR & MEJA)

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
153.	PART A/ SECTION- VI & Drg No. 0011-109-POE-J-001	IIIB	1 OF 6	1.02.00	HT/LT SWITCHGEAR: Feeding arrangement	1. It is clarified that the modification work in customer's 11kV SWGR shall be in customer's scope and the control of 11kV breakers from customer's DDCMIS shall be in customer's scope. Any change of logics in customer's existing control panel or DCS shall be arranged by customer. Please confirm. 2. Please also confirm that the feeding arrangement shown in the SLD is indicative and actual arrangement of boards/ number of boards can be changed/ altered during the detailed engineering by the bidder based on the actual loads.	Bidder to refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI) in this regard and Annexure.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
76.	Drg No. 0011-109-POE-J-001	--	--	--	2 nos. feeders to Existing CHP/AHP aux. transformer.	1. Cables & Cabling for these two 11kV HT feeders shall be in customer scope & is excluded from bidder's scope of supply & erection. 2. Customer to provide load (kVA) details for existing CHP/AHP along with any other load/feeder requirement for owner's use (if any).	Same as above.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
154.	PART A/ SECTION- VI	IIIB	2 OF 6	1.08.00. 2)	Cabling: Contractor scope shall include laying of cable from employer board as shown in Electrical Single Line Diagram Drg No. 0011-109-POE-J-001 on the employers nearest trestle in the FGD area as shown in Drg no 0011-999-POC-F-001 subject to availability of space and suitability. In case of non-availability of space in employer's trestle, contractor shall make necessary arrangements for cable tray erection & cable laying.	1. Drg No. 0011-999-POC-F-001 is not available. Please provide. 2. Since there is a shortage of space in the Main plant area, separate structure/ trestle is not possible to connect the Main plant to FGD. Where-ever there is no space in customer's trays, it is understood that bidder will utilize customer's trestle to erect cable trays. The number of cables from Main plant 11 KV SWGR to 11 KV FGD SWGR can be finalized only after receipt of CHP / AHP load from customer. 3. Runway conductor available in customer's trestle (between main plant and FGD) will be utilized for earthing purpose and runway conductor for earthing of cable trays laid on these trestles are excluded from bidder's scope . Only tapping from customer's runway conductor to cable trays supplied by bidder shall be in bidder's scope.	1. Bidder to refer necessary amendment in this regard. 2. Bidder shall comply with technical specification requirement clause no: - 1.08.00.2. 3. Bidder can utilize employers run away conductor wherever available.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
155.	PART B/ SEC-TION- VI & Drg No. 0011-109-POE-J-001	II-E11	12 OF 19	9.02.01	Rating of DG: The continuous rating of the alternator under the specified ambient condition shall be at least equal to the net electrical output specified for the DG set plus the power requirements of all electrical auxiliaries connected to the alternator terminal including excitation (if it is taken from alternator terminals) & as per system requirement	Please confirm that bidder will have the flexibility to choose the rating based on the actual load sizing during detail engineering.	Bidder shall comply with technical specification.
156.	PART B/ SEC-TION- VI	II-E15	05 OF 16	4.00.00.3	Lighting Masts	Number of Lighting Masts is not specified in the specification. Please confirm the minimum number.	The same shall be decided during detailed engg.
157.	PART B/ SEC-TION- VI & OOOD-209-POE-A-002	II-E16	01 OF 13	1.00.00 & 9.00.00	DC health monitoring system shall be offered integral with each battery set for Main Plant & Switchyard batteries.	DC health monitoring system is excluded from bidder's scope of supply for 220V DC Battery for FGD area. Please confirm.	Confirmed.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
158.	PART C/ SECTION- VI		75 OF 83		PA SYSTEM	There is no specification for PA system in detailed technical specification Part A & B-Electrical. However, in Part C the reference standards only are mentioned. Please confirm whether PA system is to be considered a part of FGD or not. If to be considered, please provide the detailed specification for the same.	It is clarified that Public Address (PA) system is not in the scope of the bidder.
159.	PART B/ SECTION- VI	II-E12	08 OF 31	2.00.00.f	LT Transformer : Outdoor transformers shall have energy efficiency level 3 as per IS 1180.	Please confirm whether LT transformers shall be designed as per IS 1180 or BEE guideline.	Bidder shall comply with specification clause no. 2.00.00.f of Part B/ Section-VI sub section II – E12 and relevant directives as per GOI.

HOISTS

(MOUDA, SOLAPUR, MEJA, BARH, TANDA, NPGCPL NABINAGAR & BRBCL NABINAGAR)

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		

CLARIFICATION No.01 (TECHNICAL)

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
160.	SEC VI, PART-B	I-M1	35 OF 51	14.09.0 0	Contractor shall provide motorized hoists and trolleys for all items requiring maintenance and weighing 500 kg or more. Items weighing more than 50 kg and required to be replaced for maintenance shall be provided with manual hoists/trolleys with runway beams/supporting structure etc. For the hoists with more than 2.0 tonne lifting capacity or more than 10.0 m lift with the exception of hoists for GTU & bend pulleys motor operated hoist blocks for both long travel & lift shall be provided.	Referred clauses are contradictory w.r.t selection of electric or manual hoist. We shall follow clause 10.09.00 of sub-section V/Section VI Part A for selection of electric or manual hoist. Kindly confirm.	Bidder shall comply with the specification requirements.
161.	SEC VI, PART-B	I-M6	6 OF 73	4.3.2			The referred clauses of technical specifications are very clear and pertains to the requirements of Lime-stone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS							
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.										
162.	Section-VI, PART-A	Sub-Section-V	23 OF 26	10.09.00	Hoists <table><tr><td>Drive</td><td></td></tr><tr><td>(i) More than 2.0 tonne or more than 10.0 m lift or hoists coming out-side the buildings</td><td>Motor driven for both travel & lift.</td></tr><tr><td>(ii) Other hoists including the hoists for handling take-up pulley and take-up weight</td><td>Manual for both travel & lift.</td></tr></table>	Drive		(i) More than 2.0 tonne or more than 10.0 m lift or hoists coming out-side the buildings	Motor driven for both travel & lift.	(ii) Other hoists including the hoists for handling take-up pulley and take-up weight	Manual for both travel & lift.			The referred clauses of technical specifications are very clear and pertains to the requirements of Lime-stone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.
Drive														
(i) More than 2.0 tonne or more than 10.0 m lift or hoists coming out-side the buildings	Motor driven for both travel & lift.													
(ii) Other hoists including the hoists for handling take-up pulley and take-up weight	Manual for both travel & lift.													
163.	Section-VI, PART-B	I-M1	35 OF 51	14.09.00	Access ladders with suitable platform shall also be provided for approach to all motorized hoists/trolleys mounted on their runway beams for the maintenance of hoists/trolleys.	Considering the layout & space constraints, it may not be feasible to provide all electric hoists with maintenance / repair platforms with handrails. Hence maintenance platform shall be provided depending upon feasibility.	Specification requirement is clear in this regard. Bidder shall comply with the specification requirements.							

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
164.	Section-VI, PART-A	Sub-Section-VII	18 OF 61	A-10	MANDATORY SPARES: Spares for Electrically operated hoist for FGD WWT system for ZLD (for each type & size)	1) Mandatory spares of Electric hoists have been mentioned under these two referred clauses/ areas only. Kindly clarify whether Mandatory spares are to be considered for Electric Hoists in area, other than specified in referred clause. In case the same has to be considered, then kindly inform about applicable list of mandatory spares to be followed.	Bidder shall comply with the specification requirements given under the clauses referring to the equipment under the sub section VII.
165.	Section-VI, PART-A	Sub-Section-VII	39 OF 61	K	Mandatory Spares of Limestone & Gypsum Handling: ELECTRIC HOISTS	2) Further, no spares are mentioned for chain pulley blocks. We understand that no spares shall be provided for chain pulley blocks. Please confirm.	2) Confirmed.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



COMPRESSED AIR SYSTEM (MOUDA, SOLAPUR, MEJA, BARH, TANDA, NPGCL NABINAGAR & BRBCL NABINAGAR)

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
166.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	1 OF 7	1.01.00	The compressed air system shall consist of and Unit Instrument air receivers (One for each Unit).	Bidder understands that the scope of air receivers is as per technical specification Clause no. 3.00.00, Scope of supply & services, SECTION-VI / PART-A, Sub section-III-A2, page 3 of 4. Separate Unit Instrument air receivers are not applicable. NTPC to confirm.	Bidder's understanding is correct. Bidder to refer relevant amendment for more clarity.
167.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	1 OF 7	2.02.00	Design and Construction – For Compressor	MOC of all components within compressor skid shall be as per OEM standard. The MOC and design of all components outside the skid shall be as per technical specification.	Bidder shall comply with specification requirement. However, any superior material may be accepted as per manufacturer proven design practice.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
168.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	2 OF 7	4.00.00	Intercooler, Aftercooler & Oil coolers (For Screw)	fication/NIT. This is being followed in all the projects executed by bidder for NTPC and other customers. Pl. accept.	
169.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	2 OF 7	3.01.00	Air Compressor (Screw / Centrifugal).....	Bidder have considered oil free Screw type compressor only in view of small rating. Centrifugal compressor for such small capacity compressors are not available. NTPC to note.	Noted. Bidder to refer relevant amendment .
170.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	2 OF 7	3.04.00	Compressor frame shall have min. 10% extra capacity . Compressor shall have 25% min. turndown capacity . Compressor shall be provided with IGV at the suction flange.	Bidder have considered oil free Screw type compressor only. Hence this clause related to centrifugal type compressor shall not be applicable on Oil free screw compressor. Pl. confirm.	Bidder to refer amendment.
171.	SECTION-VI	I-M9 MDL	21 OF 24	9.02.00	SL. NO. 570 MQP OF LT MOTOR FOR AIR COMPRESSOR (ABB MAKE)	Pl. note that make of motor shall be as per NTPC approved makes for LT motor. Pl. accept.	Bidder's understanding is correct.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
172.	SECTION-VI / PART-A	III-A2 AIR CON-DITION-ING, VEN-TILATION SYSTEM & COM-PRESSED AIR SYS-TEM	3 OF 4	3.00.00(a)	Two numbers (1 W + 1S) oil free, rotary screw type air compressors for Instrument air & service air application for	1.) Bidder understands that two number compressors shall be provided for the Station and not for individual unit. Pl. confirm. 2.) Also the common compressor is to be provided for Instrument air & Service application. NTPC to confirm whether the common piping network to be provided for Instrument air and Service air application for plant use or a separate network of Instrument air & Service air to be provided. Pl. clarify, as bidder have considered common piping network for IA & SA application.	Bidder's understanding is correct. A separate network for IA and SA shall be provided. Bidder to refer relevant Amendment.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
173.	SECTION-VI / PART-A	III-A2 AIR CON-DITION-ING, VEN-TILATION SYSTEM & COM-PRESSED AIR SYS-TEM	3 OF 4	3.00.00(a)	Bidder request NTPC to accept the capacity of compressor as per design criteria given under cl. no. 9.01.00, Salient design data, SECTION-VI / PART-A, Sub section-V, page 20 of 26 OR compressor capacity of 15 Nm3/min whichever is lower. Pl. confirm.	Bidder shall comply with specification requirement.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
174.	SECTION-VI / PART-A	V SALIENT DESIGN DATA & SIZING	20 OF 26	9.01.00(a)	Air compressor shall be designed to meet the instrument air & service air requirement.....as per given formula	The formula for compressor sizing furnished by NTPC is not considering pneumatic air requirements for multiple nos. of Units for a particular project i.e. formula remain same for 1*660 MW, 2*660 MW, 3*660 MW etc. As the given formula is applicable for various projects, where in number of Units vary from 2 units to 4 units. Pl. clarify whether the same formula to be used for all projects irrespective of number of units i.e. on station basis.	Bidder's understanding is correct that Formula was given on Station basis.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
175.	SECTION-VI / PART-A	III-A2 AIR CON-DITION-ING, VEN-TILATION SYSTEM & COM-PRESSED AIR SYS-TEM	3 OF 4	3.00.00(d)	One number air receiver of capacity 2m3 for ZLD.....	Bidder shall provide the air receiver for ZLD specifically where ZLD requirement is applicable for that project. Pl. confirm.	Bidder's understanding is correct.
176.	SECTION-VI / PART-A	IV TERMINAL POINTS & EXCLUSIONS	3 OF 3	1.14.00(B)	Instrument air at one point (if required).	NTPC have asked for standalone compressed air system in order to meet the instrument air requirement for FGD. Pl. clarify whether additional tapping from existing instrument air network shall also be provided for meeting instrument air requirement for FGD. If yes, pl. furnish the coordinates for the terminal point.	Amendment will be issued in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
177.	SECTION-VI / PART-A	VI FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	22 OF 24	xxiii	Total power consumption at motor input terminal at rated duty of air compressor	Bidder request NTPC to specify the duty factor for considering the auxiliary power consumption for Compressed air system. As the continuous consumption of compressed air will be much lesser than the rated compressor capacity specified by NTPC. In such case, the compressor will go under unload conditions for a considerable time and thus lower power requirements. We request you to specify duty point for air compressors.	Duty point shall be 1.0 . Bidder shall comply with specification requirement.
178.	SECTION-VI / PART-A	VI FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	19 OF 24	xv	Compressed air system b.) Following shall be demonstrated at site.	Clause no. b(iii) is missing. NTPC to please provide the same.	The clause b(iii) does not exist .

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
179.	SECTION-VI / PART-A	III-A2 AIR CON-DITION-ING, VEN-TILATION SYSTEM & COM-PRESSED AIR SYS-TEM	3 OF 4	3.00.00	Compressed air system	Clause no. 3.00.00(e) & 3.00.00(f) are missing. NTPC to please provide the same.	Clause no. 3.00.00(e) & 3.00.00(f) does not exist.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.			
C&I						
180.	Section VI/Part-A	Sub-Section VII	Page 13 of 61 Page 19 of 61	Clause 1.19.00 Clause 1.21.00	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.	Refer amendment in this regard. The referred clause 1.19.00 stands deleted. Bidder to refer relevant amendment in this regard.
181.	Section VI/Part-A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.	Refer amendment in this regard.
ELECTRICAL						

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
182.	PART B/ SECTION- VI	II-E1	4 OF 7	2.05.00	Control Philosophy	Control of 11kV breakers (from 11kV station switchboards) from customer's DDCMIS shall be in customer's scope. Any change of logics in customer's existing control panel or DCS shall be arranged by the customer. Please confirm.	Please refer Amendment to Technical Specifications (Section VI). b) "All switchgears and MCCs shall be controlled from PLC/DCS.
183.	Drg No. 0011-109-POE-J-001/A-E	PART E		Note No. 10 of Drg No. 0011-109-POE-J-001/A-E	Two number 11kV.....of bidder.	1. It is clarified that necessary augmentation and modification required in customer's 11kV SWGR for two no. 11 kV motors per unit from existing spare feeder from station swbd shall be done by the customer. Please confirm. 2. Please also confirm that the feeding arrangement is also indicative and the actual arrangement of boards/ number of boards can be changed/ altered during the detailed engineering by the bidder based on the actual loads.	Please refer Amendment to Technical Specifications (Section VI).

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
184.	Drg No. 0011-109-POE-J-001/A-E	--	--	Note No. 11	Panel being used.....scope of bidder.	1. Cables & Cabling (Cable trays, tray supports, termination & jointing kits, clamps etc.) for these two 11kV HT feeders shall be in customer scope & is excluded from bidder's scope of supply & erection. Please Confirm. 2. Customer is requested to provide load (kVA) details for existing CHP/AHP along with any other load/feeder requirement for owner's use (if any).	Please refer Amendment to Technical Specifications(Section VI).

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
185.	PART A/ SECTION-VI	IIIB	2 OF 6	1.08.00 2)	1. Drg No. 0011-109-POE-F-001 is not available. Please provide. 2. Since there is a shortage of space in the Main plant area, separate structure/trestle is not possible to connect the Main plant to FGD. Also it is an existing system, hence it is requested that laying of cable shall be done by the customer on nearest available trestle in FGD area. Where-ever there is no space in already running customer's trays, trays shall be provided by the bidder. Please confirm. 2. Runway conductor available in customer's trestle will be utilized for earthing purpose and bidder shall not lay runway conductor in areas where customer's runway conductor is already available. Only tapping from customer's runway conductor to cable trays supplied by bidder shall be in bidder's scope. Please confirm.	1. refer to amendment 2. Bidder shall comply with technical specification requirement clause no: - 1.08.00.2. 3. Bidder can utilize employers run away conductor wherever available.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
186.	PART B/ SECTION- VI	II-E15	05 OF 16	4.00.00 3.	Lighting Masts	Number of Lighting Masts is not specified in the specification. Please confirm the minimum number	The same shall be decided during detailed engg.
187.	PART B/ SECTION- VI & OOOD-209-POE-A-002	II-E16	01 OF 13 & 11 OF 13	1.00.00 & 9.00.00	Battery Health Monitoring System & DC Health Monitoring system	As per clause 1.00.00 DC health monitoring system shall be offered integral with each battery set for main plant and switchyard battery. We understand that Battery & DC health monitoring system is excluded from bidder's scope of supply for 220V DC Battery for FGD area.	Bidder's understanding is NOT correct. 220V DC Battery for FGD area shall be in the bidder's scope of supply and DC health monitoring system is not applicable for FGD area battery.
188.	Drg No. 0011-109-POE-J-001/A-E	--	--	--	Electrical Single line diagram	Electrical single line diagram for FGD plant for two units (2x800MW Darlipalli, 2x800MW Gadawara and 2x800MW Laxra) has been provided. Kindly also provide Electrical Single line diagram for FGD plant for Three units i.e. 3x800 MW Kudgi STPP.	Please refer Amendment to Technical Specifications(Section VI).

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
189.	PART C/ SECTION VI	--	75 OF 83	--	GENERAL TECHNICAL REQUIREMENTS-Public Address system	Requirement of Public Address system is not mentioned anywhere in the specification except in this clause (Applicable code and standards for Public Address System) hence Public Address System is excluded from bidder's scope of supply for FGD area. Please confirm.	Public Address System is not in the scope of the bidder.
190.	PART B/ SECTION VI	II-E7	4 OF 6	2.16.01	Cable selection & sizing : HT cable shall be sized based on the following considerations: a) Rated current of the equipment	For Incoming cable to 11kV Tie Switch-gear in FGD area, sizing of cable shall be done as per actual loading of the switch-board. Please confirm.	Bidder shall comply with the technical specification
LAYOUT							

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
191.	Section -VI, Part-A	Sub Section- III-A1	Page 7 of 9	14.00.00	It is understood that pipe racks need to be constructed in new area for FGD requirement. However, existing pipe racks shall be used for routing pipes related to FGD system wherever need to do so arises. Kindly confirm.	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section -VI, Part-A, shall be complied with w.r.t trestles.
192.	Section -VI, Part-A	Sub Section-III-A1	Page 7 of 9	11.00.00	Please clarify whether various Equipment Cooling Water Auxiliaries of FGD system are to be kept in Pump house or shed.	Bidder shall provide Pump house.
193.	SECTION-VI / PART-B	I-III3 COM-PRESSED AIR SYSTEM	1 OF 7	1.01.00	Bidder understands that the scope of air receivers is as per technical specification Clause no. 3.00.00, Scope of supply & services, SECTION-VI / PART-A, Sub section-III-A2, page 3 of 4. Separate Unit Instrument air receivers are not applicable. Please confirm.	Bidder's understanding is correct. Bidder to refer relevant amendment for more clarity.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
194.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	1 OF 7	2.02.00	Design and Construction – For Compressor	MOC of all components within compressor skid shall be as per OEM standard. The MOC and design of all components outside the skid shall be as per technical specification/NIT. This is being followed in all the projects executed by bidder for NTPC and other customers. Please accept.	Bidder shall comply with specification requirement. However, any superior material may be accepted as per manufacturer proven design practice.
195.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	2 OF 7	4.00.00	Intercooler, Aftercooler & Oil coolers (For Screw)		
196.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	2 OF 7	3.01.00	Air Compressor (Screw / Centrifugal).....	Bidder have considered oil free Screw type compressor only in view of small rating. Centrifugal compressor for such small capacity compressors are not available. Customer to please note.	Noted. Bidder to refer relevant amendment .
197.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYS-TEM	2 OF 7	3.04.00	Compressor frame shall have min. 10% extra capacity . Compressor shall have 25% min. turndown capacity . Compressor shall be provided with IGV at the suction flange.	Bidder have considered oil free Screw type compressor only. Hence this clause related to centrifugal type compressor shall not be applicable on Oil free screw compressor. Please confirm.	Bidder to refer amendment.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
198.	SECTION-VI	I-M9 MDL	21 OF 24	9.02.00	SL. NO. 570 MQP OF LT MOTOR FOR AIR COMPRESSOR (ABB MAKE)	Please note that make of motor shall be as per NTPC approved makes for LT motor. Please accept.	Bidder's understanding is correct.
199.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(a)	Two numbers (1 W + 1S) oil free, rotary screw type air compressors for Instrument air & service air application for	3.) Bidder understands that two number compressors shall be provided for the Station and not for individual unit. Please confirm. 4.) Also the common compressor is to be provided for Instrument air & Service application. NTPC to confirm whether the common piping network to be provided for Instrument air and Service air application for plant use or a separate network of Instrument air & Service air to be provided. Please clarify, as bidder have considered common piping network for IA & SA application.	Bidder's understanding is correct. A separate network for IA and SA shall be provided. Bidder to refer relevant Amendment.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
200.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(a)	The min. capacity of each air compressor shall be 15 Nm ³ /min.....	Bidder requests NTPC to accept the capacity of compressor as per design criteria given under cl. no. 9.01.00, Salient design data, SECTION-VI / PART-A, Sub section-V, page 20 of 26 OR compressor capacity of 15 Nm ³ /min whichever is lower. Please confirm.	Bidder shall comply with specification requirement.
201.	SECTION-VI / PART-A	V SALIENT DESIGN DATA & SIZING	20 OF 26	9.01.00(a)	Air compressor shall be designed to meet the instrument air & service air requirement.....as per given formula	The formula for compressor sizing furnished by NTPC is not considering pneumatic air requirements for multiple nos. of Units for a particular project i.e. formula remain same for 1*660 MW, 2*660 MW, 3*660 MW etc. As the given formula is applicable for various projects, where in number of Units vary from 2 units to 4 units. Please clarify whether the same formula is to be used for all projects irrespective of number of units i.e. on station basis.	Bidder's understanding is correct that Formula was given on Station basis.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
202.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(d)	One number air receiver of capacity 2m3 for ZLD.....	Bidder shall provide the air receiver for ZLD specifically where ZLD requirement is applicable for that project. Please confirm.	Bidder's understanding is correct.
203.	SECTION-VI / PART-A	IV TERMINAL POINTS & EXCLUSIONS	3 OF 3	1.14.00(b)	Instrument air at one point (if required).	NTPC have asked for standalone compressed air system in order to meet the instrument air requirement for FGD. Please clarify whether additional tapping from existing instrument air network shall also be provided for meeting instrument air requirement for FGD. If yes, please furnish the coordinates for the terminal point.	Amendment will be issued in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
204.	SECTION-VI / PART-A	FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	22 OF 24	xxiii	Total power consumption at motor input terminal at rated duty of air compressor	Bidder request NTPC to specify the duty factor for considering the auxiliary power consumption for Compressed air system. As the continuous consumption of compressed air will be much lesser than the rated compressor capacity specified by NTPC. In such case, the compressor will go under unload conditions for a considerable time and thus lower power requirements. We request you to specify duty point for air compressors.	Duty point shall be 1.0 . Bidder shall comply with specification requirement.
205.	SECTION-VI / PART-A	FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	19 OF 24	xv	Compressed air system b.) Following shall be demonstrated at site.	Clause no. b(iii) is missing. NTPC is requested to provide the same.	The clause b(iii) does not exist .

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
206.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00	Compressed air system	Clause no. 3.00.00(e) & 3.00.00(f) are missing. NTPC is requested to provide the same.	Clause no. 3.00.00(e) & 3.00.00(f) does not exist.
BIDDING DOCUMENT NO.:			CS-0011-109(1A)-2		Doc No: CS-0011-109(1A)-2-CLRF-TECH-01		Page 92 of 736

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.			
HOISTS						
207.	SEC VI, PART-B	I-M1	35 OF 51	14.09.00	Contractor shall provide motorized hoists and trolleys for all items requiring maintenance and weighing 500 kg or more. Items weighing more than 50 kg and required to be replaced for maintenance shall be provided with manual hoists/trolleys with runway beams/supporting structure etc. Referred clauses are contradictory w.r.t selection of electric or manual hoist. We shall follow clause 10.09.00 of sub-section V/Section VI Part A for selection of electric or manual hoist. Kindly confirm.	Bidder shall comply with the requirements of Technical Specification. The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
208.	SEC VI, PART-B	I-M6	6 OF 73	4.3.2	For the hoists with more than 2.0 tonne lifting capacity or more than 10.0 m lift with the exception of hoists for GTU & bend pulleys motor operated hoist blocks for both long travel & lift shall be provided.	The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.
209.	Section-VI, PART-A	Sub-Section-V	23 OF 26	10.09.00	Hoists Drive (i) More than 2.0 tonne or more than 10.0 m lift or hoists coming outside the buildings (ii) Other hoists including the hoists for handling take-up pulley and take-up weight	The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
210.	Section-VI, PART-B	I-M1	35 OF 51	14.09.00	Access ladders with suitable platform shall also be provided for approach to all motorized hoists/trolleys mounted on their runway beams for the maintenance of hoists/trolleys.	Considering the layout & space constraints, it may not be feasible to provide all electric hoists with maintenance / repair platforms with handrails. Hence maintenance platform shall be provided depending upon feasibility. Please Confirm.	Specification requirement is clear in this regard. Bidder shall comply with the specification requirements
211.	Section-VI, PART-A	Sub-Section-VII	18 OF 61	A-10	MANDATORY SPARES: Spares for Electrically operated hoist for FGD WWT system for ZLD (for each type & size)	3) Mandatory spares of Electric hoists have been mentioned under these two referred clauses/areas only. Kindly clarify whether Mandatory spares are to be considered for Electric Hoists in area, other than speci-	Bidder shall comply with the specification requirements given under the clauses referring to the equipment under the sub section VII.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
212.	Section-VI, PART-A	Sub-Section-VII	39 OF 61	K	ified in referred clause. In case the same has to be considered, then kindly inform about applicable list of mandatory spares to be followed. 4) Further, no spares are mentioned for chain pulley blocks. We understand that no spares shall be provided for chain pulley blocks. Please confirm.	Confirmed.
213.	VI/A	III-D	2 of 4	1.06.00	CIVIL Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing. In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
214.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing..	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
215.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
216.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
217.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl.No.81

CLARIFICATION No.01 (TECHNICAL)

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
218.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection... The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl.No.82
219.	VI/B	IV-D	25 of 69	7.00.00			

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
220.	VI/A	II-A4	10 of 30	7.00.01	Annexure-IV is not available in the specification. Please provide the same.	Bidder to refer amendment
221.	SEC VI / PART B	I M1	6 OF 51	3.02.07	These clauses are contradictory. Bidder understands that if 2mm thick titanium/ C276 sheet wrapping over insulation is provided then no painting is required on external surface of the chimney flue liner projecting over the chimney roof. Please confirm.	No painting is required on external surface of chimney flue liner projecting above chimney roof. Also refer Amendment in this regard.
222.	SEC VI / PART B	IV D	15 OF 69	3.14.09 (iv)	Geotechnical data and foundation system for the respective project are enclosed at annexure-III. The corresponding bore logs are enclosed at annexure-IV. External surface of the chimney flue liner projecting over the chimney roof shall be wrapped with 2mm thick titanium/ C276 sheet over insulation., external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.	

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
223.	SEC VI / PART A	V	8 OF 26	5.01.00	External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation.	
224.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
225.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		
226.	SEC VI / PART B	IV D	39 OF 69	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
227.	SEC VI / PART B	IV D	39 OF 69	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge Preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.

CLARIFICATION No.01 (TECHNICAL)

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
228.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.	Specification requirement is clear. Bidder shall comply with the specification requirements.
229.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
230.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. Kindly furnish the following specifications for chimney liners. 1. Permissible tolerances on thickness of clad sheet and base material. 2. Permissible tolerances on flatness for clad sheet and base material. 3. Specify the quality tests which will be conducted on the clad sheet for assessing mechanical and chemical properties and on the chimney cans after fabrication. 4. Indicate any special requirements applicable for welding and fabrication of chimney at site. 5. Indicate any restriction in size of base metal and clad plate to be used for fabrication of flue cans. 6. Mention tensile and yield strength of the clad material to be achieved.	Specification requirement is clear. Bidder shall comply with the specification requirements.
231.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
232.	SEC VI / PART A	I	10 OF 19	4.02.03	For Chimney, Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	Bidder understands that, there is no other prequalification requirements related to fabrication and erection of titanium/c276 clad steel flue liner in chimney. Please confirm.
233.	SEC VI / PART B	IV D	2 OF 69	2.03.00	Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	
234.	VI / A	V	8 OF 26	5.01.00	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.			
C&I						
235.	Section VI/Part-A	Sub-Section VII	Page 13 of 61	Clause 1.19.00	Mandatory spares- AC & Ventilation system (Control & Instrumentation)	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.
			Page 19 of 61	Clause 1.21.00		Refer amendment in this regard. The referred clause 1.19.00 stands deleted. Bidder to refer relevant amendment in this regard.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
236.	Section VI/Part-A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	Mandatory spares- (Control & Instrumentation)	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.	Refer amendment in this regard.
ELECTRICAL							
237.	PART B/ SECTION-VI	II-E1	4 OF 7	2.05.00	Control Philosophy	Control of 11kV breakers (from 11kV station switchboards) from customer's DDCMIS shall be in customer's scope. Any change of logics in customer's existing control panel or DCS shall be arranged by the customer. Please confirm.	Please refer Amendment to Technical Specifications (Section VI). a) "All switchgears and MCCs shall be controlled from PLC/DCS.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
238.	Drg No. 0011-109-POE-J-001/A-E	PART E		Note No. 10 of Drg No. 0011-109-POE-J-001/A-E	Two number 11kV of bidder.	1. It is clarified that necessary augmentation and modification required in customer's 11kV SWGR for two no. 11 kV motors per unit from existing spare feeder from station swbd shall be done by the customer. Please confirm. 2. Please also confirm that the feeding arrangement is also indicative and the actual arrangement of boards/ number of boards can be changed/ altered during the detailed engineering by the bidder based on the actual loads.	Please refer Amendment to Technical Specifications (Section VI).

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
239.	Drg No. 0011-109-POE-J-001/A-E	--	--	Note No. 11	Panel being used.....scope of bidder.	1. Cables & Cabling (Cable trays, tray supports, termination & jointing kits, clamps etc.) for these two 11kV HT feeders shall be in customer scope & is excluded from bidder's scope of supply & erection. Please Confirm. 2. Customer is requested to provide load (kVA) details for existing CHP/AHP along with any other load/feeder requirement for owner's use (if any).	Please refer Amendment to Technical Specifications (Section VI).

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
240.	PART A/ SECTION- VI	IIIB	2 OF 6	1.08.00 2)	Cabling: Contractor scope shall include laying of cable from employer board as shown in Electrical Single Line Diagram Drg No. 0011-109-POE-J-001 on the employers nearest trestle in the FGD area as shown in Drg no 0011-999-POC-F-001 subject to availability of space and suitability. In case of non-availability of space in employer's trestle, contractor shall make necessary arrangements for cable tray erection & cable laying.	1. Drg No. 0011-109-POE-F-001 is not available. Please provide. 2. Since there is a shortage of space in the Main plant area, separate structure/ trestle is not possible to connect the Main plant to FGD. Also it is an existing system, hence it is requested that laying of cable shall be done by the customer on nearest available trestle in FGD area. Where-ever there is no space in already running customer's trays, trays shall be provided by the bidder. Please confirm. 2. Runway conductor available in customer's trestle will be utilized for earthing purpose and bidder shall not lay runway conductor in areas where customer's runway conductor is already available. Only tapping from customer's run way conductor to cable trays supplied by bidder shall be in bidder's scope. Please confirm.	1. refer to amendment no 2. Bidder shall comply with technical specification requirement clause no: - 1.08.00.2. 3. Bidder can utilize employers run away conductor wherever available.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
241.	PART B/ SECTION-VI	II-E15	05 OF 16	4.00.00 3.	Lighting Masts	Number of Lighting Masts is not specified in the specification. Please confirm the minimum number	The same shall be decided during detailed engg.
242.	PART B/ SECTION-VI & OOOD-209-POE-A-002	II-E16	01 OF 13 & 11 OF 13	1.00.00 & 9.00.00	Battery Health Monitoring System & DC Health Monitoring system	As per clause 1.00.00 DC health monitoring system shall be offered integral with each battery set for main plant and switchyard battery. We understand that Battery & DC health monitoring system is excluded from bidder's scope of supply for 220V DC Battery for FGD area.	Bidder's understanding is NOT correct. 220V DC Battery for FGD area shall be in the bidder's scope of supply and DC health monitoring system is not applicable for FGD area battery.
243.	Drg No. 0011-109-POE-J-001/A-E	--	--	--	Electrical Single line diagram	Electrical single line diagram for FGD plant for two units (2x800MW Darlipalli, 2x800MW Gadawara and 2x800MW Lara) has been provided. Kindly also provide Electrical Single line diagram for FGD plant for Three units i.e. 3x800 MW Kudgi STPP.	Please refer Amendment to Technical Specifications(Section VI).

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
244.	PART C/ SECTION- VI	--	75 OF 83	--	GENERAL TECHNICAL REQUIREMENTS-Public Address system	Requirement of Public Address system is not mentioned anywhere in the specification except in this clause (Applicable code and standards for Public Address System) hence Public Address System is excluded from bidder's scope of supply for FGD area. Please confirm.	Public Address System is not in the scope of the bidder.
245.	PART B/ SECTION- VI	II-E7	4 OF 6	2.16.01	Cable selection & sizing : HT cable shall be sized based on the following considerations: a) Rated current of the equipment	For Incoming cable to 11kV Tie Switchgear in FGD area, sizing of cable shall be done as per actual loading of the switchboard. Please confirm.	Bidder shall comply with the technical specification
LAYOUT							
246.	Section –VI, Part-A	Sub Section- III-A1	Page 7 of 9	14.00.00	The contractor scope shall also include the provision of FGD trestle for routing of air & water lines, slurry lines, steam line, waste water, etc.. required for the complete process operations.	It is understood that pipe racks need to be constructed in new area for FGD requirement. However, existing pipe racks shall be used for routing pipes related to FGD system wherever need to do so arises. Kindly confirm.	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section –VI, Part-A, shall be complied with w.r.t trestles.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
247.	Section –VI, Part-A	Sub Section-III-A1	Page 7 of 9	11.00.00	Buildings	Bidder shall provide Pump house.
COMPRESSED AIR SYSTEM						
248.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	1 OF 7	1.01.00	The compressed air system shall consist of and Unit Instrument air receivers (One for each Unit).	Bidder understands that the scope of air receivers is as per technical specification Clause no. 3.00.00, Scope of supply & services, SECTION-VI / PART-A, Sub section-III-A2, page 3 of 4. Separate Unit Instrument air receivers are not applicable. Please confirm.
249.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	1 OF 7	2.02.00	Design and Construction – For Compressor	MOC of all components within compressor skid shall be as per OEM standard. The MOC and design of all components outside the skid shall be as per technical specification/NIT. This is being followed in all the projects executed by bidder for NTPC and other customers. Please accept.
250.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	2 OF 7	4.00.00	Intercooler, Aftercooler & Oil coolers (For Screw)	Bidder shall comply with specification requirement. However, any superior material may be accepted as per manufacturer proven design practice.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
251.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	2 OF 7	3.01.00	Air Compressor (Screw / Centrifugal)	Bidder have considered oil free Screw type compressor only in view of small rating. Centrifugal compressors are such small capacity compressors are not available. Customer to please note.	Noted. Bidder to refer relevant amendment .
252.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	2 OF 7	3.04.00	Compressor frame shall have min. 10% extra capacity . Compressor shall have 25% min. turndown capacity . Compressor shall be provided with IGV at the suction flange .	Bidder have considered oil free Screw type compressor only. Hence this clause related to centrifugal type compressor shall not be applicable on Oil free screw compressor. Please confirm.	Bidder to refer amendment.
253.	SECTION-VI	I-M9 MDL	21 OF 24	9.02.00	SL. NO. 570 MQP OF LT MOTOR FOR AIR COMPRESSOR (ABB MAKE)	Please note that make of motor shall be as per NTPC approved makes for LT motor. Please accept.	Bidder's understanding is correct.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
254.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(a)	Two numbers (1 W + 1S) oil free, rotary screw type air compressors for Instrument air & service air application for.....	5.) Bidder understands that two number compressors shall be provided for the Station and not for individual unit. Please confirm. 6.) Also the common compressor is to be provided for Instrument air & Service application. NTPC to confirm whether the common piping network to be provided for Instrument air and Service air application for plant use or a separate network of Instrument air & Service air to be provided. Please clarify, as bidder have considered common piping network for IA & SA application.	Bidder's understanding is correct. A separate network for IA and SA shall be provided. Bidder to refer relevant Amendment.
255.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(a)	The min. capacity of each air compressor shall be 15 Nm ³ /min.....	Bidder requests NTPC to accept the capacity of compressor as per design criteria given under cl. no. 9.01.00, Salient design data, SECTION-VI / PART-A, Sub section-V, page 20 of 26 OR compressor capacity of 15 Nm ³ /min whichever is lower. Please confirm.	Bidder shall comply with specification requirement.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
256.	SECTION-VI / PART-A	V SALIENT DESIGN DATA & SIZING	20 OF 26	9.01.00(a)	Air compressor shall be designed to meet the instrument air & service air requirement.....as per given formula	The formula for compressor sizing furnished by NTPC is not considering pneumatic air requirements for multiple nos. of Units for a particular project i.e. formula remain same for 1*660 MW, 2*660 MW, 3*660 MW etc. As the given formula is applicable for various projects, where in number of Units vary from 2 units to 4 units. Please clarify whether the same formula is to be used for all projects irrespective of number of units i.e. on station basis.	Bidder's understanding is correct that Formula was given on Station basis.
257.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COM-PRESSED AIR SYSTEM	3 OF 4	3.00.00(d)	One number air receiver of capacity 2m3 for ZLD.....	Bidder shall provide the air receiver for ZLD specifically where ZLD requirement is applicable for that project. Please confirm.	Bidder's understanding is correct.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
258.	SECTION-VI / PART-A	IV TERMINAL POINTS & EXCLUSIONS	3 OF 3	1.14.00(b)	Instrument air at one point (if required).	NTPC have asked for standalone compressed air system in order to meet the instrument air requirement for FGD. Please clarify whether additional tapping from existing instrument air network shall also be provided for meeting instrument air requirement for FGD. If yes, please furnish the coordinates for the terminal point.	Amendment will be issued in this regard.
259.	SECTION-VI / PART-A	VI FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	22 OF 24	xxiii	Total power consumption at motor input terminal at rated duty of air compressor.....	Bidder request NTPC to specify the duty factor for considering the auxiliary power consumption for Compressed air system. As the continuous consumption of compressed air will be much lesser than the rated compressor capacity specified by NTPC. In such case, the compressor will go under unload conditions for a considerable time and thus lower power requirements. We request you to specify duty point for air compressors.	Duty point shall be 1.0 . Bidder shall comply with specification requirement.

TENDER NO. : PSER:SCT:NBH-C2080:20

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
260.	SECTION-VI / PART-A	VI FUNCTION- AL GUAR- ANTEES & LIQUIDITY DAMAGES	19 OF 24	xv	Compressed air system b.) Following shall be demonstrated at site.	Clause no. b(iii) is missing. NTPC is requested to provide the same.	The clause b(iii) does not exist .

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
261.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COM-PRESSED AIR SYSTEM	3 OF 4	3.00.00	Compressed air system	Clause no. 3.00.00(e) & 3.00.00(f) are missing. NTPC is requested to provide the same.	Clause no. 3.00.00(e) & 3.00.00(f) does not exist.
BIDDING DOCUMENT	NO.:	CS-0011-109(1A)-2			Doc No: CS-0011-109(1A)-2-CLRF-TECH-01		Page 120 of 736

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
HOISTS							
262.	SEC VI, PART-B	I-M1	35 OF 51	14.09.00	Contractor shall provide motorized hoists and trolleys for all items requiring maintenance and weighing 500 kg or more. Items weighing more than 50 kg and required to be replaced for maintenance shall be provided with manual hoists/trolleys with runway beams/supporting structure etc.	Referred clauses are contradictory w.r.t selection of electric or manual hoist. We shall follow clause 10.09.00 of sub-section V/Section VI Part A for selection of electric or manual hoist.	
263.	SEC VI, PART-B	I-M6	6 OF 73	4.3.2	For the hoists with more than 2.0 tonne lifting capacity or more than 10.0 m lift with the exception of hoists for GTU & bend pulleys motor operated hoist blocks for both long travel & lift shall be provided.	Kindly confirm.	The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
264.	Section-VI, PART-A	Sub- Section-V	23 OF 26	10.09.00	Hoists		The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.
					Drive		
					(i) More than 2.0 tonne or more than 10.0 m lift or hoists coming out-side the buildings (ii) Other hoists including the hoists for handling take-up pulley and take-up weight		
265.	Section-VI, PART-B	I-M1	35 OF 51	14.09.00	Access ladders with suitable platform shall also be provided for approach to all motorized hoists/trolleys mounted on their runway beams for the maintenance of hoists/trolleys.	Considering the layout & space constraints, it may not be feasible to provide all electric hoists with maintenance / repair platforms with hand-rails. Hence maintenance platform shall be provided depending upon feasibility. Please Confirm.	Specification requirement is clear in this regard. Bidder shall comply with the specification requirements

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
266.	Section-VI, PART-A	Sub- Section-VII	18 OF 61	A-10	MANDATORY SPARES: Spares for Electrically operated hoist for FGD WWT system for ZLD (for each type & size)	5) Mandatory spares of Electric hoists have been mentioned under these two referred clauses/ areas only. Kindly clarify whether Mandatory spares are to be considered for Electric Hoists in area, other than specified in referred clause. In case the same has to be considered, then kindly inform about applicable list of mandatory spares to be followed.	Bidder shall comply with the specification requirements given under the clauses referring to the equipment under the sub section VII.
267.	Section-VI, PART-A	Sub- Section-VII	39 OF 61	K	Mandatory Spares of Lime-stone & Gypsum Handling: ELECTRIC HOISTS	6) Further, no spares are mentioned for chain pulley blocks. We understand that no spares shall be provided for chain pulley blocks. Please confirm.	
CIVIL							Confirmed.

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
268.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
269.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
270.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

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271.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
272.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colored coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer SI.No.81

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
273.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
274.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
275.	VI/A	II-A3	22 OF 31	Annexure-IV, e)	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.
				The minimum pile length for each group of piles shall be determined based on the nearest bore log. A minimum embedment of 2.0m into pebbles/cobbles/boulder strata (river Bed material) as observed in such bore log shall be ensured, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby bore log data.		

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
276.	VI/A	II-A3	14 OF 31	7.02.03 xv	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder may conduct either static routine load test or high strain dynamic load test. Refer amendment .

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
277.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished.	Bidder to refer amendment.
278.	SEC VI / PART B	I M1	6 OF 51	3.02.07	External surface of the chimney flue liner projecting over the chimney roof shall be wrapped with 2mm thick titanium/ C276 sheet over insulation.	These clauses are contradictory. Bidder understands that if 2mm thick titanium/ C276 sheet wrapping over insulation is provided then no painting is required on external surface of the chimney flue liner projecting over the chimney roof. Please confirm.	No painting is required on external surface of chimney flue liner projecting above chimney roof. Also refer Amendment in this regard.
279.	SEC VI / PART B	IV D	15 OF 69	3.14.09 (iv)	, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.		
280.	SEC VI / PART A	V	8 OF 26	5.01.00	External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation.		

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
281.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder understands that cladding can be done with explosion bonding or hot rolling or combination of both to achieve the required quality as per ASTM B 898-11. Please confirm.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.
282.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.
283.	SEC VI / PART B	IV D	39 OF 69	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
284.	SEC VI / PART B	IV D	39 OF 69	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge Preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
285.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.	Specification requirement is clear. Bidder shall comply with the specification requirements.
286.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
287.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Kindly furnish the following specifications for chimney liners. 1. Permissible tolerances on thickness of clad sheet and base material. 2. Permissible tolerances on flatness for clad sheet and base material. 3. Specify the quality tests which will be conducted on the clad sheet for assessing mechanical and chemical properties and on the chimney cans after fabrication. 4. Indicate any special requirements applicable for welding and fabrication of chimney at site. 5. Indicate any restriction in size of base metal and clad plate to be used for fabrication of flue cans. 6. Mention tensile and yield strength of the clad material to be achieved.	Specification requirement is clear. Bidder shall comply with the specification requirements.
288.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		Bidder's understanding is Correct.
289.	SEC VI / PART A	I	10 OF 19	4.02.03	For Chimney, Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	Bidder understands that, there is no other prequalification requirements related to fabrication and erection of titanium/ c276 clad steel flue liner in chimney. Please confirm.	Bidder's understanding is Correct.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
290.	SEC VI / PART B	IV D	2 OF 69	2.03.00	Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.		
291.	VI / A	V	8 OF 26	5.01.00	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	The location of new Wet Chimney shall be near to Existing Chimney in the space provided clearing foundation interface. The design of Wet Chimney shall be done considering interface factor of existing chimney as determined by wind tunnel study. However, no design check or validation shall be done for existing chimney/structures/buildings. Kindly confirm.	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.			
C&I						
292.	Section VI/Part-A	Sub-Section VII	Page 13 of 61	Clause 1.19.00 Clause 1.21.00	Mandatory spares- AC & Ventilation system (Control & Instrumentation)	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.
293.	Section VI/Part-A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	Mandatory spares- (Control & Instrumentation)	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.
ELECTRICAL						

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
294.	PART B/ SECTION- VI	II-E1	4 OF 7	2.05.00	Control Philosophy	Control of 11kV breakers (from 11kV station switchboards) from customer's DDCMIS shall be in customer's scope. Any change of logics in customer's existing control panel or DCS shall be arranged by the customer. Please confirm.	Please refer Amendment to Technical Specifications(Section VI). a) "All switchgears and MCCs shall be controlled from PLC/DCS.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.			
C&I						
295.	Section VI/Part-A	Sub-Section VII	Page 13 of 61 Page 19 of 61	Clause 1.19.00 Clause 1.21.00	C&I Mandatory spares for AC & Ventilation are covered in both clauses and are repeated also. Only Clause 1.19.00 (3) will be considered for C&I spares. Please confirm.	Refer amendment in this regard. The referred clause 1.19.00 stands deleted. Bidder to refer relevant amendment in this regard.
296.	Section VI/Part-A	Sub-Section VII	Page 45 of 61	Clause 1.25.00	C&I mandatory spares for AC & ventilation system and Compressed air system shall be provided as per clause 1.19.00 and 1.23.00 respectively. Mandatory Spares mentioned under Clause 1.25.00 shall not be applicable for above mentioned packages. Please confirm.	Refer amendment in this regard.
ELECTRICAL						

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
297.	PART B/ SEC-TION- VI	II-E1	4 OF 7	2.05.00	Control Philosophy	Control of 11kV breakers (from 11kV station switchboards) from customer's DDCMIS shall be in customer's scope. Any change of logics in customer's existing control panel or DCS shall be arranged by the customer. Please confirm.	Please refer Amendment to Technical Specifications(Section VI). a) "All switchgears and MCCs shall be controlled from PLC/DCS.
298.	Drig No. 0011-109-POE-J-001/A-E	PART E		Note No. 10 of Drig No. 0011-109-POE-J-001/A-E	Two number 11kV of bidder.	1. It is clarified that necessary augmentation and modification required in customer's 11kV SWGR for two no. 11 kV motors per unit from existing spare feeder from station swbd shall be done by the customer. Please confirm. 2. Please also confirm that the feeding arrangement is also indicative and the actual arrangement of boards/ number of boards can be changed/ altered during the detailed engineering by the bidder based on the actual loads.	Please refer Amendment to Technical Specifications(Section VI).

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
299.	Drp No. 0011-109-POE-J-001/A-E	--	--	Note No. 11	1. Cables & Cabling (Cable trays, tray supports, termination & jointing kits, clamps etc.) for these two 11kV HT feeders shall be in customer scope & is excluded from bidder's scope of supply & erection. Please Confirm. 2. Customer is requested to provide load (kVA) details for existing CHP/AHP along with any other load/feeder requirement for owner's use (if any).	Please refer Amendment to Technical Specifications (Section VI).

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
300.	PART A/ SEC- TION- VI	IIIB	2 OF 6	1.08.00 2)	Cabling: Contractor scope shall include laying of cable from employer board as shown in Electrical Single Line Diagram Drg No. 0011-109-POE-J-001 on the employers nearest trestle in the FGD area as shown in Drg no 0011-999-POC-F-001 subject to availability of space and suitability. In case of non-availability of space in employer's trestle, contractor shall make necessary arrangements for cable tray erection & cable laying.	1. Drg No. 0011-109-POE-F-001 is not available. Please provide. 2. Since there is a shortage of space in the Main plant area, separate structure/ trestle is not possible to connect the Main plant to FGD. Also it is an existing system, hence it is requested that laying of cable shall be done by the customer on nearest available trestle in FGD area. Where-ever there is no space in already running customer's trays, trays shall be provided by the bidder. Please confirm. 2. Runway conductor available in customer's trestle will be utilized for earthing purpose and bidder shall not lay runway conductor in areas where customer's runway conductor is already available. Only tapping from customer's runway conductor to cable trays supplied by bidder shall be in bidder's scope. Please confirm.	1. Bidder to refer necessary amendment in this regard. 2. Bidder shall comply with technical specification requirement clause no: - 1.08.00.2. 3. Bidder can utilize employers run away conductor wherever available.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
301.	PART B/ SEC-TION- VI	II-E15	05 OF 16	4.00.00 3.	Lighting Masts	Number of Lighting Masts is not specified in the specification. Please confirm the minimum number	Bidder shall provide LMs as per technical specification requirements. Quantity shall be decided during detail engineering.
302.	PART B/ SEC-TION- VI & OOOD-209-POE-A-002	II-E16	01 OF 13 & 11 OF 13	1.00.00 & 9.00.00	Battery Health Monitoring System & DC Health Monitoring system	As per clause 1.00.00 DC health monitoring system shall be offered integral with each battery set for main plant and switchyard battery. We understand that Battery & DC health monitoring system is excluded from bidder's scope of supply for 220V DC Battery for FGD area.	Bidder's understanding is NOT correct. 220V DC Battery for FGD area shall be in the bidder's scope of supply and DC health monitoring system is not applicable for FGD area battery.
303.	Drp No. 0011-109-POE-J-001/A-E	--	--	--	Electrical Single line diagram	Electrical single line diagram for FGD plant for two units (2x800MW Darlipalli, 2x800MW Gadawara and 2x800MW Lara) has been provided. Kindly also provide Electrical Single line diagram for FGD plant for Three units i.e. 3x800 MW Kudgi STPP.	Refer amendment to technical specifications wherein SLD for FGD system for all unit configurations have been provided.

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
304.	PART C/ SEC- TION- VI	--	75 OF 83	--	Requirement of Public Address system is not mentioned anywhere in the specification except in this clause (Applicable code and standards for Public Address System) hence Public Address System is excluded from bidder's scope of supply for FGD area. Please confirm.	Public Address System is not in the scope of the bidder.
305.	PART B/ SEC- TION- VI	II-E7	4 OF 6	2.16.01	For Incoming cable to 11kV Tie Switchgear in FGD area, sizing of cable shall be done as per actual loading of the switchboard. Please confirm.	Bidder shall comply with the technical specification
LAYOUT						

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
306.	Section -VI, Part-A	Sub Section- III-A1	Page 7 of 9	14.00.00	The contractor scope shall also include the provision of FGD trestle for routing of air & water lines, slurry lines, steam line, waste water, etc.. required for the complete process operations.	It is understood that pipe racks need to be constructed in new area for FGD requirement. However, existing pipe racks shall be used for routing pipes related to FGD system wherever need to do so arises. Kindly confirm.	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section -VI, Part-A, shall be complied with w.r.t trestles.
307.	Section -VI, Part-A	Sub Section-III-A1	Page 7 of 9	11.00.00	Buildings	Please clarify whether various Equipment Cooling Water Auxiliaries of FGD system are to be kept in Pump house or shed.	Bidder shall provide Pump house.
COMPRESSED AIR SYSTEM							
308.	SECTION-VI / PART-B	I-M3 COMPRESSED AIR SYSTEM	1 OF 7	1.01.00	The compressed air system shall consist of and Unit Instrument air receivers (One for each Unit).	Bidder understands that the scope of air receivers is as per technical specification Clause no. 3.00.00, Scope of supply & services, SECTION-VI / PART-A, Sub section-III-A2, page 3 of 4. Separate Unit Instrument air receivers are not applicable. Please confirm.	Bidder's understanding is correct. Bidder to refer relevant amendment for more clarity.
309.	SECTION-VI / PART-B	I-M3 COMPRESSED AIR SYSTEM	1 OF 7	2.02.00	Design and Construction – For Compressor	MOC of all components within compressor skid shall be as per OEM standard. The MOC and design of all components outside the skid shall be as per technical	Bidder shall comply with specification requirement. However, any superior material may be accepted as per manufacturer proven design practice.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
310.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	2 OF 7	4.00.00	Intercooler, Aftercooler & Oil coolers (For Screw)	specification/NIT. This is being followed in all the projects executed by bidder for NTPC and other customers. Please accept.	
311.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	2 OF 7	3.01.00	Air Compressor (Screw / Centrifugal).....	Bidder have considered oil free Screw type compressor only in view of small rating. Centrifugal compressor for such small capacity compressors are not available. Customer to please note.	Noted. Bidder to refer relevant amendment .
312.	SECTION-VI / PART-B	I-M3 COM-PRESSED AIR SYSTEM	2 OF 7	3.04.00	Compressor frame shall have min. 10% extra capacity . Compressor shall have 25% min. shutdown capacity . Compressor shall be provided with IGV at the suction flange.	Bidder have considered oil free Screw type compressor only. Hence this clause related to centrifugal type compressor shall not be applicable on Oil free screw compressor. Please confirm.	Bidder to refer amendment.
313.	SECTION-VI	I-M9 MDL	21 OF 24	9.02.00	SL. NO. 570 MQP OF LT MOTOR FOR AIR COMPRESSOR (ABB MAKE)	Please note that make of motor shall be as per NTPC approved makes for LT motor. Please accept.	

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
314.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(a)	Two numbers (1 W + 1S) oil free, rotary screw type air compressors for Instrument air & service air application for.....	7.) Bidder understands that two number compressors shall be provided for the Station and not for individual unit. Please confirm. 8.) Also the common compressor is to be provided for Instrument air & Service application. NTPC to confirm whether the common piping network to be provided for Instrument air and Service air application for plant use or a separate network of Instrument air & Service air to be provided. Please clarify, as bidder have considered common piping network for IA & SA application.	Bidder's understanding is correct. A separate network for IA and SA shall be provided. Bidder to refer relevant Amendment.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
315.	SEC-TION-VI / PART-A	III-A2 AIR CON-DITION-ING, VENTILA-TION SYS-TEM & COM-PRESSED AIR SYS-TEM	3 OF 4	3.00.00(a)	The min. capacity of each air com-pressor shall be 15 Nm3/min.....	Bidder requests NTPC to accept the capacity of compressor as per design criteria given under cl. no. 9.01.00, Salient design data, SEC-TION-VI / PART-A, Sub section-V, page 20 of 26 OR compressor ca-pacity of 15 Nm3/min whichever is lower. Please confirm.	Bidder shall comply with speci-fication requirement.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
316.	SECTION-VI / PART-A	V SALIENT DESIGN DATA & SIZING	20 OF 26	9.01.00(a)	The formula for compressor sizing furnished by NTPC is not considering pneumatic air requirements for multiple nos. of Units for a particular project i.e. formula remain same for 1*660 MW,2*660 MW, 3*660 MW etc. As the given formula is applicable for various projects, where in number of Units vary from 2 units to 4 units. Please clarify whether the same formula is to be used for all projects irrespective of number of units i.e. on station basis.	Bidder's understanding is correct that Formula was given on Station basis.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
317.	SECTION-VI / PART-A	III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM	3 OF 4	3.00.00(d)	One number air receiver of capacity 2m3 for ZLD.....	Bidder shall provide the air receiver for ZLD specifically where ZLD requirement is applicable for that project. Please confirm.	Bidder's understanding is correct.
318.	SECTION-VI / PART-A	IV TERMINAL POINTS & EXCLUSIONS	3 OF 3	1.14.00(b)	Instrument air at one point (if required).	NTPC have asked for standalone compressed air system in order to meet the instrument air requirement for FGD. Please clarify whether additional tapping from existing instrument air network shall also be provided for meeting instrument air requirement for FGD. If yes, please furnish the coordinates for the terminal point.	Amendment will be issued in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
319.	SECTION-VI / PART-A	VI FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	22 OF 24	xxiii	Total power consumption at motor input terminal at rated duty of air compressor.....	Bidder request NTPC to specify the duty factor for considering the auxiliary power consumption for Compressed air system. As the continuous consumption of compressed air will be much lesser than the rated compressor capacity specified by NTPC. In such case, the compressor will go under unload conditions for a considerable time and thus lower power requirements. We request you to specify duty point for air compressors.	Duty point shall be 1.0 . Bidder shall comply with specification requirement.
320.	SECTION-VI / PART-A	VI FUNCTIONAL GUARANTEES & LIQUIDITY DAMAGES	19 OF 24	xv	Compressed air system b.) Following shall be demonstrated at site.	Clause no. b(iii) is missing. NTPC is requested to provide the same.	The clause b(iii) does not exist .

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/PART	SUBSEC.	PAGE NO.			
321.	SECTION-VI / PART-A	III-A2 AIR CON-DITION-ING, VENTILA-TION SYS-TEM & COM-PRESSED AIR SYS-TEM	3 OF 4	3.00.00	Clause no. 3.00.00(e) & 3.00.00(f) are missing. NTPC is requested to provide the same.	Clause no. 3.00.00(e) & 3.00.00(f) does not exist.
BIDDING DOCUMENT NO.:			CS-0011-109(1A)-2	Doc No: CS-0011-109(1A)-2-CLRF-TECH-01		Page 149 of 736

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
HOISTS							
322.	SEC VI, PART-B	I-M1	35 OF 51	14.09.00	Contractor shall provide motorized hoists and trolleys for all items requiring maintenance and weighing 500 kg or more. Items weighing more than 50 kg and required to be replaced for maintenance shall be provided with manual hoists/trolleys with runway beams/supporting structure etc. For the hoists with more than 2.0 tonne lifting capacity or more than 10.0 m lift with the exception of hoists for GTU & bend pulleys motor operated hoist blocks for both long travel & lift shall be provided.	Referred clauses are contradictory w.r.t selection of electric or manual hoist. We shall follow clause 10.09.00 of sub-section V/Section VI Part A for selection of electric or manual hoist. Kindly confirm.	Bidder shall comply with the specification requirements.
323.	SEC VI, PART-B	I-M6	6 OF 73	4.3.2			The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
324.	Section-VI, PART-A	Sub-Section-V	23 OF 26	10.09.00	Hoists Drive (i) More than 2.0 tonne or more than 10.0 m lift or hoists coming out-side the buildings (ii) Other hoists including the hoists for handling take-up pulley and take-up weight		The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.
325.	Section-VI, PART-B	I-M1	35 OF 51	14.09.00	Access ladders with suitable platform shall also be provided for approach to all motorized hoists/trolleys mounted on their runway beams for the maintenance of hoists/trolleys.	Considering the layout & space constraints, it may not be feasible to provide all electric hoists with maintenance / repair platforms with handrails. Hence maintenance platform shall be provided depending upon feasibility. Please Confirm.	Specification requirement is clear in this regard. Bidder shall comply with the specification requirements

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
326.	Section-VI, PART-A	Sub-Section-VII	18 OF 61	A-10	MANDATORY SPARES: Spares for Electrically operated hoist for FGD WWT system for ZLD (for each type & size)	7) Mandatory spares of Electric hoists have been mentioned under these two referred clauses/ areas only. Kindly clarify whether Mandatory spares are to be considered for Electric Hoists in area, other than specified in referred clause. In case the same has to be considered, then kindly inform about applicable list of mandatory spares to be followed.	Bidder shall comply with the specification requirements given under the clauses referring to the equipment under the sub section VII.
327.	Section-VI, PART-A	Sub-Section-VII	39 OF 61	K	Mandatory Spares of Limestone & Gypsum Handling: ELECTRIC HOISTS	8) Further, no spares are mentioned for chain pulley blocks. We understand that no spares shall be provided for chain pulley blocks. Please confirm.	Confirmed.
CIVIL							

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
328.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
329.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
330.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
331.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		
332.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl.No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
333.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection... The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
334.	VI/B	IV-D	25 of 69	7.00.00			
335.	VI-A	II-A2	23-39 of 48	Annexure-II	BORE LOG	Geotechnical investigation report is not readable. Please provide the report in readable format.	Bidder to refer amendment.
336.	SEC VI / PART B	I M1	6 OF 51	3.02.07	External surface of the chimney flue liner projecting over the chimney roof shall be wrapped with 2mm thick titanium/ C276 sheet over insulation.	These clauses are contradictory. Bidder understands that if 2mm thick titanium/ C276 sheet wrapping over insulation is provided then no painting is required on	No painting is required on external surface of chimney flue liner projecting above chimney roof. Also refer Amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
337.	SEC VI / PART B	IV D	15 OF 69	3.14.09 (iv)	external surface of the chimney flue liner projecting over the chimney roof. Please confirm.	
338.	SEC VI / PART A	V	8 OF 26	5.01.00	, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation.	
339.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC / PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
340.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		
341.	SEC VI / PART B	IV D	39 OF 69	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
342.	SEC VI / PART B	IV D	39 OF 69	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge Preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
343.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.	Specification requirement is clear. Bidder shall comply with the specification requirements.
344.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		
345.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Kindly furnish the following specifications for chimney liners. 1. Permissible tolerances on thickness of clad sheet and base material. 2. Permissible tolerances on flatness for clad sheet and base material. 3. Specify the quality tests which	Specification requirement is clear. Bidder shall comply with the specification requirements.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
346.	SEC VI / PART B	I M1	6 OF 51	3.02.07	will be conducted on the clad sheet for assessing mechanical and chemical properties and on the chimney cans after fabrication. 4. Indicate any special requirements applicable for welding and fabrication of chimney at site. 5. Indicate any restriction in size of base metal and clad plate to be used for fabrication of flue cans. 6. Mention tensile and yield strength of the clad material to be achieved.	
347.	SEC VI / PART A	I	10 OF 19	4.02.03	Bidder understands that, there is no other prequalification requirements related to fabrication and erection of titanium/ c276	Bidder's understanding is Correct.
348.	SEC VI / PART B	IV D	2 OF 69	2.03.00	clad steel flue liner in chimney. Please confirm.	

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
349.	VI / A	V	8 OF 26	5.01.00	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	The location of new Wet Chimney shall be near to Existing Chimney in the space provided clearing foundation interface. The design of Wet Chimney shall be done considering interface factor of existing chimney as determined by wind tunnel study. However, no design check or validation shall be done for existing chimney/structures/buildings. Kindly confirm.	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

CLARIFICATION No.01 (TECHNICAL)**Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects**

Sl. No.	Vol No	Clause No.	Page No.	Issues	Comments / Clarifications	NTPC reply
350.	Sec-VI Part-D ,ECC	Clause no. 28.04.00	Page no. 12	Site laboratory for Civil Work	Bidder through its civil work sub-contractors will set up a temporary field quality Lab to conduct normal civil work tests at site. However, customer to allow bidder/it's subcontractors to take back those field quality lab equipment after completion of work at site. Please confirm.	We understand that after completion of work at site, contractor may be allowed to take back their lab equipments.

SL.	ENQUIRY SPECIFICATION	SPECIFICATION REQUIRE-	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



NO	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.	MENT		
351.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	04 of 51	1.09.00	The equivalent weighted average of sound level measured at a distance of 1.5 m above floor level in each elevation and one meter horizontally from the base of any equipments furnished and installed under these specifications, expressed in decibel to a reference of 0.0002 microbar, shall not exceed 85 dB(A).	Deviation: It is possible to meet guaranteed noise level of 85 dBA for all equipments except for Ball Mill and crushers. The guaranteed values for these equipments are • Ball Mill : 90 dBA • Crusher : 100 dBA Kindly Confirm	Bidder to refer necessary amendment in this regard.
352.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	05 of 51	3.01.00 Sl. no: 5	Flue Gas Velocity: Maximum flue gas velocity through the Absorber (m/s)- Not more than 4 m/s at design point	Deviation: As per our FGD design practice, maximum gas velocity through the Absorber shall be 4.0-4.5m/s. Kindly confirm.	Bidder shall comply with the specification requirements under the referred clause 3.01.00.
353.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	05 of 51	3.01.00 Sl. no: 6	Recirculation Slurry pH: Not Less than 5.5 under all operation conditions	Deviation: Based on our FGD design practice, slurry pH in the Absorber is between 5 and 6.5. FGD will be designed for the same. Kindly confirm.	Bidder shall comply with the specification requirements under the referred clause 3.01.00

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
354.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	06 of 51	3.02.04	The duct from Absorber outlet to bypass duct shall be made of Carbon steel of minimum 7mm thickness with 2 mm (minimum) thickness lining / cladding / wall paper of Alloy C276 / Alloy 59 or better material.	Clarification: Treated flue gas after Absorber outlet will be sent to New wet stack. No bypass duct is envisaged. Bidder requested Employer to delete the bypass duct in the scope of bidder. Please confirm	Bidder to refer necessary amendment in this regard.
355.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	14 of 51	5.01.00 Sl.no: iv	The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side.	Deviation: Normally in case of recirculation pump area, in case of any pump stoppage the gate needs to quickly close without leakages in the slurry lines. In case of knife gate valves, there may be leakages after few operations due to wearing of components. In such applications, we propose to provide pneumatic operated butterfly valves that are widely provided in FGD plants.	Bidder shall comply with the specification requirements.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
356.	General					Owner to furnish the following drawings (project wise) which will come as interface for the proposed FGD system: 1. ESP Control Room - Plan & Elevation 2. Ash Handling System & Buildings - Plan & Elevation 3. Pipe Rack around AHS - Plan & Elevation	1&2. Requested drawings/details will be furnished during the detailed engg. stage with the successful bidder. 3. Bidder to refer list of drawings provided at of Sub Section- II- PROJECT INFORMATION (For Various Projects) Section –VI, Part-A for pipe/cable trestle drawings.
357.	General				Barh BRBCL Nabinagar	Owner to furnish the Pipe Rack drawings (Plan & Elevation) around existing Chimney which will come as interface for the proposed FGD system for the following projects 1. NTPC Barh (3x660 MW) 2. NTPC BRBCL (4x250 MW) Nabina-gar	Bidder to refer Amended Project Information, being issued separately, as under: 1. Table 6 of Sub Section- II-A 11 PROJECT INFORMATION (NABINAGAR TPP) Section –VI Part-A. 2. List of drawings provided at Page 30/30 of Sub Section- II- PROJECT INFORMATION (Barh-I 3X660 MW) Section –VI, Part-A.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
358.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	15 of 51	5.02.00	Deviation: As per our FGD design, under normal FGD operation, the jet Air Sparger (JAS) works to keep the slurry in suspension and no agitators are required to be in operation. The Agitators are required only during FGD stoppage to prevent the deposit settlement. For this purpose, we are offering two numbers of Agitators. However, to meet tender requirement, one spare will be provided as a ware house spare.	NTPC noted.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
359.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	17 of 51	5.06.02	Clarification: Customer's requirement "deviation from average: less than $\pm 10\%$" is too strict and it is not required for the stable operation at the actual plants based on Bidder's experiences. The deviation from average is generally 15-20% and Bidder designed and delivered FGD plants based on the deviation from the average for approx. $\pm 15\%$. Bidder requested to change deviation from "$\pm 10\%$" to "$\pm 15-20\%$".	Bidder shall comply with the specification requirements under the referred cl. 5.06.02.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
360.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	17 of 51	5.06.06	Mist Eliminator: Three stage chevron type Mist Eliminators (ME) made of Polysulfone or stainless steel shall be provided at the exit of the absorber.	Clarification: As per our proven practice, Mist Eliminator will be made of polypropylene (PP) or FRP. Kindly confirm.	Bidder shall comply with the specification requirements under the referred cl. 5.06.06.
361.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	20 of 51	5.06.23	It should be possible to discharge the absorber sump into the auxiliary absorbent tank within 2 hours.	Clarification: We propose 8 hours to discharge the slurry from absorber / absorber sump into the emergency drain tank to have optimum design of pumps. Please confirm	Bidder shall comply with the specification requirements under the referred cl. 5.06.23.
362.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	26 of 51	7.04.01 SI no: c	Vacuum Belt Filters: Gypsum purity : 90 % (minimum)	Limestone purity of 89% as CaCO ₃ is necessary to get 90 wt. % of Gypsum Purity So Gypsum purity will be guaranteed based on 89 % of Limestone purity as CaCO ₃ (FGD Guarantee point). Please confirm	Bidder shall comply with the specification requirements under the referred cl. 7.04.01

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
363.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	29 of 51	7.08.03	Agitation shall be provided to prevent settlement of slurry by side entry agitators with emergency flush start system. Sufficient number of agitators shall be provided in the tank by the contractor to prevent the solids from settling down.	As per proven FGD practice, the installation height (shaft installation height) of the agitator will be located above the limestone/Gypsum accumulation level of the tank. Bidder will offer agitator without emergency flushing system Please confirm.	Bidder shall comply with the specification requirements under the referred cl.no. 7.08.03.
364.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	33 of 51	12.02.00	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality.	Clarification: As per proven practice, all the pipes handling slurry shall be provided with FRP material. Please confirm.	Bidder shall comply with the specification requirements under the referred cl.no. 12.02.00.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
365.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	31 of 51	10.01.00	Slurry & Process Water Tanks: Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor	Clarification: In clause no: 10.01.00, additional corrosion allowance for tank is mentioned as 3 mm whereas in clause no: 13.01.00, it is mentioned as 1.5mm. Kindly confirm the additional corrosion allowance to be considered for the process water tank.	Amendment will be issued in this regard.
366.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	33 of 51	13.01.00	Process Water Storage Tanks & Pumps: Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the bidder		Bidder shall comply with the specification requirements.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
367.	SECTION-VI / Part-B	Project Information			Design Clarified Water Analysis:	Bidder request Customer to note that use of CW blow down (COC-5.5) for FGD process makeup result in degradation of absorption and/or oxidation performance because the CW blow down inherently contains anticorrosion reagents which will inhibit the performance. Bidder considered clarified water analysis (Design Clarified Water Analysis) for FGD make up without any COC. Please confirm.	Bidder to note that the source of water is as per the tender specifications which is of CW blowdown quality, widely used for FGD process world around. Bidder shall design and supply the system such that degradation of the FGD system will not take place.
368.	SECTION-VI / Part-B	Project Information			Design Clarified Water Analysis:	Bidder request customer to inform the CW blow (COC-5.5) water temperature which is required for FGD designing. Please furnish.	Please refer specification Cl no-4.02.00 (a), Sub-section -I-M5, Part-B, Section-VI for secondary water inlet temperature. Specification is quite clear in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
369.	VI-Part-A	IV Functional Guarantees	18 of 24	4.02.00 Sl. No: vi	Waste Water: The Contractor guarantees that the maximum purge flow rate to waste water treatment system for the complete plant shall be 10m3/hr averaged over a 24 hour period from each unit.	Bidder understands that the waste water requirement is 5 m3/hr for each unit of Nabigar (4x250MW) project. Total waste water for all 4 units is 20 m3/hr. Kindly confirm.	Kindly refer amendment in this regard.
370.	VI-Part-A	V Salient Design Data & Sizing	01 of 26	1.00.00	Salient Design Data & Sizing: Kudgi (3x800MW), Lara (2x800MW), Gadawara (2x800MW), Darlipalli (2x800MW)	In FGD Flue Gas composition, the value of H ₂ O content specified at design point is very less (i.e. 3.958 % wet) Bidder request customer to check and confirm.	Kindly refer amendment in this regard.
371.	VI-Part-A	V Salient Design Data & Sizing	03 of 36 & 05 of 36	2.00.00 & 3.00.00	Salient Design Data & Sizing: Meja (2x660MW)	Meja (2x660MW) The FGD sizing data were furnished for Meja (2x660MW) project in two clauses (2.00.00 & 3.00.00). Kindly confirm FGD sizing data to be considered for design and guarantee.	Kindly refer amendment in this regard.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
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372.	VI-Part-A	V Salient Design Data & Sizing	07 of 26	4.00.00	Number of Absorber: Nabinagar (4x250MW)	Nabinagar (4x250MW) Bidder would like to propose common Absorber for 2 units. Therefore 2 Nos of Absorber for all 4 units. Please confirm.	Bidder shall comply with specification requirements.
373.	SECTION-VI / Part-B	SUB-SECTION-I-M1 (FGD)	08 of 51	4.01.01	Booster Fan: Nabinagar (4x250MW)	Nabinagar (4x250MW) Bidder would like to propose mono Booster Fan for each unit. Therefore 4 Nos of Booster Fan for all 4 units. Please confirm.	Bidder shall comply with specification requirements.

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374.	VI/B	I-M1	4.01.00	8 of 51	Booster Fan: Additional a pressure loss of 100 mm wcl (excluding margin) shall be built up in booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-Nox system	We understand from the tender that 44 % margin to be applied over the summation of P1 & P2 where P1 is pressure requirement for the FGD system as arrived from the tender sizing conditions for booster fan P2 is 100 mm wcl to take care of pressure loss due to future installation of De-Nox system. Kindly clarify Bidder understanding.	Bidder's understanding is correct.

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
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375.	VI/B	I-M1	4.04.00	11 of 51	The Booster Fans for these FGD projects are of similar construction to that of axial reaction ID fans and is handling the same volume and flue gas parameter as that of ID fans. In case of Patratu 3x800 MW & Talcher 2x660 MW tenders, NTPC has already issued amendment for ID fan max speed as 750 rpm. Bidder would like to offer FGD Boosters Fans with 750 rpm (max speed).	Bidder shall comply with specification requirements.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
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376.	VI/B	I-M1	4.04.00	11 of 51	Booster Fan : Fan casing material thickness : Abrasion and wear resistant, high BHN steel having minimum 8.0 mm thickness or 12 mm mild steel with liner of thickness 10 mm (min.)	The Booster Fans for these FGD projects are of similar construction to that of axial reaction ID fans and is handling the same volume and flue gas parameter as that of ID fans. In case of Patratu 3x800 MW & Talcher 2x660 MW tenders, NTPC has stipulated : “ID Fan casing material thickness: Abrasion and wear resistant, high BHN steel having minimum 8.0 mm thickness or 12 mm mild steel with liner of thickness 10 mm (min.) Alternatively, 22 mm thickness casing of mild steel is also acceptable.” Bidder would like to clarify that offered FGD Booster Fans casing shall be of mild steel without liners and with minimum thickness as per design requirement/ manufacturer’s standard.	Bidder to refer necessary amendment in this regard.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
377.	Section-VI, Part A	Sub Section- VII Mandatory Spares	Page 6 of 61	1.02.00 Gates in Flue Gas System	1. Seals [1 set of each type (Set means complete replacement for one gate)] & 4. Seals for guillotine gate (Both port side and bonnet side) (In case Gates are provided) – 1 set for each gate	Port & Bonnet Seals for Guillotine Gate (required as per clause: 4. are already covered in 1. Seals (complete replacement for one gate). Hence, these Port and Bonnet seals are repeating as these items form part of complete set of seals. Please inform whether to consider these seals in Sl. No. 1 alone.	Bidder to refer necessary amendment in this regard.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
378.	Section-VI, Part A	Sub Section- VII Mandatory Spares	Page 6 of 61, & Page 55 of 61	1.02.00 Gates in Flue Gas System & 1.26.00 ELECTRICAL → 1.02.00 Electrical Actuators	1.02.00 → 2. Actuator (1 no. of each type & rating) & 1.26.00 → 1.02.00 Electrical Actuators → 1. Actuator (1 no. of each type & rating) in Page no: 6 of 61. Hence, we are not considering the same electrical actuators under Clause no: 1.26.00 → 1.02.00 Electrical Actuators → 1. Actuators (1 no of each type and rating) in Page no: 55 of 61. Please confirm.	For FGD Gates, we are considering mandatory spare Electrical Actuators under clause 1.02.00 Gates in Flue Gas System → 2. Actuator (1 no. of each type & rating) in Page no: 6 of 61. Hence, we are not considering the same electrical actuators under Clause no: 1.26.00 → 1.02.00 Electrical Actuators → 1. Actuators (1 no of each type and rating) in Page no: 55 of 61. Please confirm.	Bidder to refer amendment in this regards.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
379.	Section-VI, Part B	Sub-Section-I-M1 (FGD)	Page 7 of 51	3.03.01 & 3.03.07	3.03.01. . . . A gas tight, motor operated Guillotine gate shall be provided by the Contractor in the bypass duct (flue gas duct connecting the existing chimney). & 3.03.07. A quick acting biplane damper shall be provided by the Contractor in the bypass duct (flue gas duct connecting the existing chimney) for quick opening to allow bypass to come into operation in case of emergency. The damper shall be capable of quick opening during emergency conditions within a time of 10-20 secs.	When the FGD is in operation, the FGD Bypass Damper will be closed (ensuring 100 % sealing efficiency with seal air fans). However, the FGD Bypass Gate cannot be kept closed as emergency situation may arise suddenly. (The Gate will take not less than 5 minutes considering the Height of the Gate Blade to slide open). In case the FGD Bypass Gate is also kept closed and emergency situation arises, the purpose of providing the Quick Operating Damper in Bypass duct is vanished and serves no purpose. So, this Gate will be open all the time – whether FGD is in service or FGD not operating. Hence, only Quick-acting Biplane Damper is required and Guillotine Gate is not required in the bypass duct.	Bidder to reply with specification requirements.

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380.	PART – B	Sub section II- E10	11 OF 58	4.15.00	All 415v switchgear panel shall be of single front type. MCC's and DB'S shall be single front\double front construction as per requirement.	Breaker modules will be of Single front and the other modules will be of Double front type construction. Kindly confirm.	Technical Specifications to be complied with.
381.	PART – B	Sub section II- E10	12 OF 58	5.0.00	In order to establish the compliance with the requirements of this technical specification, prototype panels shall be made and offered for the employers inspection and approval before the start of manufacturing of panels for this project.	Prototype panel shall consist of one vertical section meeting all the technical requirements indicated by customer. Kindly confirm	Clause is ample clear which says "The exact configuration of such prototype panels shall be finalized during detailed engineering."

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
382.	PART – B	Sub section II- E10	20 OF 58	18.01.00	All circuit breaker feeders shall be provided with communicable numerical relays complying with IEC- 61850..... Connected to the Switchgear SCADA System	Communication to be given to both DDCMIS & SCADA system. Kindly confirm.	This clause is deleted. Please refer Amendment to Technical Specification (Section VI)
383.	PART – B	Sub section II- E6	2 OF 69	2.01.05	The cable vault / cable spreader room space below the HT/LT Switchgear room.....800 mm wide & 2.1m high movement passage .	Since for human movement 2.1m height is envisaged , we are offering vault room with 2.1m height. Kindly confirm.	The same shall be decided during detailed engg..

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	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
384.	VI-PART-B	VI-D CIVIL WORKS	24 of 69	6.08.00	Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, ball Mill building shall be through RCC staircase and roof access to all other buildings all shall be through cage ladder as per requirement	It is proposed to provide steel staircases for access to operating floors of all buildings except FGD Control room/MCC building. RCC staircase will be provided for FGD Control room/MCC building. Cage ladder may be allowed for access to roofs of all buildings with roof sheeting. Kindly accept	Bidder shall comply with technical specification requirement.
385.	VI-PART-B	VI-D CIVIL WORKS	-	-	Ball Mill Building:	Type of construction of Ball Mill building is not mentioned in the technical specification. Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting). Kindly confirm.	Type of building structure (Steel/RCC) and cladding system shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any). However, roof shall be of RCC as per technical specification requirement.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
386.	VI-PART-B	VI-D CIVIL WORKS	-	-	Gypsum building: dewatering	Type of construction of Gypsum Dewatering building is not mentioned in the technical specification. Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting). Floor of Vacuum belt filter will be RCC over metal deck sheeting. Kindly confirm.	Bidder shall comply with technical specification requirement.

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
387.	VI-PART-B	VI-D CIVIL WORKS	-	-	Type of construction of the building to house recirculation pumps and oxidation blowers is not mentioned in the technical specification. Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting). Kindly confirm.	Type of building structure (Steel/RCC) and cladding system shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any). However, roof shall be of RCC as per technical specification requirement.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
388.	SECTION – VI, PART-A	SUB-SECTION-III-A1 FGD	1.03.00	The contractor's scope shall include,, common limestone grinding system...	Please confirm if we can have a common limestone, unloading, storage, grinding, slurrification and dosing system for FGD and ZLD systems. This would reduce footprint.	Bidder's understanding is correct.
389.	SECTION – VI, PART-A	SUB-SECTION-III-A6 ZLD	1.01.00	Pre treatment system shall consist of FGD waste water storage tank (2x50%) to store FGD waste water,	We propose 1x100% tank sized for 30 m3/h inflow (Barh-I) and 20 m3/h inflow (Nabinagar) instead of 2x50%	Stipulations of technical specification is clear. As mentioned in Cl. No. 1.01.00, Sub-section IIIA-6,

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
				GGH washing water, etc	tanks. Please confirm. Also please clarify all the waste water sources leading to ZLD, such GGH washing wastes, process wastes, cooling water wastes, if any.	Part-A, Bidder shall provide Pre-treatment system consisting of 2x50% FGD waste water storage tank for storing FGD wastewater, GGH washing water etc. As such, any other waste water as envisaged by Bidder shall also be considered while designing the Waste storage tank.
390.	SECTION – VI, PART-A	SUB-SECTION-III-A6 ZLD	1.02.00	1 of 3	We propose 1x100% Evaporative Concentration System.	Stipulations of Technical specification requirement is clear. Contractor shall provide one independent train (1x100%) or two independent trains (2x50%) of Evaporative concentration system.
391.	SECTION – VI, PART-A	SUB-SECTION-III-B ELECTRICAL	1.02.00	1 of 6	Electrical Single Line Diagram Drg No. 0011-109-POE-J-001	Common HT/LT switchgear for FGD & ZLD Can be provided. Regarding integration of ZLD and FGD control in one PLC, confirmation from C&I

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
					based control system for ZLD can be integrated with that of FGD.	may be taken.
392.	SECTION – VI, PART-A	SUB-SECTION-IV Terminal Points & Exclusions	1.08.00	2 of 3	FGD waste water pipes shall terminate allong with isolation valve at 5 meters near HCSD mixing tank	We presume this is not applicable in Barh & Nabinagar since ZLD is provided. Please clarify.
393.	SECTION – VI, PART-A	SUB-SECTION-IV Functional Guarantees & LD	4.02.00	18 of 24	Waste Water: The contractor guarantees that the maximum purge flow rate to waste water treatment system for the complete plant shall be 10 m3/h averaged over a 24 hour period for each unit.	Please clarify the exact flow rate to be considered for de-signing the ZLD. Is it
394.	SECTION – VI, PART-C	General Technical Requirements	30.00.00	42 of 83	Noise levels <85 dBA for FGD equipment and <90 dBA for Ball Mills	Please clarify the acceptance of noise levels for ZLD equipment - near field & far field.
395.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	2.00.00	3 of 32	Conditions of Service - 'All Design Pressure of all device, piping, and auxiliary facilities...Device and tank maximum allowance: operating pressure x 1.5' and also 'piping and auxiliary	This may not apply for larger "fit for service" equipment like Evaporators and Crystallizers. We will provide our recommendations on design pressuress for piping and tanks in our offer based on our

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
				facilities: 150 lb class flange, STD wall pipe'	proven experience.	
396.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	E 2	Evaporative concentrator shall be designed to start / stop every day	Please clarify why this requirement is made. We presume FGD & ZLD will operate at full capacity continuously.	Bidder shall comply Technical specification requirement.
397.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	E 6	Pressure vessel in evaporative concentration shall be designed as per ASME Sec VIII or equivalent code listed above.	Evaporator is typically not a pressure vessel and not necessarily designed as per ASME Sec VIII. Kindly accept our standard practice.	Technical specification requirement is clear. Any pressure vessel in evaporative concentration shall be designed as per ASME Sec VIII or equivalent code. However, for evaporator, proven design and experience meeting provenness criteria specified in tender is acceptable .
398.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	E 14	Hoists shall be provided for all vessels in evaporative concentration system as per the Manufacturer's proven practice	We will recommend our practice for handling / maintenance.	Technical specification requirement is clear. However, proven practice of handling and maintenance of OEM is also acceptable which shall be decided during detailed engineering.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS	
	Part	Sub-section	Clause no.				Page
399.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	E 15	10 of 32	Vessel support shall be designed same as materials for vessel. Different material cannot be welded to vessel.	This is not our practice to provide supports of same material as the vessel. We will explain our arrangement of supports in our offer.	Vessel support arrangement as per proven practice of OEM is also acceptable which shall be finalized during detail engineering.
400.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	F 2	10 of 32	Centrifuge to dehydrate solids form evaporative concentration shall be consist of Centrifuge 2x50%	Centrifuge does not 'dehydrate solids' it makes wet cake or solids suitable for landfill.	Bidder's query is not clear. Bidder shall comply Technical specification requirements.
401.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	22 d	14 of 32	Size: 1/2%-inchOD minimum	Our minimum is 1/4" OD tube. Kindly accept.	This shall be finalized during detail engineering.
402.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	3.02.01 4)	15 of 32	...the contractor shall provide duplicate pumps (2x100%) or multiple standby pumps for the same service.	Duplicate pumps are not needed for all pumps. We will propose in our offer the applicable connected redundancies and store standbys.	Redundancy with store standby of Pumps as per the proven practice of OEM is also acceptable which shall be decided during detailed engineering.
403.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	3.02.03 2)	20 of 32	Slurry tanks shall be provided with screen at the inlet nozzles.	This is not our practice. Screens if required will be provided to protect downstream equipment (such as heat exchangers) as per our proven experience.	Technical specification requirement is clear. However, proven practice of screens for slurry tanks of OEM is also acceptable which shall be decided during

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
404.	SECTION – VI, PART-B	SUB-SECTION-I-M7 ZLD	3.02.056)	Additional required equipment for Vapour Compressor : i) Shaft driven lube oil pump	Kindly accept electrically driven lube oil pump due to limitations in design of certain compressor manufacturers	Electrically driven lube oil pumps as per the proven practice of OEM is also acceptable which shall be decided during detailed engineering.
405.	Process Flow Diagram	ZLD		3 of 3	The scheme shows steam driven crystalizer, whereas write up calls for MVR. Please clarify.	As mentioned in Cl. No. 2.00.00 D, Sub-section I-M7, Part-B, Auxiliary steam if required shall be provided by owner for start-up condition only. For continuous duty, Bidder to design the various systems considering power driven equipment and the same shall be considered in power guarantee.
406.	Part-B	Sec-VI, Sub Sec: I-M7	2.00.00D)	Auxiliary steam if required shall be provided by owner for start-up condition only. For continuous duty, Bidder to design the various	We request Customer to provide steam for continuous duty (for Brine concentrator & Crystallizer) to optimize power consumption. Kindly con-	Technical specification requirement is clear. Auxiliary steam if required shall be provided by owner for start-up condition only.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
407.	Part-B	Sec-VI, Sub Sec: I-M7		systems considering power driven equipment and the same shall be considered in power guarantee.	firm acceptance.	For continuous duty, Bidder to design the various systems considering power driven equipment and the same shall be considered in power guarantee.
			3.02.06-11	Mechanical Vapour Compressor One (1), 100% duty, centrifugal compressor shall be provided. Compressor shall have 2507 casing, 2507 impeller. Inlet guide vanes or an outlet damper valve shall be provided for flow control. Oil cooler, filter and vibration monitoring shall be included as required.	We recommend steam driven for the application if steam can be made available. Request Customer to provide steam for continuous duty of Crystallizer. Kindly confirm acceptance.	Technical specification requirement is clear. Auxiliary steam if required shall be provided by owner for start-up condition only. For continuous duty, Bidder to design the various systems considering power driven equipment and the same shall be considered in power guarantee.
408.	Part-B	Sec-VI, Sub Sec: I-M7	3.01.00	Evaporative concentration system consisting of 1x100% or 2x50% Evaporator/Brine concentrator train(s) to be provided to accept feed from Pre-	The clauses are contradictory. We presume that both the options i.e 1x100% and 2x50% are acceptable. Kindly confirm.	Evaporative concentration system consisting of 1x100% or 2x50% Evaporator/Brine concentrator train(s) shall be provided.
			3.01.00 E)			

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
				treatment Contractor shall provide two independent trains (2x50%) to maintain for redundancy of critical operations;		

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
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409.	VI Part D	ECC	11/53	27.02.00	Water Contractor shall make all arrangements himself for the supply of construction water as well as portable water for labour and other personnel at worksites/colony. However drawl of construction/portable water from bore well shall be permitted if found suitable.	Owner requested that Construction & domestic water shall be provided at a single point free of charge. All arrangements for further distribution beyond this point have to be made by the Contractor.	Specification requirement is clear. Bidder shall comply with the specification requirements.
410.	VI Part A	III D	2/4	2.00.00 (1)	Providing drinking and service water for bidder labour, staff and other personnel.....		
411.	VI Part A	III D	2/4	2.00.00 (4)	Providing all arrangement for the supply of construction water including bore wells, water tankers etc.		
412.	VI Part A	III D	2/4	2.00.00 (5)	Providing Temporary construction office, construction stores open/covered.....	As per the bid specifications we understand that the owner shall provide land, free from all encumbrances, free of charge for construction of site office.	Specification requirement is clear. Bidder shall comply with the specification requirements.
413.	VI Part D	ECC	12/53	28.01.00	Contractors site office establishment The contractor shall establish a site office and keep posted an authorized representative..... And the employer	Owner to confirm the availability of same.	
414.	VI Part A	III D	2/4	2.00.00 (5)	Providing Temporary construction office, construction stores open/covered.....	As per the bid specifications we understand that the owner shall provide land, free from all en-	Bidder shall comply with technical specification requirement.

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415.	VI Part D	ECC	16/53	35.01.00	All the equipment's furnished under the contract and arriving at site shall be promptly received, unloaded and transported and stored in the storage spaces by the contractor.	cumbrances, free of charge for construction of open yard, closed storage sheds. Owner to confirm the availability of same.	
416.	VI Part A	III D	2/4	2.00.00 (2)	Developing temporary staff colony & labour colony	As per the bid specifications we understand that the owner shall provide land, free from all encumbrances, free of charge for construction labour colony and other site infrastructure. Owner to confirm the availability of same.	Bidder shall comply with technical specification requirement.

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S.No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
417.	/Section-VI/Part-A/Subsection-I Intent of Specification/4.05.02		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 JV/subsidiary or up to the end of defect liability period of the contract whichever is later.	It is applicable to critical equipment or all the equipment and materials?	Bidder to refer clarifications being issued separately.

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S.No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
418.	Amendment No.1 to Technical Specification/Section-VI/Part-A/Subsection-I Intent of Specification/1.01.01	2/19	TECHNICAL SPECIFICATION (SECTION VI PART A)1.01.01 2 OF 19 (New Clause added) Government of India has launched "Make in India" initiative to transform India into a global design and manufacturing hub. Accordingly, to promote manufacturing within India, the import content in Flue Gas Desulphurisation (FGD) System package has been restricted to 30% of the total Supply value quoted by Bidder in Price Schedule-11plus Schedule-2 . . Bidder shall ensure that it does not import more than 30% of its Supplies and shall manufacture/source equipment Uco mponents from within India to meet the aforesaid requirement.	Considering Schedule - 1 and Schedule - 2, the two clarifications made by the Employer are ambiguous. Please further clarify: 1. whether the 30% restriction applies only to the FGD system or also to the stack system and the ZLD system. 2. what the denominator is in the calculation of the 30% restriction. Is it the total of the prices in Schedule - 1 and Schedule - 2, or the sum of the prices for the FGD system in Schedule - 1 and Schedule - 2? or anything else? 3. It is suggested that the ZLD system should not be subject to the 30% restriction. (The system has to be imported because no such technology is available locally.) 4. Whether the equipment and materials produced by a foreign company in a sole proprietorship or joint venture in India belong to "made in India"?	Bidder to refer clarifications being issued separately.

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S.No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
419.	Section VI/Part A/Sub Section III Scope of Supply and Services			1, Please clarify whether the spare parts for the wet stack, stack condensate system, stack flow simulation, stack corrosion protection, stack lift, etc. are in the scope of supply of the Bidder? 2, Who is going to provide the weighing wridge for road trucks / Tipplers? 3, Who is going to provide the front end loader/ pay loader?	
420.	Section VI/Part A/SubSectionA1 FGD/6.01.00	5/9	The employer shall provide a common auxiliary absorbent tank, common for all the unites, of sufficient capacity for storage of absorbent slurry of one unit.	Please clarify who shall supply the auxiliary absorbent tank, the Employer or the Contractor? Please advise us of the dimensions of the tank if it is provided by the Employers. Who is responsible for the corrosion protection of the tank?	The Contractor shall provide an auxiliary absorbent tank. Bidder to refer necessary amendment in this regard.
421.	Section VI/Part B/SubSection-I-MI FGD/6.01.00/7.08.01		The Contractor shall provide an auxiliary absorbent tank, for the unit, sized to contain the complete slurry of one absorber tank at its maximum level equipped with		Specification requirement is clear in this regard.

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S.No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
422.	Section VI/Part B/SubSection-I-MI FGD/6.01.00/7.04.03		Gypsum cake from each belt filter shall be discharged through a hopper onto belt conveyor being provided by the Employer.	Please advise us of the location for gypsum storage.	Bidder to identify the suitable location for Gypsum storage based on the tender drawings provided.

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S.No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
423.	Section VI/Part E/ Electrical single line diagram for FGD Package/Drg No.0011-109-POE-J-001 / A-E	53/53		Query 1: About the drawing 0011-109-POE-J-001 / A-E: ① Which part in the single-line diagram is for the existing switch board segments or the additional HV and LV switch board segments? Please clarify the scope of work. ② Please advise us of the current rating and breaking capacity of the 11kV circuit breakers for the FGD system and clarify whether the circuit breakers are within the scope of work. Please also advise us of the cable type and channel length for the connection of the two segments and clarify whether the supply and reconstruction of the cable is within the scope of work. ③ Regarding Note 11, please advise us of the capacity of the coal handling / ash handling segment and the specific type and model of the existing 11/3.3kV transformer for the consideration of replacement with a DD type transformer. Please advise us of the existing wiring of the transformer and clarify whether the switchgear and cable are within the scope of supply. Please advise us of the HV side cable length from the transformer to the main power building and clarify whether the existing cable can be re-used. ④ Is the 415V segment for the FGD system for one unit or two units? Is the diesel generator necessary? Is it acceptable for the Bidder to supply an emergency power supply from the main power building instead of the diesel generator? ⑤ Is it acceptable for the two FGD systems to share one DC system and one UPS system? The DC system consists of two sets of lead-acid valve-controlled maintenance-free batteries, two high-frequency switching chargers and two DC feeder panels. Query 2: Please advise us of the interfaces between the main power building and the cables and Lighting protection and grounding systems for the FGD system Query 3: Are there any special requirements of the motors, switchgears, primary elements, secondary elements, etc. for environment, such as temperature and humidity?	Query 1: 1) Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI). 2) Please refer Technical Specification Section VI/Part-B/Subsection -II-E1 & E9. 3) Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI). 4) Bidders shall create suitable number of 415V LT Systems for feeding FGD loads as per requirement. Scheme shown in SLD is typical for the entire FGD plant. Bidder to refer Note-8 of Revised SLD being issued with AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI) regarding applicability of DG set. 5) Common DC system for entire FGD Plant is acceptable. However the DC system shall be as per requirements of Technical Specification Section VI/Part-B/Subsection -II-E1, E16 and E17. Query 2: Query 3: Please refer Technical Specification Section VI/Part-B/Subsection -II-E1.

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S.No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
424.	Section VI/Part B/SubSection-III-C&I			Please advise us of the respective numbers of the operator stations and the engineer stations (to provide according to the configuration as shown in 0000-151-POI-A-013?).	i) Bidder to refer clause 6.01.00, PART-A, Sub Section-III-C, where in it is mentioned that Operator Work Station (OWS) shall be supplied on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control room)-(N+1) where N is the total number of generating units per project under this package. b) OWS cum EWS (placed in FGD control room)-ONE (1) c) OWS (placed in central control room of each generating unit)-TWO (2). Bidder to refer amendment in this regard.
				The Technical Specification does not mention the CCTV system. Please clarify whether the CCTV system for the FGD system is within the scope of supply. Please clarify whether the environmental acceptance of the CEMS system is within the scope of work.	
					ii) CCTV system for FGD is not in bidder's scope of supply.

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					iii) Bidder's query is not clear. Bidder shall comply with the specification requirement.
425.	Section VI/Part B/SubSection-IV-CIVIL			Please provide the geotechnical investigation report and the trial pile report for the main power building.	Bidder to refer Project information chapter. Bidder to refer necessary amendment in this regard.
426.	Section VI/Part A/Sub Section III Scope of Supply and Services			Please confirm the scope of supply for water supply and drainage? Is sanitary ware not within the scope of supply?	Specification requirement is clear. Bidder shall comply with the specification requirements.

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
427.	Part-B-Sec-MI	5.01.00, A, (iv)	5 of 51	Maximum flue gas velocity through the absorber (m/s) : Not more than 4.0m/s at design point conditions	Maximum flue gas velocity through the absorber (m/s) : Not more than 4.0m/s at guarantee point conditions	Flue gas velocity through the absorber is important design factor for FGD. Fast velocity increases mist carry over and low velocity decrease SO ₂ removal efficiency. Considering both guarantee items ab-	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.01.00..

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
428.	Part-B-Sec-MI	5.01.0 O, A, (iv)	14 of 51	The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side	The slurry recirculation pumps shall have motor driven butterfly valve at pump suction and discharge side	sorber diameter is designed to have proper velocity.	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.01.00..
429.	Part-B-Sec-MI	5.01.0 O, A, (iii)	14 of 51	The slurry recirculation pumps shall have a minimum margin of 10% of flow and 10% on friction head, over the actual requirement for meeting the guarantee and design point conditions.	The slurry recirculation pumps shall have a minimum margin of 10% of flow and 1~2% head, over the actual requirement for meeting the guarantee and design point conditions.	If pressure has 10% margin, it is difficult to control flow rate at spray nozzles for suitable droplet size related to SO ₂ removal efficiency due to required operation pressure at spray nozzle.	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.01.00..
430.	Part-B-Sec-MI	5.01.0 O, A, (v)	14 of 51	Sufficient redundancy, as per the proven practice of the bidder, shall be provided in	Sufficient redundancy, as per the proven practice of the bidder, shall be provided in the spray nozzles.	Quantity of nozzles at each level is designed according to the nozzle arrangement. Recirculated	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.01.00..

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
				the spray nozzles. Minimum 10% spare nozzles shall be provided at each level.	Minimum 10% spare nozzles shall be provided as spares	slurry shall be sprayed through all nozzles to cover cross section and flue gas contacts with slurry. 10% spare nozzles will be provided as spares for maintenance.	
431.	Part-B-Sec-MI	5.06.06	18 of 51	Adequate number of viewing ports with flushing devices connected to automatically operating washing system shall be delivered at following locations	Adequate number of viewing ports with flushing devices connected to manually operating washing system shall be delivered at following locations	Operators check inside of absorber occasionally therefore manual flushing devices are provided to reduce cost.	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.06.06.
432.	Part-B-Sec-MI	6.06.01	24 of 51	For tank volume calculation, solid concentration (by weight) in the slurry shall be assumed, not more than 20% or actual required whichever is lower.	For tank volume calculation, solid concentration (by weight) in the slurry shall be assumed 25~30%	Our design guide & reference for solid concentration of limestone slurry: 25~30wt%	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 6.06.01.
433.	Part-B-Sec-MI	6.07.01, (v)	24 of 51	Solid concentration : Max. 20% by weight	Solid concentration : Max. 35% by weight or actual	Our design guide & reference for solid concentration for solid concentration	Bidder shall comply with the Technical Specification requirements

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
434.	Part-B-Sec-MI	7.04.01, (a)	25,26 of 51	or actual as per suppliers practice, whichever is minimum Each vacuum belt filter shall be sized to meet the following requirements, all occurring together with inlet solid concentration of not more than 45% or outlet of hydrocyclones whichever is minimum : 110% of gypsum produced by absorber at design point	as per suppliers practice Each vacuum belt filter shall be sized to meet the following requirements, all occurring together with : 110% of gypsum produced by absorber at design point	tion of limestone slurry: 25~30wt% Our design guide & reference for solid concentration of gypsum slurry : Around 50wt%	under the referred cl.no. 6.07.01 Will be discussed during detail engg..
435.	Part-B-Sec-MI	12.03.00	33 of 51	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	The isolation valves provided in all the slurry lines shall be of knife gate type / butterfly type unless specifically mentioned. Motorized / Pneumatic actuators shall be provided for valves requiring	Both type of actuators can be applied for slurry lines and considering the cost, pneumatic type is economical.	Specification requirement is clear. Bidder to also refer tender schemes.

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
				valves requiring frequent operation as indicated in the relevant scheme.	frequent operation as indicated in the relevant scheme.		
436.	Part-B-Sec-MI	1.09.00	4 of 51	Noise level -shall not exceed 85dB(A)	Noise level a) Wet Mill only <105 dB(A) b) Crusher only < 102 dB(A)		Refer necessary amendment in this regard.
437.	Part-B-Sec-MI	5.06.06	17 of 51	Three stage chevron type Mist Eliminators (ME) made of polysulfone or stainless steel shall be provided at the exit of the absorber.	Three stage chevron type Mist Eliminators (ME) made of polysulfone, stainless steel or PP shall be provided at the exit of the absorber.		Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.06.06 .
438.	Part-B-Sec-MI	5.06.10	19 of 51	The raw gas inlet duct of the absorber shall be equipped with a flushing device of the side walls and the ground, which shall operate continuously	NA	It is unnecessary according to our references.	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 5.06.10.

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
				as well as intermit-			
439.	Part-B-Sec-MI	6.06.04	24 of 51	The slurry preparation tank shall be CS construction with replaceable chlorobutyl /bromobutyl rubber lining of minimum 5 mm thickness.	The slurry preparation tank shall be CS construction with replaceable chlorobutyl /bromobutyl rubber lining of minimum 5 mm thickness or KS's flake glass lining.	We have proven experience.	Bidder shall comply with the Technical Specification requirements under the referred cl.no. 6.06.04.
440.	Part-B-Sec-MI	6.06.03	24 of 51	The limestone slurry tanks shall be installed indoor beneath the hydrocyclone station.	The limestone slurry tanks shall be installed outdoor.	Pipes from hydrocyclone to limestone slurry storage tank will be design to have gravity flow.	NTPC noted. Bidder to refer necessary amendment in this regard.
441.	Part-B-Sec-MI	6.07.03	24 of 51	The slurry pipes shall be lined with replaceable natural rubber lining of 10 mm thickness. Additional thickness of 2 mm rubber ling shall be provided at bends.	The slurry pipes shall be lined with replaceable natural rubber lining of 5 mm thickness. Ceramic lined shall be provided at bends.		Bidder shall comply with the Technical Specification requirements under the referred cl.no. 6.07.03.

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S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	Reason for Deviation	NTPC CLARIFICATIONS
442.	Part-B-Sec-MI	7.08.04	29 of 51	The auxiliary absorbent tank shall be made of minimum 7 mm thick carbon steel with 4 mm thick rubber lining of best quality bromine butyl rubber~	The auxiliary absorbent tank shall be made of minimum 7 mm thick carbon steel with 4 mm thick rubber lining of best quality bromine butyl rubber or flake glass lining ~		Bidder shall comply with the Technical Specification requirements under the referred cl.no. 7.08.04.
443.				Electrical Room	We would like to apply 3 electric room as below to reduce cable size and construction BOM; 1) FGD Electric Room 2) L/S Preparation Electric Room 3) G/S Dewatering Electric Room		This will be discussed during detailed Engineering.

S.N	Section/Part/Chapter	Clause No.	Page No.	Statement of subject	Clarification	NTPC CLARIFICATIONS

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S.N	Section/Part/Chapter	Clause No.	Page No.	Statement of subject	Clarification	NTPC CLARIFICATIONS
444.	Section-VI/Part-B/ Sub-section- I -M1	3.02.04	Page 6 of 51	The duct to Absorber inlet shall be made of Carbon steel of minimum 7mm thickness. The duct to Absorber inlet shall be made of Carbon steel of minimum 7mm thickness. The duct from Absorber outlet to bypass duct shall be made of Carbon steel of minimum 7mm thickness with 2 mm (minimum) thickness lining / cladding / wall paper of Alloy C276 / Alloy 59 or better material.	In Part E, 0011-109-POM-A-001 (a) and 0011-109-POM-A-001 drawings, the absorber clean gas flue duct is not connected to the bypass flue duct, please clarify whether the bypass flue duct should be connect to new chimney?	Bypass duct is already connected to the existing chimney. Refer necessary amendment in this regard.

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S.N	Section/Part/Chapter	Clause No.	Page No.	Statement of subject	Clarification	NTPC CLARIFICATIONS
446.	Section-VI/Part-B/ Sub-section- I -M1	3.01.00 16.01.03	Page 5 of 51 Page 39 of 51	Design internal pressure at 67% yield strength (mm wc) : +660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans, whichever is higher at 67% of yield strength of material	Please clarify which clause should we obey	Refer necessary amendment in this regard.
447.					Kudgi STPP, Stage-I (3X800MW) 项目，图纸9573-999-POC-F-001显示，在烟窗的北侧场地中布置有“ESP&VFD，XFMR”，请澄清如下： (1) 请提供ESP&VFD的	Bidder to refer the revised GLP in issued amendments.

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					图纸（包括基础，结构和建筑图纸）； (2) ESP&VFD 是否已建设好？因该区域便于布置FGD系统，所以ESP&VFD是否可以移至其他区域？ For project Kudgi STTP , the drawing 9573-999-POC-F-001 shows that there is a ESP&VFD control room at the north of the chimney . Please clarify that : (1) Please provided the ESP&VFD drawings(including Profile Drawing, base drawing , Structure drawing) (2) whether the ESP&VFD control room has been built up ,if not ,could the owner move	Requested documents will be discussed with the successful bidder during the detail engg. stage.

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					the ESP&VFD control room to another region ,because the region is easy to arrange FGD system .	
448.	SECTION – VI/PART-A/SUB SECTION-III-A1	5.05.00	Page 5 of 9	The gypsum slurry from each Absorber shall be fed to a common Primary hydro-cyclone feed tank (sized for minimum 1 hr storage capacity)	请明确我方是否可以按照1台机的1小时的石膏浆液存储量设置石膏浆	The common Primary hydro-cyclone feed tank shall be sized for minimum 1 hr storage capacity considering all the units operating

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				capacity).	液缓冲箱 Please clarify whether provide a common Primary hydro-cyclone feed tank which sized for minimum 1 hr storage capacity for 1 unit	ating at Design point.
449.	SECTION – VI/PART-A/SUB SECTION-III-A2 Section-VI/Part-B/ Sub-section- I -M1	6.02.00 7.08.02	Page 5 of 9 PAGE 29 OF 51	The contractor shall provide 1x100% slurry pumps for pumping the slurry back to the absorber of any of the units in 8 hrs (max.). The contractor shall provide 2 x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours.	Please clarify how many slurry pumps for pumping the slurry back to the absorber should we provide for one FGD system	The contractor shall provide 2 x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours. Refer necessary amendment in this regard.
450.	SECTION – VI/PART-A/SUB-SECTION-IV	1.04.00 1.05.00 1.06.00	PAGE 1 OF 3		Please clarify how far away form the DM normal make up pump discharge, condenser transfer pump discharge, CW pump house, potable water pump discharge, HVAC	Requirement of Technical Specification are clear. Also refer GLP for the project.

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S.N	Section/Part/Chapter	Clause No.	Page No.	Statement of subject	Clarification	NTPC CLARIFICATIONS
					make up pump discharge .etc from the chimney.	
451.	Section-VI/PART-B SUB-SECTION-I-M1	7.08.01	PAGE 29 OF 51	The Contractor shall provide an auxiliary absorbent tank, for the unit, sized to contain the complete slurry of one absorber tank at its maximum level equipped with all necessary pumps, valves, piping and controls to transfer the tank's contents back to the absorber to refill the absorber sump It should be possible to discharge the each absorber into the emergency drain tank within 2 hours.	Please clarify whether the emergency drain tank and the auxiliary tank be the same tank with different name. And discharge the absorber slurry to the auxiliary tank in 2 hours is too short for the FGD system , we advice that the gypsum sized to discharge the absorber slurry to the auxiliary tank in 8 hours	Auxiliary absorbent tank & emergency drain tank referred in the clause are same.
452.	SECTION – VI/PART-A/SUB SECTION-III-A1 Section-VI/Part-B/ Sub-section- I -M1	7.03.00 13.03.04	Page 6 of 9 Page 34 of 51	One (1) clarified water Storage tanks (each tank catering to the clarified water requirement for all the units) along with two numbers of 2x100 % clarified Booster water pumps (Each pump catering to the clarified water requirements for all the units) from terminal point.	Please clarify how many clarified water Storage tank should we provide for one FGD system	Bidder shall provide Two (2) clarified water Storage tanks along with two numbers of 2x100 % clarified Booster water pumps. Bidder to refer necessary amendment in this regard.

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S.N	Sec- tion/ Part/ Chapter	Clause No.	Page No.	Statement of subject	Clarification	NTPC CLARIFICATIONS
				Two (2) clarified water Storage tanks along with two numbers of 2x100 % clarified Booster water pumps from terminal point shall be provided by the Contractor. The two tanks shall be interconnected with an isolation valve.		
453.					Please provide the temperature of the DM water and process water for the FGD system.	Please refer specification Cl no- 4.02.00 (a), Sub-section -I-M5, Part-B, Section-VI for secondary water inlet temperature. Specification is quite clear in this regard.
454.					Please clarify whether the PID in the tender specification can be optimized according to our technology.	Specification requirement is clear. Bidder shall comply with the specification requirements.
455.					For the project Kudgi STTP ,the drawing 9573-999-POM-A-001 shows that there is a line(Marked as:Member for supporting cable trays at EL(+)3.4	The line marked in the drawing is fire fighting line routing inside trench below paving level. Bidder to take care of this pipe while finalisation of FGD system

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					(typ)) between ID fan outlet flue gas duct and ESP&VFD. Please check : Whether the line can be moved.	
456.					For the project Gad-arwara STPP, Stage-I (2X800MW) ,the drawing 9572-999-POC-F-001 shows that A pipe rack connects two electrostatic precipitator between stack and FGD area, but the drawing 9572-999-POM-A-001 shows that the pipe rack is set between FGD and road, and the ESP control room is placed in different locations, please check the pipe rack and ESP control room position.	Bidder to refer Amended GLP being issued separately.

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S.N	Section/Part/Chapter	Clause No.	Page No.	Statement of subject	Clarification	NTPC CLARIFICATIONS
457.					Please clarify the elevation of the AUX BOILER area and the Chimney area in SOLAPUR project.	Bidder to refer Topographical Survey drawing.
458.					Please clarify the elevation range of the pipe supporting trestle between the FGD area and the Chimney area in MOUDA project.	Bidder to refer drawings at S.No 6 and 7 in Page no 40/40 Sub Section-II-A5 PROJECT INFORMATION (MOUDA-II 2x660MW) Section -VI, Part-A for pipe/cable trestle drawings.

Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
459.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.02.01	12 of 19	Bidder/ Sub Vendor should have manufactured and supplied <u>at least a total of four hundred & fifty (450) nos.</u> draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels ~	Bidder understands that Total Quantity of Panels will be decided during detail design stage based on FGD Bidder's design such as Electrical Load list and Single line diagram within performance guarantee and contract requirements for spare feeders per each contracted Project. (It will be changed due to Bidder's system design and contracted project	This is proveness criteria for Vendor selection for LT Switchgear to be supplied under this package and refers to the past experience.

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					Quantity). Please confirm.	
460.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.02.01	12 of 19	Bidder/ Sub Vendor should have manufactured and supplied <u>at least one hundred & fifty (150) nos. of Air Circuit Breakers ~</u>	Same with above.	Same as above.
461.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.02.02	12 of 19	Bidder/Sub-vendor should have manufactured and supplied at least a total of two hundred & <u>twenty five (225) nos. draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels ~</u>	Same with above.	Same as above.
462.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.02.02	12 of 19	Bidder/Sub-vendor should have manufactured and supplied <u>at least seventy five (75) nos. of draw out type Air Circuit Breaker panels ~</u>	Same with above.	Same as above.
463.	Section-VI (TS)	4.03.03.01	13 of 19	The Bidder/ Sub Vendor should have manufactured	Same with above.	Same as above.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Part-A Sub-section-I Intent of Specification			tured and supplied on an <u>average one hundred (100) numbers of 11 kV and /or 6.6kV Switchgear panels ~</u>		
464.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.03.02	13 of 19	The Bidder/ Sub Vendor should have designed, manufactured and supplied at least one hundred (100) numbers of 11 kV and /or 6.6kV Switchgear panels	Same with above.	Same as above.
465.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.03.03	13 of 19	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of Vacuum Circuit Breakers ~	Same with above.	Same as above.
466.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.03.04	13 of 19	The Bidder/ Sub Vendor should have manufactured and supplied on an <u>average one hundred (100) numbers of 11 kV and /or 6.6kV Switchgear panels ~</u>	Same with above.	Same as above.
467.	Section-VI	4.03.03.05	13 of 19	The Bidder/ Sub Vendor	Same with above.	Same as above.

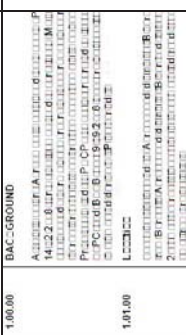
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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	(TS) Part-A Sub-section-I Intent of Specification			should have manufactured and supplied <u>at least one hundred (100) numbers</u> of 11 kV and /or 6.6kV Switchgear panels ~		
468.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.03.06	14 of 19	The Bidder/ Sub Vendor should have manufactured and supplied <u>at least one hundred (100) numbers</u> of Vacuum Circuit Breakers ~	Same with above.	Same as above.
469.	Section-VI (TS) Part-A Sub-section-I Intent of Specification	4.03.04.01	14 of 19	Numerical Relays shall be offered from a Manufacturer who has manufactured and supplied and successfully configured <u>at least 100 No's</u> of Numerical Relays with IEC 61850 ~	Bidder understands that Total Quantity of Numerical Relays will be decided detail design stage based on FGD Bidder's design such as Electrical Load list and Single line diagram within performance guarantee and contract requirements for Numerical Relays per each contracted Project. (It will be changed due to Bidder's system design and contracted project Quantity). Please confirm.	Same as above.
470.	Section-VI	4.03.05.01	14 of 19	The Bidder/ Sub-Vendor	Bidder understands that Total	Bidder's understanding is not correct.



Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	(TS) Part-A Sub-section-I Intent of Specification			should have manufactured & supplied at least <u>two numbers</u> (one each at two different installations) of <u>16 MVA, 11KV or higher rating oil filled Transformers</u>	Quantity and rating of Transformers will be decided detail design stage based on FGD Bidder's design such as Electrical Load list and Single line diagram within performance guarantee per each contracted Project. (It will be changed due to Bidder's system design and contracted project Quantity). Please confirm.	rect. This is proveness criteria for Vendor selection for transformers to be supplied under this package and refers to the past experience.
471.	Section-VI (TS) Part-A Sub-section-II-A8 Project Information- Nabinagar-I 3x660MW	-	-		All letters in NABINAGAR Project Information is not able to be understood. Please provide this tender again.	Bidder may collect legible soft copy from the contact for communication as published in the subject NIT.
472.	Section-VI (TS) Part-A Sub-Section-III-A1	25.00.01	9 of 9	Wet stack of 150 metre height shall be provided with a stack condensate collection system to avoid the carryover of	Bidder understands that the end point of Stack is 150m far from ground. Please clarify the meaning of 150 metre height.	Bidder's understanding is correct.

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	Flue Gas Desulphurisation System			the condensate/acidic dewes/water drop-lets/Gypsum coming out of the stack.		
473.	Section-VI (TS) Part-A Sub-Section-III-A1 Flue Gas Desulphurisation System	25.00.05	9 of 9	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided. Storage tank/neutralization tank shall be complete with dosing, mixing and preparation system. After neutralization of the stack condensate collection, same shall be pumped to common drain system. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc.	Bidder would like to apply external piping from wet stack to absorber reaction tank in order to drain the condensate without storage/neutralizing tank. Bidder have experience applying to previous project. Please confirm.	Specification requirement is clear. Bidder shall comply with the specification requirements.

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				Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration. All the material in contact with the condensate shall be of suitable material for the operating duty.		
474.	Section-VI (TS) Part-A Sub-Section-III-A1 Flue Gas Desulphurisation System	25.00.06	9 of 9	Stack outlet liquid collector shall be designed in such a way so that the liquid condensate film near the exit of the stack is collected instead of carrying with the exit gas. Bidders shall provide all these details in its bid.	Liquid collector design only can be finalized after carry out the physical model by design agency. Please Clarify.	Specification requirement is clear. Bidder shall comply with the specification requirements.
475.	Section-VI (TS) Part-A Sub-section-III-A2 Air Conditioning, Ventilating, Ventila-	1.00.00(g) 2.00.00(g)	1 of 4 2 of 4	Air Conditioning System: Contractor shall provide microprocessor/PLC/GIU based control system for monitoring and monitoring of air conditioning sys-	Please clarify whether common microprocessor/PLC/GIU based control system for control and monitoring can be provided for both air conditioning and ventilation system.	Common microprocessor/PLC/GIU based control system for control and monitoring for both air conditioning and ventilation system can be provided. Control and monitoring of air conditioning and ventilation system from FGD control system is also acceptable.

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	tion System & Compressed Air System			tem as per manufacturer's standard practice. Ventilation System: Contractor shall provide microprocessor/PLC/GIU based control system for control and monitoring of ventilation system ...		
476.	Section-VI (TS) Part-A Sub-section-III-A3 Fire Fighting System	1.00.00, 1.5 b&c	1 of 2	b) All Conveyors and Cable Galleries shall be provided with Linear Heat Sensing Cable detectors. c) All cable galleries shall be provided with Multi-sensor type detectors.	Please clarify the type of detector to be used in cable galleries i.e. Linear Heat Sensing Cable detector and /or Multisensor type detectors. Also please clarify above requirement for the conveyor area related to cable rack.	As per specification clause 1.00.00, 1.5 b&c, Part-A, Sub-section-III-A3, it is envisaged that both Linear Heat Sensing detectors and Multisensor type detectors shall be provided for Cable galleries whereas only Linear Heat Sensing detectors shall be provided for conveyors.
477.	Section-VI (TS) Part-A Sub-section-III-A3 Fire Fighting System	1.2,1.3	1 of 2	HVW Spray System: Automatic fire detection cum high velocity water spray system shall be provided for various transformers (having oil capacity 2000 liters or more) envisaged under this package. Tapping	Please clarify spray pumps to be provided for spray system or tapping will be provided from nearby existing header.	Specification requirement is amply clear. Tapping for HVW and MVW spray system shall be provided from nearby existing spray headers.

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	Section-VI (TS) Part-B Sub-section-I- M4 Fire Detection & Protection System	3.01.00	1 of 18	for HVW spray system shall be provided from nearby existing hydrant header. MVW Spray System: Automatic fire detection cum medium velocity water spray system for the various cable galleries envisaged under this package. Tapping for MVW spray system shall be provided from nearby existing Spray header HVW AND MVW SPRAY SYSTEM General It shall consists of Spray Pumps, Pressurization arrangements, water mains network, deluge valves, alarm valves, flow switches, isolation valves, Y type strainers....		
478.	Section-VI	1.00.00,1.	1 of 2	Five numbers each type	Bidder understands that, "Five	Bidder to refer relevant amendment.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	(TS) Part-A Sub-section-III-A3 Fire Fighting System	4		of Portable fire extinguishers consisting of water type, dry chemical powder type, CO2 type shall be provided in various facilities of FGD system.	nos. each types" means 5 nos. CO2 type, 5 nos. DCP Type, 5 nos. water type to be provided in area as or to be distributed as per TAC's norms. Please confirm.	
479.	Section-VI (TS) Part-A Sub-section-III-A5 Lime Stone & Gypsum Handling System	2.01.01	2 of 6	Limestone Handling Plant (LHP) Limestone received through Indian Railway Rakes will be unloaded in one of the side discharge Wagon Tipplers of Track Hopper of existing Coal Handling Plant (CHP).	Please clarify the terminal point between LHP and existing CHP.	The unloaded limestone will be fed to new limestone crusher house through series of new conveyors/bucket elevators before existing Crusher house of CHP. Exact terminal point shall be finalized based on the layout of FGD plant proposed by various bidders.
480.	Section-VI (TS) Part-A Sub section-III-B Electrical System/ Equipment	1.07.00	2 of 6	DG set (if applicable)	Please clarify whether the main power plant DG set spare capacity is available for FGD system emergency loads. If spare capacity is available in the main DG set, please indicate the capacity.	No emergency load of FGD area is envisaged in main plant DG.
481.	Section-VI (TS)	1.08.00	2 of 6	Contractor shall provide cable trays and their accessories	The Cable tray, supports and tray earthing for contractor cables on	Technical specifications are clear. Bidder shall comply with technical specification requirement clause no: - 1.08.00.2.

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	Part-A Sub-section-III B Electrical System/Equipment			cessories with support arrangements, trestle, trenches, duct bank etc. as required for the cables under his scope of supply for the complete system. However the <u>Cable tray, supports and tray earthing for contractor cables on employer cable vault shall be supplied by employer.</u>	employer cable <u>trestle</u> shall be supplied by employer also. (Not limited to employer cable vault). Please confirm.	
482.	Section-VI (TS) Part-A Sub-section-III B Electrical System/Equipment	1.10.00	4 of 6	Complete below ground earth mat and above ground equipment earthing system and lightning protection for the plant and equipment under contractors scope along with its interconnection to the nearest employers earth grid at two points.	Existing earth grid plan drawing nearby FGD and ESP area required for bidder's bidding design. Please provide.	The same shall be provided during detailed engg. However bidder may visit the project in order to get itself acquainted with existing electrical of plant
483.	Section-VI (TS) Part-A Sub-section-IV	1.13.01	3 of 3	Electrical Terminal points of Contractor's electrical scope, applicable for all systems/	Bidder understands incoming power cables from Terminals of Employers HT switchgear to 11kV FGD SWGR in FGD Area is Bidder's	The same shall be provided during detailed engg. However bidder may visit the project in order to get itself acquainted with existing electrical of plant

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Terminal Points & Exclusions			subsystems described in relevant clauses for SCOPE is given below: (i) <u>Terminals of Employers HT switchgear.</u>	scope of supply. And according to this understanding, below data and plan drawing is required for bidding design for incoming power cable & raceway. 1. Each PJT's Main cable route plan including below information's - Employers HT switchgear location. - Existing employer's cable vault or trestle (main cable route) plan. - Terminal points between "Existing employers cable vault or trestle" and "bidders new cable trestle for FGD system" - Approximately Cable length from "Terminals of Employers HT switchgear" to "Terminal points on existing employer's cable vault or trestle for FGD interface". Please provide.	
484.	Section-VI (TS) Part-A Sub-section-V	1.00.00	1 of 26	Design Point 7. Flue Gas Composition at FGD system inlet:	Please check volume percentage of H₂O at design point. This is too low value compared with normal practices. And summation of pro-	Bidder to refer necessary amendment in this regard.

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	Salient Design Data & Sizing			(iii) H ₂ O (% v/v wet) : 3.958	vided volume percentage of all gas composition is not 100%.	
485.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	2.00.00	3 of 26	7. Flue Gas Composition at FGD system inlet (ix) SO ₃ (ppm)	Please clarify whether the SO ₃ concentration is dry condition or wet condition.	Specification requirement is clear under the referred cl.no. 2.00.00 . Bidder shall comply with the specification requirements.
486.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	2.00.00 3.00.00	3~6 of 26	Salient Design Data 2.00.00 The FGD for MOUDA-II 2X660MW & TANDA-II 2X660MW, NABINAGAR-1 3X660MW, MEJA-1 2 X 660MW & BARH-1 3X660MW shall be designed to comply with the requirements stipulated under Guarantee point and Design point in the table below. 3.00.00 The FGD for SOLAPUR-II 2X660MW & MEJA-1 2 X 660MW shall be designed to comply	Please clarify which design data between 2.00.00 and 3.00.00 for MEJA-1 2X660MW shall be used for the design of FGD system for MEJA-1 2X660MW.	Bidder to refer necessary amendment in this regard.

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487.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	7.03.00, 2.0	13 of 26 15 of 26	with the requirements stipulated under Guarantee point and Design point in the table below. Note: Dry bulb temperature during summer = 45 Deg C.	In clause No. 7.03.00, 2.0 of SUB SECTION-V Salient Design Data: It is mentioned that Dry Bulb Temperature during summer = 45 Deg C. However in Appendix – A of same subsection individual project wise dry bulb temperature are also indicated. Please confirm which dry bulb temperature for summer to be followed for air conditioning system design.	Bidder to refer clause 7.01.00 (1) of subsection-V, Part A of Section VI for air conditioning system design, Appendix -A to be considered.
488.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	8.04.00.ii)	19 of 26	Alarms from the FGD fire alarm panel shall be repeated simultaneously in repeater panel at Fire station. Also the fire alarms of this area have to be communicated to the main plant Fire alarm control panel through	Please provide details of existing fire alarm repeater panel at fire station and main plant Fire alarm control panel at main powerhouse control room e.g. what interface protocol need to be considered, length and location etc.	It is clarified that potential free contacts for Fire Alarms to be provided in the FGD Fire alarm panel. So interface protocol, length and location is not required.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
489.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	10.09.00(i) 14.09.00	23 of 26 35 of 51	potential free contacts. More than 2.0 tonne or more than 10.0 m lift or hoists coming outside buildings- Motor driven for both travel & lift. Contractor shall provide motorized hoist and trolleys for all items requiring maintenance and weighing 500 kg or more.	Please clarify the minimum weight of item for which motorized hoist is to be considered as there is ambiguity.	Technical specifications are clear. Bidder shall comply with the requirements of technical specification pertaining to the area specified.
490.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	5.01.00	8 of 26	Wet chimney installed downstream of the wet FGD system	Please confirm whether there is any requirement of elevator in the wet chimney.	Rack and pinion type elevator is required to be provided inside the chimney. Refer clause 3.14.01 & 3.14.11 of sub-section IVD, Part-B, Section VI in this regard
491.	Section-VI (TS) Part-A Sub-section-V	5.01.00	8 of 26	The chimney flue liner cladding shall be of 2mm thick Titanium (Grade 2 as per ASME SB265) or C-	Please confirm whether alternative material such as Borosilicate block / Acid brick / Fiber Glass Reinforced Plastic can be used in	Bidder to refer necessary amendment in this regard.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Salient Design Data & Sizing			276 alloy over 8mm. thick mild steel base plate of flue liner.	place of Titanium or C-276 alloy.	
492.	Section-VI (TS) Part-A Sub-section-V Salient Design Data & Sizing	11.01.00	25 of 26	The coal conveyor shall also be suitable for handling limestone unloaded at wagon tippler / track hopper & being conveyed to limestone crusher house...	Please clarify how the existing coal conveyor can be used as limestone conveyor too.	Bidder's query is not clear.
493.	Section-VI (TS) Part-A Sub section VII Mandatory Spares	1.18.00 1.24 (R) 1.27	11 of 61 42 of 61 60 of 61	Good Cum Passenger Elevator Chimney Elevators	For Mandatory spares Bidder has considered following clauses for respective elevator • Cl 1.18.00 for spares for Absorber Elevator, • Cl 1.24(R) for Limestone Crushing System Elevator, • Cl 1.27 for Chimney Elevator, if applicable Please confirm respective clauses.	For Mandatory spares Bidder shall consider the following clauses for respective elevator • Cl 1.18.00 for spares for Absorber & Limestone Grinding system building Elevator, • Cl 1.24(R) for Limestone Crushing System Elevator, • Cl 1.27 for Chimney Elevator
494.	Section-VI (TS) Part-B Sub-Section-I-M1 Flue Gas De-	3.01.00 16.01.03	5 of 51 33 of 51	1. Design internal pressure at 67% yield strength (mm wc): +660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), which-	Please clarify Duct design Pressure.	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	sulphurisation System			ever is higher Duct Design Pressure : All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans, whichever is higher at 67% of yield strength of material		
495.	Section-VI (TS) Part-B Sub-section-I-M1 Flue Gas De-sulphurisation System	15.01.00	36 of 51	(ii) Design/Construction/Installation Codes Latest addition of IS:14665(all parts) and also meeting any additional requirements of IS:4666, IS:1860 and IS:3534	IS: 14665(all parts) supersedes IS: 4666, IS: 1860 and IS: 3534. Hence we will refer only IS: 14665(all parts). Please confirm	Specification requirement is clear. Bidder shall comply with the specification requirements.
496.	Section-VI (TS) Part-B Sub-section-I-M1 Flue Gas De-sulphurisation	15.06.00	38 of 51	Provide Special corrosion resistant treatment on all elevator components. The protective treatment shall be subject to Employer's Approval.	Please clarify the type of corrosion resistant treatment to be provided over the elevator components room if there is any specific requirement as such.	Same will be discussed with the successful bidder during the detail engg. stage.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
497.	System Section-VI (TS) Part-B Sub-section-I-M2 Air Conditioning and Ventilation System	3.01.00 3.02.00	1 of 26	Unitary Air Filtration (UAF) units of min. capacity 75,000 m ³ /hr. or capacity calculated considering 8 air changes per hour whichever is higher, shall be provided for Non-Air Conditioned areas of FGD and ZLD (as provided) control building (e.g. Switch gear rooms, cable galleries, etc.) MCCs and Switchgear room etc. Supply air fan Back draft dampers	In clause no. 3.01.00 it is mentioned that UAF type ventilation should be provided for Switch gear rooms. However in clause 3.02.00 a table is provided wherein it is mentioned to provide supply air fan and back draft dampers for MCCs and Switch gear room. Please confirm the type of ventilation to be used.	Bidder to refer relevant amendment in this regard.
498.	Section-VI (TS) Part-B Sub-section-I-	5.15.00. Note-3,	13 of 18,	Over and above, contractor may note that short term fire proof cables shall be provided for coal	As Inert gas system is not specified in scope of work in FGD & ZLD area, the Bidder does not need consider inert gas system.	Bidder's understanding is correct. Amendment will be issued in this regard.

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	M4 Fire Detection & Protection System	5.18.00.ii)	14 of 18	handling plant and inert gas protected areas. Short term fire Cross zoning of the signal from two adjacent multi sensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and...	Please confirm.	
499.	Section-VI (TS) Part-B Sub-section-I-M4 Fire Detection & Protection System	7.06.00	16 of 18	Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam....	As foam system will not be required, water monitors also not required either. Please confirm.	Bidder to note that this is a general requirement regarding painting. Hence painting shall be applicable as per scope of supply and services mentioned in Sub-section III-A3, Part-A of Technical specification, Section –VI.
500.	Section-VI (TS) Part-B Sub-Section-I-M7 Zero Liquid Discharge System	3.01.00	4 of 32	To avoid scale buildup in the Brine Concentrator, calcium sulfate(seed) will be continuously circulated over the wetted surfaces in the Brine Concentrator	There are two methods to control and prevent scale formation on the heat exchange tube in thermal ZLD system. One is, as specified in the tender, Seed slurry method with atmospheric pressure operation. Another is Vacuum/Low temperature operation.	Vacuum/Low temperature operation, where no seed slurry is added and wastewater boil in low temperature due to vacuum condition, is acceptable provided such system meets the proveness criteria specified in tender. In case, the Bidder provides such

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					Seed slurry method uses CaSO_4 slurry injection to FFE. CaSO_4 scale will attach and grow on the surface of the injected CaSO_4 in steady of on the surface of heat exchange tube, which is the principle of scale prevention and control of Seed slurry method. In Vacuum/Low temperature operation, no seed slurry is added and wastewater will boil in low temperature due to vacuum condition. In low temperature, the solubility of CaSO_4 increases and scale potential of CaSO_4 decreases, which is the principle of scale prevention and control of Vacuum/Low temperature operation. Both methods are already proven in the treatment of FGD wastewater. However, in the tender, only seed slurry method is specified. Please clarify if the both scale control methods to participate in this project.	a system, all other associated system etc. shall be provided in line with the above reference project as proposed by the vendor. Further, the contractor shall provide all necessary support documents like P&IDs, Process calculation, Equipment Layouts, etc. of the Reference Project during detail engineering & same shall be provided for these projects also as a minimum. Further, Contractor shall also comply with all other requirements like Design criteria, Redundancy of equipment, MOC, Guarantee etc. as specified in Technical specification.
501.	Section-VI (TS)	3.01.00	4 of 32	The wastewater enters a	Deaeration/decarbonation tank is	Bidder to refer Sl. 500 of this Clarification

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Part-B Sub-Section-I-M7 Zero Liquid Discharge System			feed tank to deaeration and decarbonation.	only needed to seed slurry method, because there is no system to remove O ₂ , CO ₂ gas in wastewater. In Vacuum/Low temperature operation, vacuum operation of ZLD can remove the dissolved O ₂ , CO ₂ gas in wastewater.	tion to Technical Specification.
502.	Section-VI (TS) Part-B Sub-Section-I-M7 Zero Liquid Discharge System	3.02.05	22 of 32	1. Falling film evaporator(FFE) and accessory equipment design; d) Deaerator h) Hydrocyclone 2. Seeding system	Only Seed slurry method needs deaerator, hydrocyclone and seeding system. Hydrocyclone and seeding system are needed to collect and inject CaSO ₄ slurry, respectively. Vacuum/Low temperature operation do not need them.	Bidder to refer Sl. 500 of this Clarification to Technical Specification.
503.	Section-VI (TS) Part-B Sub-Section-I-M7 Zero Liquid Discharge System	3.02.05	27 of 32	J). Seeding System 1). One (1) seeding system. 2). The seeding system shall be of proven type and the contractor shall submit the detail scheme for employer's approval. Reference list of previous installations for similar	We have references in Vacuum/Low temperature ZLD. When required, the reference list and certificates from client will be submitted.	Noted

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504.	Section-VI (TS) Part-B Sub-section-I-M9 MDL	MDL 387 388	15 of 24	application shall also be furnished to the employer. GA Drawing & Datasheet of 12T Hoist for Ball Mill Building GA & Datasheet of 25T Hoist	Capacity of Hoist/crane shall be as per equipment weights/specification and shall be provided during the bidding stage. Please confirm	Specification requirement is clear. Bidder shall comply with the specification requirements.
505.	Section-VI (TS) Part-B Sub-section-I-M9 MDL	542 640	21 of 24 23 of 24	MQP for Chimney Elevator MQP of Elevator(Rack & Pinion)	Both Elevators are same. Please confirm.	The type of elevator is same for chimney area and CHP area. For a single supplier, the testing and inspection requirements can be tied up in the single MQP. However, if there are two different suppliers, two nos. of MQP are required.
506.	Section-VI (TS) Part-B Sub-section-II E1 General Electrical Specification	2.03.00	4 of 7	For 415V system, busduct assemblies shall be used for incoming connection from transformers to the switchboard and interconnecting sections between switchboards wherever transformer	Bidder suggests Power Cable can also be applied for incoming connection from transformer to the LV SWGR board depend on result of calculation for load demand. Please confirm.	Technical Specification is amply clear and to be complied.

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507.	Section-VI (TS) Part-B Sub-section-II E3 Medium Voltage Bus Ducts	3.03.01	4 of 11	rating is 1000KVA or above. Bus support insulators shall be interchangeable, high creep, high strength and made of fine glazed solid porcelain manufactured by wet process or high strength cast resin insulators.	Bidder suggests FRP can also be applied for material of insulator and bushing. (FRP is normal practice in current industry for BUS Duct) Please confirm.	Technical Specification to be complied.
508.	Section-VI (TS) Part-B Sub-section-II E3 Medium Voltage Bus Ducts	6.01.00	8 of 11	d) Material of Insulator / Bushing → Porcelain / Cast Resin	Bidder suggests FRP can also be applied for material of insulator and bushing. (FRP is normal practice in current industry for BUS Duct) Before : Porcelain / Cast Resin After : Porcelain / Cast Resin / FRP Please confirm.	Technical Specification to be complied.
509.	Section-VI (TS) Part-B Sub-section-II	2.14.04	4 of 6	All cables shall be armoured type if laid in CHP area or directly buried.	If cable doesn't laid in CHP area or directly buried, Bidder can use unarmoured Single & Multi core cables with cable tray & conduit.	Bidder understanding is correct.

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	E4 LT Power Cables				Please confirm	
510.	Section-VI (TS) Part-B Sub-section-II E5 LT Control Cables	2.14.02	3 of 6	All cables shall be armoured type if laid in CHP area or directly buried.	Same with above.	Bidder understanding is correct.
511.	Section-VI (TS) Part-B Sub-section-II E6 Cabling Earthing & Lightning Protection	2.01 .04	2 of 69	No sub zero level cable vault/trenches shall be provided below control building/switchgear rooms in main plant.	Bidder understands "Main Plant" means TG & SG Area. So, Sub zero level cable vault/trenches can be provided below control building/switchgear rooms in FGD system. Please confirm.	Bidder understanding is correct.
512.	Section-VI (TS) Part-B Sub-section-II E6 Cabling Earthing & Light-	3.03.01	5 of 69	Pipes offered shall be complete with fittings and accessories	1. In case of applying Non-armoured Cable, Bidder shall use Flexible Conduit & Box connector for Equipment connection. 2. In case of applying armoured Cable, Bidder shall use Cable gland instead of using flexible	Bidder shall comply with technical specification.

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	ning Protection				conduit (with Box connector) for Equipment connection. Please confirm	
513.	Section-VI (TS) Part-B Sub-section-II E6 Cabling Earthing & Lightning Protection	3.02.05	5 of 69	Cable trenches shall be provided only in Switch-gear/MCC rooms.	Same with above.	Bidder understanding is correct.
514.	Section-VI (TS) Part-B Sub-section-II E7 HT Cables	2.16.04	4 of 6	All cables shall be armored type if laid in CHP area or directly buried.	Same with above.	Bidder understanding is correct
515.	Section-VI (TS) Part-B Sub-section-II E9 HT Switchgear	1.00.00	1 of 39	Motor Feeder: KW Rating/ [System Vol* 1.732 * (Eff) *(Pf)] *1 .1 (at least)	Bidder understands KW Rating for Motor Feeder sizing is BHP(kW) value. (Not Name plate rating value for Motor.) Please confirm.	Bidders understanding is not correct. Feeder sizing shall be done as per motor name plate kw rating at 50° C..
516.	Section-VI (TS)	1.01.01	1 of 58	Lighting load of 50 kVA (Minimum) shall be con-	Tender SLD is Missing.	Please refer Amendment to Technical Specification.

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	Part-B Sub-section-II E10 LT Switchgear & LT Busduct			sidered on each section of main switchgears with incomer from transformer as indicated in the tender SLD.	Please clarify this requirements.	
517.	Section-VI (TS) Part-B Sub-section-II E10 LT Switchgear & LT Busduct	1.04.00	2 of 58	Standardization It shall be preferred to have all LV Switchboards for the entire plant from a single manufacturer from maintainability and spares management point of view. It shall be preferred to follow a standardization of Terminal Numbers across all LV Modules for ease of Interconnection and maintenance.	Bidder applies the unification for the LV SWGR within Bidder's scope of supply. Please confirm.	Selection table of clause 43.01.00 to be referred.
518.	Section-VI (TS) Part-B Sub-section-II E10 LT Switchgear & LT Busduct	43.01.00	44 of 58	Feeder Module, Other than Motor Selection Table (415 V AC)	Bidder understands Protection for LV MCC Feeder Module as below. Please confirm. · Feeder rating 0 ~ 99Amp : Fuse Protection · Feeder rating 100 ~ 400Amp : MCCB Protection	Selection table of clause 43.01.00 to be referred.

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519.	Section-VI (TS) Part-B Sub-section-II E10 LT Switchgear & LT Busduct	43.02.00	44 of 58	Motor Module Selection table	- Feeder rating 400 ~ 1120Amp : ACB Protection Bidder understands Protection for Motor Module on LV MCC as below. Please confirm. - Motor rating 1.1 ~ 110 kW : Fuse Protection - Motor rating 110 ~ 200 kW : ACB Protection (MCCB is not used for Motor Module)	Selection table of clause 43.02.00 to be referred.
520.	Section-VI (TS) Part-B Sub-section-II E11 Diesel Generators	3.00.00 (i) 8.02.03	2 of 19 10 of 19	Fuel service tank 8 hours running A day oil tank 990 litres fuel capacity shall be provided by Bidder	Bidder understands that bidder will supply both the tanks along with FO loading and unloading system. Please confirm.	Bidder to provide 1 (one) day tank of 990 ltr fuel capacity along with FO loading and unloading system for each DG set
521.	Section-VI (TS) Part-B Sub-section-II E11 Diesel Generators	5.03.00	3 of 19	The alternator outgoing supply of DG set shall be fed into employer's breaker panel.	Bidder understands that the DGPCC will be scope of employers. Please confirm.	The alternator outgoing supply of DG set shall be fed into FGD Emergency MCC which is under bidder's scope. Refer SLD and amendment
522.	Section-VI	6.01.01	4 of 19	All DG sets shall be connected	Please clarify whether we have to	Min 1 (one) number of DG set common

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	(TS) Part-B Sub-section-II-E11 Diesel Generators			trolled independently through separate control panel.	supply (1w+1s) DG set for each unit or (1w+ 1s) DG set for all the units.	for entire FGD plant shall be provided by bidder for meeting emergency process loads envisaged for FGD plants. Refer tender SLD
523.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	6.01.01	4 of 19	It shall also have auto initiation through command from remote from Owner's panel.	Our understanding is not clear in this regard, whether Bidder's have to remotely connect all the DG Sets with their FGD control system or it will be connected to main station DCS under NTPC scope of supply. Please clarify.	Bidders have to remotely connect all the DG Sets with their FGD control system. Refer amendment-1 to Technical Specification.
524.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	7.00.00	6 of 19	Diesel Generator control panel	Bidder understands that any kind of grid synchronization and earth fault protection will not be in bidder's scope. Any earth fault protection is not considered. We considered only 1 master trip relay for common fault both electrical & mechanical in our scope. Please confirm.	Bidder to electrical protections as per technical specifications. Refer amendment-1 to Technical Specification.
525.	Section-VI	7.11.00	8 of 19	Suitable 4 to 20mA trans-	Our understanding is not clear in	Please refer Amendment to Technical

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	(TS) Part-B Sub-section-II-E11 Diesel Generators			ducer with dual output shall be provided in control panel for voltmeter & frequency meter for Owner's use.	this regards. Please provide the requirement of these transducer in owner's panel.	Specification.
526.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	7.12.00	8 of 19	The bidder is required to provide coupling relay (with diodes) having 24V DC energising coil in the control panel for the following for owner's use: DG start/Stop, DG voltage raise/lowered, DG speed raise/lower, DG auto start.	Our understanding is not clear in this regards. Please clarify why owner requires these relays at owner's panel.	Refer amendment-1 to Technical Specification.
527.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	8.04.01	10 of 19	The radiators tubes shall be copper with sufficient heat transfer area.	As per manufacturer standard engine shall be provided with low carbon steel tubing and aluminium fins radiator core. Please confirm.	Technical specifications are clear. Bidder shall comply with technical specification requirements
528.	Section-VI (TS) Part-B	8.06.00(j)	11 of 19	Necessary foundation bolt and base channels for the engine, alternator,	As the DG set shall be supplied with specially designed AVM pad, foundation bolts is not applicable	Technical specifications are clear. Bidder shall comply with technical specification requirements

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Sub-section-II-E11 Diesel Generators			fuel service tank and for all other equipment include this package.	in LT (415 V) DG set. Please confirm if Bidder can proceed with above understanding.	
529.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	9.02.01	12 of 19	Voltage – 415V, Frequency – 50hz (+3 to -5%)	As per manufacture standard voltage variation shall be $\pm 5\%$ & frequency variation shall be $\pm 3\%$. Please confirm.	Technical specifications are clear. Bidder shall comply with technical specification requirements
530.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	12.01.03	18 of 19	Check of fuel consumption – A check of the fuel consumption shall be made throughout the load run test. The fuel consumption should not exceed the design values.	As regards the fuel consumption test, kindly note that due variation of DG load specific fuel measurement test cannot be conducted at site, same can be done by tentative method only or we shall however provide the internal test report of manufacturer for specific fuel consumption. Please confirm.	Technical specifications are clear. Bidder shall comply with technical specification requirements
531.	Section-VI (TS) Part-B Sub-section-II-E11	13.04.00	18 of 19	Function test on DG set complete with AVR and speed governor.	As AVR and governor being the part of engine and alternator control so no separate functional tests for the same can be done. Please confirm.	Technical specifications are clear. Bidder shall comply with technical specification requirements

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Diesel Generators					
532.	Section-VI (TS) Part-B Sub-section-II-E11 Diesel Generators	14.01.00 & 15.01.00	18 of 19 & 19 of 19	Vibration test is to be carried out at site. Noise level measurement shall be done generally following the guidelines given in IS: 12065. The measurement shall be carried out with a calibrated integrating sound level meter as per IS: 9779. This test is to be carried out at site.	Measurement of sound level and vibration test cannot be performed at site/works as there will be other equipment vibrations. However the vibration shall be within the level of 250 micron and as per CPCB norms presently applicable with the acoustic enclosure reduction in the sound level shall be 25dBA. Please confirm.	Technical specifications are clear. Bidder shall comply with technical specification requirements
533.	Section-VI (TS) Part-B Sub-section-II E12 Outdoor Transformers	1.01.00	1 of 31	OUTDOOR TRANSFORMER	Bidder suggests indoor service can also be applied for LV Transformer (11kV/0.4kV or 3.3kV/0.4kV) for this PJT. Please confirm.	Bidders query is not clear.
534.	Section-VI (TS) Part-B Sub-section-II-E13	1.01.00	1 of 2	All work shall be carried out as per the following standard/codes as applicable IS:4722, IS:325	Since IS 4722 is not applicable for traction equipment, it shall not be applicable for Elevator motor. Please confirm.	Bidder's understanding is correct. Referred standard as applicable shall be followed in line with the technical specifications.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	Elevator Electrical					
535.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	3.02.02	4 of 16	Emergency AC Lighting System This system shall be provided for certain important areas in the main plant.	Bidder understands "Main Plant" means TG & SG Area. So, Emergency AC Lighting System is not applied for FGD Plant Area. Please confirm.	Emergency AC lighting system mentioned in areas as per technical specifications to be provided. refer amendment-1 to Technical Specification
536.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	3.03.04	5 of 16	For Coal Handling plant./FGD Plant Area 100W, 220V DC Lighting fixture shall be provided in underground portion of conveyor, each switch-gear room, control room, office room, pump house, ~~	Please confirm that 'Strategic locations' where emergency DC lighting system shall be supplied for FGD Plant Area are as below. - FGD SWGR Room - FGD Control Room & Office, Control equipment rooms - Staircases for FGD Elec & control BLDG - Pump House	Bidder understanding is correct. However strategic location also include each floor of TP and TP staircase(if any)
537.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	4.00.00.10 .(I)	8 of 16	Lighting Panels shall be of following types:	Please clarify the definition/usage of each type of lighting panels.	The definitions and its details have already been provided in technical specs

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
538.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	4.00.00.10 (I)	8 of 16	Lighting Panels shall be of following types:	Please clarify the purpose of 3kVA transformer located inside of LP-3 type lighting panel itself.	LP-3 shall be used for feeding of RC receptacle as mentioned in technical specification. Kindly refer clause no:- 4.00.00.10.h
539.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	Annexure - A.	15 of 16	Annexure - A.	Please clarify average illumination Lux levels (or ratio (%) of fixture) to be adopted in certain area where Emergency AC, Normal DC, Emergency DC Lightings are installed.	Refer to Annexure-B in Station Lighting chapter. Amendment-1 Issued
540.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	3.14.00	10 of 69	Single flue or multiple flue chimneys to be provided	Bidder suggests that this chimney might not be necessary. Please confirm.	Bidder shall comply to the requirements of technical specification.
541.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	12.00.00 (Roads)	30 of 69	Concrete pavement for roads shall be min. 250mm thick slab	Please clarify which particular specification about roads needs to be followed.	Query is not clear

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542.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	12.00.00	31 of 69	Dry lean concrete shall be minimum M10 grade and concrete pavement slab shall be minimum M35 grade concrete.	Please clarify which particular specification about roads needs to be followed.	Query is not clear
543.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	21.00.00	41 of 69	RCC paving of min. 150mm thick with M25 grade concrete	Please clarify which particular specification about roads needs to be followed.	Query is not clear
544.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	29.02.00	48 of 69	Interconnecting walkway between various structures, buildings & facilities shall be finished with 22mm chequered concrete tiles	Please confirm - between which structures / buildings are interconnecting walkways required? Further, if the interconnecting walkways (if any) are steel structures, can we use steel chequered plate / gratings in place of chequered concrete tiles?	As the layout of FGD system is in Bidder's scope, ascertaining the requirement of Interconnecting walkway between various structures, buildings & facilities is in the scope of Bidder. For finishing schedule, Bidder shall comply with technical specification requirement.
545.	Section-VI (TS) Part-B Sub-Section	31.03.00	56 of 69	All steel surfaces should be provided with two component moisture curing zinc silicate primer	What separate paint is required other than the primer, intermediate & final coat already provided in the shop?	For steel sections and structures which are to be transported on sea, anti-corrosive paint before shipment shall be provided to take care of sea worthiness.

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	IV-D Civil Works			coat, followed by polyamide curved epoxy (with MIO content) intermediate & aliphatic isocyanate curved acrylic final coat, all in shop	Please clarify.	
546.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	31.07.00	57 of 69	All steel sections & fabricated structures, which are required to be transported by sea, shall be provided with anti-corrosive paint before shipment to take care of sea worthiness	Same with above.	For steel sections and structures which are to be transported on sea, anti-corrosive paint before shipment shall be provided to take care of sea worthiness.
547.	Section-VI (TS) Part-E List of Tender Drawings	ELECTRICAL SINGLE LINE DIAGRAM FOR FGD PACKAGE	53 of 53	GENERAL NOTE 11. Panel being used for feeding of CHP	Bidder understands scope of supply for cabling from 11kV FGD TIE SWGR to 11/3.45kV Exiting CHP/AHP TR as below. Please confirm. - Power Cable: Supplied by FGD Supplier's - Cable raceway: Supplied by employer. (up to employer's trestle : Supplied by FGD Supplier's)	Refer amended tender SLD. -Bidder shall comply with technical specification requirement clause no: - 1.08.00.2.However bidder may visit the project in order to get itself acquainted with existing electrical of plant. GLP of respective plants has already been attached.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
548.	Section-VI (TS) Part-E List of Tender Drawings	ELECTRICAL SINGLE LINE DIAGRAM FOR FGD PACKAGE	53 of 53	GENERAL NOTE 11. Panel being used for feeding of CHP Panel being used for feeding of CHP/AHP HT transformer shall be suitably modified to DD type for feeding of 11kV FGD tie switchgear. CHP/AHP HT transformer shall then inturn be fed from 11kV tie switchgear. Necessary cabling upto AHP/CHP transformers shall also be in scope of bidder.	For power cables from 11kV FGD TIE SWGR to 11/3.45kV Exiting CHP/AHP TR, below data and plan drawing is required for bidding design for incoming power cable & raceway. 1. Each PJT's Main cable route plan including below information's - 11/3.45kV Exiting CHP/AHP TR location. - Existing employer's cable vault or trestle (main cable route) plan for Cabling to 11/3.45kV Exiting CHP/AHP TR - Terminal points between "Existing employers cable vault or trestle" and "bidders new cable trestle for FGD system" for Cabling to 11/3.45kV Exiting CHP/AHP TR - Approximately Cable length from "11/3.45kV Exiting CHP/AHP TR" to "Terminal points on existing employer's cable vault or trestle for FGD interface". - Rating of CHP/AHP TR for Cable	Refer amended tender SLD. -Bidder shall comply with technical specification requirement clause no: - 1.08.00.2.However bidder may visit the project in order to get itself acquainted with existing electrical of plant. GLP of respective plants has already been attached.

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					Sizing. Please provide.	
549.	Section-VI (TS) Part-E List of Tender Drawings	ELECTRICAL SINGLE LINE DIAGRAM FOR FGD PACKAGE	53 of 53	Spare for owners use	Please provide feeder rating, type and Q'ty for Spare for owners use feeder design per each bus section.	Shall be intimated during detail engineering.
550.	General Queries	-	-	-	Please confirm questions below. a. Can any additional cable / piping / ducting load be taken from the existing structures? b. Shall NTPC clear the FGD area of all debris prior to the contractor's start of work? c. What is the lead distance for disposal of excavated debris? d. Where there is a single dry chimney for 2 boilers, whether there can be 1 no. wet chimney for the 2 corresponding FGD units?	D. Bidder to note that irrespective of number of chimney(s), there shall be one dedicated flue (liner) for each unit.
551.	Section-VI (TS) Part-A,	10.06.00	22 of 26	-	NTPC to provide the Sieve analysis, BWI for limestone considered for the project as	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
552.	Salient Design Data Section-VI (TS) Part-A, Salient Design Data	10.06.00	22 of 26	-	the same is not mentioned in the tender specification. As per the tender specification of lime stone handling system lump size (max.) of 400 mm (1 - 2%) has been specified, NTPC to please clarify whether entire system has to be designed for handling lump size of 400 mm . For example Crushers, belt conveyor & other equipment's etc.	Technical specifications is clear. Bidder shall comply.
553.	Section-VI (TS) Part-A, Salient Design Data	10.06.00	22 of 26		As per the tender specification of lime stone handling system lump size (max.) of 400 mm (1 - 2%) has been specified, please clarify the bucket elevator & side wall conveyor shall also be designed to handle that size of 400 mm.	Technical Specifications is clear. Bidder shall comply.
554.	Section-VI (TS)	10.06.00	22 of 26		Input to the crusher is 400 mm lump size (Maximum) 1 -	Technical Specifications is clear. Bidder shall comply.

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	Part-A, Salient Design Data				2% as specified in the specification, and output lime stone size shall be 20 mm. hence NTPC to please confirm that is single stage crushing or can go for two stage crushing also.	
555.	Section-VI (TS) Part-A, Salient Design Data	Clause no.11.01.00	25 of 26		Please clarify the capacity of truck unloading system to limestone shed / silo.	The system shall be designed to handle trucks of 60 MT gross weight. Necessary amendment in this regard shall be issued.
556.	Section-VI (TS) Part-A, Scope of Supply & Services	Clause no.1.00.00	1 of 6		Please provide the detail profile drawing of CHP & all relevant drawings of CHP.	General Layout Plan of the plants is already given in the tender documents. Other drawings like Coal Flow Diagram and Transfer Tower GA, if required, shall be provided to successful bidders.
557.	Section-VI (TS) Part-A, Scope of Supply & Services	Clause no.1.00.00	1 of 6		Area for Limestone handling system has not been defined in the tender specification. NTPC is requested to identify additional space for limestone handling system	Space available for FGD and associated system is marked in the General Layout Plan drawings attached with the Technical Specifications. Bidder has to propose the layout for LHP & GHP to cater the

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
558.	Section-VI (TS) Part-B, Scope of Supply & Services	Clause no.3.01.00	2 of 73		The complete truck unloading system must not have any underground structure /Facilities has been specified in the tender specification. As for unloading from Wagon tippers to crusher house underground facilities are already there, we request NTPC to allow for underground hopper and underground unloading facilities from truck hopper to Crusher house to accumulate in the layout and looking at the space constraints.	requirement of FGD plant based on the layout of FGD system and existing facilities in the available space. Technical specifications is clear. Bidder shall comply.

TENDER NO. : PSER:SCT:NBH-C2080:20

CLARIFICATION No.01 (TECHNICAL)

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
559.	SECTION – VI, PART-A	SUB-SECTION-III-A1 FGD	1.03.00	1 of 9	Bidder understands that "two units" is a typographical error and auxiliary absorbent tank will be common for "all units" (either 3x800, 2x800, 3x660, 2x660, 4x250 MW etc.). Employer is requested to confirm on Bidders under-	Bidders understanding is correct. Refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
560.	SECTION – VI, PART-A	SUB-SECTION-III-A1 FGD	2.04.00	2 of 9	The contractor shall terminate the flue gas duct (at a suitable point on the common flue gas duct to chimney upstream of the chimney terminal point and outside the chimney).	Bidder understands that, this point is not applicable for this projects as separate wet stack is offered as per tender requirement and the PFD of FGD enclosed in the Tender. Employer is requested to confirm on Bidder's understanding.
					standings.	Refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
561.	SECTION – VI, PART-A	SUB-SECTION-III-A1 FGD	3.01.01	2X100% Limestone storage silos each having minimum 24 hours storage capacity equivalent to the requirements of all the units.	As there are space restrictions in all the sites, Bidder would like to propose the following: Option-A: One (1) no. common limestone Silo to store the crushed limestone for 9 days instead of one (1) common silo for 7 days & 2 silos for 1 days (total 9 days).	Specification requirement is clear in referred sub-section clauses. Bidder shall comply with the specification requirements. Refer necessary amendment for query on SUB-SECTION-III-A5 regarding Limestone Storage capacity in this regard.
	SECTION – VI, PART-A	SUB-SECTION-III-A5 Limestone & Gypsum Handling Plants	2.01.11	Alternatively, suitable number of Limestone Storage Silos to store limestone equivalent to consumption of minimum 7 days. Suitable number of Belt feeders below silos shall be provided taking feed from silo and discharging onto onward conveyors/ Bucket elevators.	Option-B: Two (2) no. common limestone Silos to store the crushed limestone for 4.5 days each instead of one (1) common silo for 7 days & 2 silos for 1 days (total 9 days).	
	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	6.02.01	The Contractor shall provide 2X100% Limestone storage silos each silo having minimum 24 hours storage capacity	Employer is requested to furnish their acceptance/comments on the above options.	

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
562.	SECTION – VI, PART-A	SUB-SECTION-III-A1 FGD	2.06.00	2 of 9	Bidder understandss that Gypsum transfer conveyors (from Vacuum Belt Filter outlet to Gypsum storage area) are in Bidders scope NOT in Employer scope as per Terminal Point chapter (Section-VI, Part-A, Sub-section-IV). Employer is requested to confirm on Bidders understandings.	Refer necessary amendment in this regard.
	SECTION – VI, PART-A	SUB-SECTION-I-M1 FGD	7.04.03	26 of 51	- Washed and dewatered gypsum from the dewatering system shall be fed to a belt conveyor (in Employers scope). The contractor shall discharge the gypsum cake above the Gypsum handling belt conveyor being provided by the Employer. - Gypsum cake from each belt filter shall be discharged through a hopper onto belt conveyor being provided by the Employer.	
563.	SECTION – VI, PART-A	SUB-SECTION-III-A4 Equipment Cooling Water System	-	1 of 3 3 of 3	Bidder wishes to inform that Solapur (2x660 MW) project name is missing in the ECW system specification Further Kudgi project is mentioned as 2x800 MW instead of 3x800 MW. Employer is requested to clarify the above mis-	Necessary Amendement is being issued.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
564.	SECTION – VI, PART-A	SUB-SECTION-III- A5Limestone & Gypsum Handling Plants	2.01.01	2 of 6	match & missing project.	Technical Specifications is clear. Limestone will be received to power plant either through road by trucks and/or through Indian railway rakes. Road unloading facility shall be provided for all the plants under this package. Whenever feasible, railway unloading shall also be provided using existing Wagon Tippler / Track Hopper as detailed out in the Technical Specifications.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
565.	SECTION – VI, PART-A	SUB-SECTION-III-A5 Limestone & Gypsum Handling Plants	2.01.01	2 of 6	Bidder requests Employer to furnish the following detail / clarifications: 1. Drawings (plan & elevation) of existing coal handling plants (Buildings/conveyors etc.) 2. As built drawings of CHP from Track Hopper to Crusher house, this is required in order to plan the tapping for limestone handling system of FGD. 3. As build foundation drawings of CHP from Track hopper till Crusher house is required in order to plan the tapping for limestone handling system of FGD. 4. Employer to confirm that the warranty for CHP	Noted. Detailed drawings of existing facilities shall provided with the successful bidder.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
					after taking the necessary tapping for lime stone handling and warranty for any existing structures dismantled and re-built during execution of FGD shall remain with the respective CHP vendors.	
566.	SECTION – VI, PART-A	SUB-SECTION-III-A5 Limestone & Gypsum Handling Plants	3.08.00	6 of 6	Bidders understands that front end loader / pay loader is in Employer scope. Employer is requested to confirm on Bidders understandings.	Confirmed.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
567.	SECTION – VI, PART-A	SUB-SECTION-IV Terminal Point & Exclusions	1.02.00	1 of 3 Un cleaned Flue Gas For each unit: i) One tapping from the common Flue Gas Duct going towards the existing Chimney (in case of twin flue chimney). ii) One tapping each from the two Flue Gas Duct going towards the existing Chimney (in case of single flue chimney).	Does Bidder have the flexibility to choose between single tapping / double tapping as per layout constraints or it is fixed. Also the tapping points shown in some of the layout drawing is fixed or bidder can propose as per the layout suitability. Further Employer is requested to provide the details i.e. exact location, size and elevation of Terminal Points for all the projects.	Bidder can choose between single or double tapping based on the flow distribution and layout feasibility in case of twin flue chimney. Bidder shall note that we have provided existing ID system drawing based on which Bidder shall decide the terminal points.
568.	SECTION – VI, PART-A	SUB-SECTION-IV Terminal Point & Exclusions	1.10.00	2 of 3 Gypsum: Outlet of Gypsum storage silo/shed	Bidder understands that as per Tender specification (Section-VI, Part-A, Sub-section-III-A5, Cl no. 3.07.00) Gypsum shall be stored in a shed. Employer is requested to clarify that which option (shed/silo) needs to be consider for	Technical Specifications is clear. One (01) number of covered storage shed for gypsum sufficient to store gypsum equivalent to gypsum generation of minimum 7 days at Design Point (Generation of all units to be considered) is envisaged.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
569.	SECTION – VI, PART-A	SUB-SECTION- VSalaient Design Data & Sizing	2.00.00 3.00.00	3 of 26 5 of 26	Gypsum storing.	Refer necessary amendment in this regard.
				- The Flue Gas Desulphurisation (FGD) System FOR MOUDA-II 2X660 MW, TANDA-II 2X660 MW, NABINAGAR-1 3X660 MW, MEJA-I 2X660 MW & BARH-I 3X660 MW shall be designed to comply with the requirements stipulated under Guarantee point and Design point' in the table below: - The Flue Gas Desulphurisation (FGD) System for SOLAPUR-II 2X660 MW & MEJA-I 2X660 MW shall be designed to comply with the requirements stipulated under 'Guarantee point and Design point' in the table below	Please note that MEJA-I 2X660 MW is appearing in Cl. no. 2.00.00 & 3.00.000. Employer is requested Employer to clarify which Cl. No. is applicable for MEJA-I 2X660 MW.	

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
570.	SECTION – VI, PART-A	SUB-SECTION-V Salient Design Data & Sizing	5.01.00	8 of 26	Bidder understands that the wet stack shall be designed when FGD is in operation only. During FGD bypass the flue gas shall be passes directly through the existing stack which is not lined. Employer is requested to confirm on Bidders understanding.	Bidders understanding is correct.
571.	SECTION – VI, PART-A	SUB-SECTION-VII Mandatory Spares	1.19.00 & 1.21.00	12 of 61 & 18 of 61	The mandatory spare of Air Conditioning & Ventilation System is repeated in cl no. 1.19.00 & 1.21.00. Bidder requested Employer to clarify the same.	The referred clause 1.19.0.0 stands deleted. Bidder to refer amendment in this regard.
572.	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	1.09.00	4 of 51	Bidder understands that 85 dB(A) is not applicable for Ball Mill, Crusher & Compressor and the exact noise level shall be informed in the Stage-1 Bid.	Refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
573.	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	3.02.04	The duct from Absorber outlet to bypass duct shall be made of Carbon steel of minimum 7mm thickness	Bidder understands that the Absorber outlet duct will be directly connected to the new wet stack instead of Bypass duct. Employer is requested to confirm on Bidder's understanding.	Bidders understanding is correct. Refer necessary amendment in this regard.
574.	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	3.03.09	The dampers shall be pneumatically operated and controlled.....of failure of the absorber spray system or the GGH.	Bidder understands that GGH is not applicable for this project. Employer is requested to confirm on Bidder's understanding.	Bidders understanding is correct.
575.	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	5.04.00	The pumps shall be designed to meet the stipulations of Clause No.9.00.00 of this Sub-Section.	Bidder understands that the Cl. No. 9.00.00 is a typographical error and the correct reference cl. No. is 8.00.00.	Bidders understanding is correct.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
576.	SECTION – VI, PART-A	SUB SECTION-III-A1	3.01.02	2x100% wet horizontal ball mills with each mill sized to meet 110% of the maximum total limestone requirement of all the units at Design point.	Bidder understands that the Ball Mill is common for all absorbers units instead of two absorber.	Bidders understanding is correct. Bidder shall provide 2x100% wet horizontal ball mills with each mill sized to meet 110% of the maximum total limestone requirement of all the units at Design point.
	SECTION – VI, PART-B	SUB-SECTION-I-M1 (FGD)	6.05.01	There shall be 2X100% tube mills for grinding of limestone. Each mill shall be sized to meet 110% of the maximum limestone requirement of all the units in a project operating under the following conditions, all occurring together. (i) Load Design point flow (ii) Flow 110% of limestone requirement of two absorbers at Design point		

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
577.	SECTION – VI, PART-BPART-A	SUB-SECTION-I-M1FGDSUB-SECTION-III-A1FGD	7.07.07 & 7.07.102 .06.00	28 of 51 & 29 of 512 of 9	Employer is requested to furnish the following:1) A detailed scheme for automated waste water neutralization system along with automated lime feeding and dosing system since same has not been shown in the Tender Drawing no. 0011-109-POM-A-003, Rev-A, Scheme of Gypsum Dewatering System. 2) Please let us know the bulk density of Hydrated lime and weather this lime (supplied by Employer) will be in the form of bags or transported through trucks. 3) As Employer is arranging the Hydrated lime unto lime storage building (in Dewatering area) / ZLD, so this point needs to be incorporated in the Terminal Point	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
					Chapter (Section-VI, Part-A, Sub-section IV, Terminal Points & Exclusions).4) Bidder understands that the lime will be manually feed to the Bucket elevator from the lime storage room.	
578.	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	13.01.00 & 13.03.07	- Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness - Additional Corrosion allowance	Both clauses are contradictory to each other. Employer is requested to clarify which clause needs to be considered.	Refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
579.	SECTION – VI, PART-B	SUB-SECTION-I-M1 FGD	16.01.03	39 of 51 All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the reheat fans, whichever is higher at 67% of yield strength of material	Bidder understands that, the FGD is designed for +660 and -150 mmwc or maximum conceivable head of Booster fan, whichever is higher, as per cl. No. 3.01.00 of same sub-section (pg. 5 of 51). Employer is requested to confirm on Bidder's understanding.	Refer necessary amendment in this regard.
580.	SECTION – VI, PART-A SECTION – VI, PART-E	SUB-SECTION-III-A1 FGD Drawing No. : 0011-109-POM-A-003, Rev-A	5.04.00 -	5 of 9 2x100% pump shall be provided to supply wash water (for cake washing as well as belt cloth washing) to the belt filters. In addition, 2x100% Filtrate water pump (common for all units) shall be provided to recycle the filtrate to the absorber.	Bidder clarifies that Filtrate water (from Filtrate water tank) can not be used for belt & cloth washing as filtrate may contain solids. Process/Make-up water (from process water pump) shall be used for belt cloth washing. Hence Bidder do	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
		(Scheme of Gypsum De-watering System)		2x100% Belt & Cloth wash water pump (going to belt filter)	not envisage 2x100% belt & cloth wash water pumps as indicated in the specification & drawings. Employer is requested to confirm on Bidders above clarification.	
581.	SECTION – VI, PART-A Section VI part B	Sub-section-III A-1 Sub section-I-M1	6.02.00 7.08.02	5 of 9 29 of 51	There is a contradictory in the specification, so Employer is requested to clarify the no. of pumps to be considered.	Refer necessary amendment in this regard.
582.	SECTION – VI, PART-B	Sub section- I-M1	5.06.10	19 of 51	Bidder understands that this clause (flushing device) means emergency quenching, Employer to clarify on Bidders understanding is not correct.	Bidders understanding is not correct.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
				termittently.	standing.	
583.	SECTION – VI, PART-B	SUB-SECTION - I-M1 - FGD System	6.05.07	23 of 49	Bidder understands that Peripheral/central drive system with motor shall be provided as per clause no. 3.01.06 vi) of section - VI, Part - A & Sub section - III A - 1, page 3 of 9. Employer is requested to confirm on Bidders understanding.	Bidder's understanding is correct.
584.	SECTION – VI, PART-A	SUB-SECTION- I INTENT OF SPECIFICATION	1.01.00-d	1 of 19	Bidder will furnish the necessary technical drawings/documents enabling Employer to take clearance from statutory authorities.	Specification requirement is clear. Bidder shall comply with the specification requirements.
585.	SECTION- VI; PART-B	SUB-SECTION- I-M6 Limestone & gypsum Handling System	3.5.0	3 of 73	Bidder understands that as per this clause the Gypsum shall be stored near the Plant Boundary, so Employer is requested to furnish the exact location	Space available for FGD and associated system is marked in the General Layout Plan drawing attached with the Technical Specifications. Bidder has to propose the layout

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
				boundary.	of Gypsum storage area (near plant boundary) in the layout drawing for all 11 projects.	for LHP & GHP including storage area to meet the requirement of FGD system and existing facilities.
586.	SECTION – VI, PART-B	SUB-SECTION-I-M1	1.06.00	4 of 51 The Contractor shall offer the best design to accommodate the Flue Gas Desulphurisation (FGD) System and Lime stone & Gypsum handling & storage system within the confines of the space available. The location of FGD System and associated facilities shall be decided by the Bidder after visiting the Project site.	Bidder understands that Bidder will be allow to use space which is not highlighted in project specific tender drawings as "Space for FGD", based on dismantling of some facilities if required. Bidder request Employer to confirm the same.	Specification requirement is clear. Bidder shall comply with the specification requirements. Bidder to refer the revised GLP in issued amendments.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
587.	SECTION – VI, PART-B	SUB-SECTION-I-M6 (LHP)	3.1.0	2 of 73	Both statement mentioned in two clauses are contradictory to each other. Bidder request Employer to clarify whether underground hopper for unloading the Truck can be used inline the clause 2.01.01 of Sub section -III-A5 of Section VI Part A.	Noted. Necessary amendment shall be issued.
	SECTION – VI, PART-A	SUB-SECTION-III-A5	2.01.01	2 of 6		
588.	SECTION – VI, PART-B	SUB-SECTION-I-M1	6.05.01	22 of 51	Bidder understands that the offered mill are "Ball	Bidder's understanding is correct.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
		(FGD)		stone.	Mill" not "Tube mill" as mentioned in this clause.	Refer necessary amendment in this regard.
589.	SECTION – VI, PART-A	SUB SECTION- III-A1	3.01.04	2x100% limestone slurry pumps for each absorber connected to each of the limestone slurry tank (total 4 nos. of pumps for 2x800 MW). Each pump catering to slurry requirement of each unit's absorber.	Bidder understands that this "2x800 MW" is mentioned only as an example. However for each Absorber 2x100% reagent feed pump is required. Employer is requested to confirm on Bidders understanding.	Bidder's understanding is correct.
590.	SECTION- VI PART-B	SUB-SECTION- I-M1 (FGD)	6.07.03	The slurry pipes shall be lined with replaceable wear resistant natural rubber of min. 10 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	Bidder shall envisage 6 mm thick rubber lined Carbon steel pipes for slurry applications.	Specification requirement is clear. Bidder shall comply with the specification requirements.
591.	SECTION- VI PART-B	SUB-SECTION- I-M1 (FGD)	8.07.00	For Absorber Recirculation service a Silicon Carbide impeller and SiC lining for casing can also be accepted if manufacturer has supplied a similar pump for a previous installation for	Bidder also proposes the Absorber recirculation pump impeller with Hi-chrome/ Duplex Stainless steel material and SiC lining for casing as per manufacturer's proven	Bidder's understanding is correct. Refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
				similar service.	practice in similar applications.	
592.	SECTION-VI PART-B	SUB-SECTION-I-M1 (FGD)	12.03.00	33 of 51 The isolation valves provided in all slurry lines shall be of knife gate/ butterfly type.	Bidder shall also propose diaphragm valves as per bidder's proven supply in similar service for valve sizes lower than 2" .	Specification requirement is clear. Bidder shall comply with the specification requirements.
593.	SECTION-VI PART-B	SUB-SECTION-I-M2 (AIR CONDITIONING AND VENTILATION SYSTEM)	3.01.00	1 of 26 Unitary Air Filtration Unit (UAF) of min. capacity 75,000 m3/hr. or capacity calculated considering 8 air changes per hour, whichever is higher, shall be provided for non-Air Conditioned areas of FGD and ZLD (as provided) control building (e.g. Switchgear rooms, cable galleries etc.).	Bidder shall envisage Mechanical ventilation (Supply air fan and back draft louvres) in Non-Air Conditioned area of FGD and ZLD control building (like MCC and switchgear rooms) as per specification clause no. 3.02.00. Employer is requested to confirm on Bidders understandings.	Specification requirement is amply clear. Accordingly, Evaporative type ventilation system shall be provided for non-AC area of FGD/FGD cum ZLD Control room building . Bidder to refer relevant Amendment in this regard.
			3.02.00	2 of 26 All non-air conditioned areas shall be ventilated by a combination of supply/ exhaust fans and fresh air intake/ back draft louvres:		

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Sl. No.	Specification Reference		Employer (NTPC) Specification		Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.	Page		
594.	SECTION-VI PART-B				ii) MCC and Switchgear rooms: Supply air fan and back draft dampers	Limestone Bond Index : 13 kWh/Sh.T (Min.) shall be followed.
	SECTION-VI PART-A	SUB-SECTION-I-M1 (FGD)	6.05.01	23 of 51		
595.	SECTION-VI PART-A	SUB-SECTION-V SALIENT DESIGN DATA AND SIZING	6.00.00	10 of 26	Both clauses are contradictory to each other, so Employer is requested to clarify the same, which data shall be considered by Bidder.	These spares may be applicable based on the offered fan design.
	SECTION-VI PART-A	SUB-SECTION-VII MANDATORY SPARES	1.01.00	5 of 61		
596.	SECTION-VI PART-A	SUB-SECTION-VII MANDATORY SPARES	1.07.00	7 of 61	Same may not be applicable for pumps which are V-belt driven, hence bidder shall not envisage any spares for these items for V-belt driven pumps.	Specification requirement is clear. Bidder shall comply with the specification requirements.
	SECTION-VI PART-A	SUB-SECTION-VII MANDATORY SPARES	1.17.00	11 of 61		
597.	SECTION-VI PART-A	SUB-SECTION-VII MANDATORY SPARES			Same shall not be applicable for water pumps since there is no wear resistant liners on casing, hence	Bidder's understanding is correct. Refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
598.	SECTION-VI PART-B	SUB-SECTION-I-M8 (Low Pressure Piping)	1.13.00	Drains and vents: No option for Butterfly valve.	bidder shall not envisage any spares for these items for water pumps.	Provisions of Technical specification are clear. Bidder shall comply with the same.
599.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	4.4.3 2.4.4	Provision for alternative manual operation shall also be made using declutchable hand wheel of 500 mm diameter. Minimum Hand wheel diameter: 500 mm	Bidder understands that 500 mm hand wheel diameter is a typical figure. Same might not be maintained for all Flap gates used in Limestone Handling plant. Bidder is free to select hand wheel size as per the recommendation of equipment manufacturer.	Technical Specifications is clear. Bidder shall comply.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
600.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	4.4.3	All the actuators in the plant should be selected based on heaviest loading, but the rating should not be less than 2500 kg with a lever arm of 1.0 m in any case.	Bidder understands that 2500 kg is a typical figure. Same might not be maintained for all Flap gates used in Limestone Handling plant. Bidder is free to select actuator size as per the recommendation of equipment manufacturer.	Technical Specifications is clear. Bidder shall comply.
			2.3.3	Minimum Actuator rating: 2500 kg with 1.0 m lever arm		
601.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	4.4.3	The diameter of the shaft shall not be less than 150 mm.	Bidder understands that 150 mm shaft diameter is a typical figure. Same might not be maintained for all Flap gates used in Limestone Handling plant. Bidder is free to select shaft diameter as per the recommendation of equipment manufacturer.	Technical Specifications is clear. Bidder shall comply.
			2.4.5	Flap gate shaft diameter: minimum 150 mm		
602.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	1.2.0	Maximum slope: 16 deg.	As per IS 8730: 1997 maximum allowed inclination angle for Belt Conveyor handling limestone shall be 18 deg. Hence bidder	Technical Specifications is clear. Bidder shall comply.

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603.	SECTION-VI PART-A	SUB-SECTION-III A1FGD	3.01.06	Each mill shall be complete with the following items: Complete lubricating system with appropriate lubricating medium storage facility (i.e. 1 no. lube oil tank for storage of lube oil and/or 1 no. grease storage drum as required).	Bidder shall envisage common lube oil system for two (2) mills as per bidder's proven practice.	Specification requirement is clear. Bidder shall comply with the specification requirements.
604.	SECTION-VI PART-A	SUB-SECTION-III A1 FGD	23.01.00	Each booster fan shall be provided with bearing lubrication and hydraulic blade pitch control unit(s).	Bidder shall envisage common lubrication system for two (2) booster fans as per bidder's proven practice.	Specification requirement is clear. Bidder shall comply with the specification requirements.

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605.	SECTION-VI PART-B	SUB-SECTION-I M1 (FGD)	3.03.01	7 of 51 A gas tight motor operated Guillotine gate shall be provided by the Contractor in the bypass duct (flue gas duct connecting to existing chimney).	Bidder shall not envisage any Guillotine gate damper at the bypass damper for isolation. Same shall be Quick acting bi-plane damper as per clause no. 3.03.07 mentioned in Sub-section-I M1 (FGD) under Technical Specification Section VI Part B. Same shall be provided with a common 2x100% seal air system and shall be acting like an isolation damper (complete isolation, 100% leak proof with seal air fan under operation) to isolate the bypass duct during FGD loop is under operation.	Specification requirement is clear under the referred cl.no. 3.03.01 . Bidder shall comply with the specification requirements.
					Further In case of single point tapping, one Guillotine gate shall be provided additionally at the tap-	

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
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					ping from existing duct coming from ID Fan. Employer is requested to comment/confirmation on above clarification.	
606.	SECTION-VI PART-A	SUB-SECTION-III A5 LIMESTONE AND GYPSUM HANDLING PLANTS	3.03.00	6 of 6	Employer to clarify the same, which one is the correct data to consider: four (4) nos. or two (2) nos. pumps.	The number of sump pump shall be read as four (4). Necessary Amendment shall be issued.
607.	SECTION-VI PART-A	SUB-SECTION-V SALIENT DESIGN DATA AND SIZING	5.01.00	8 of 26	Employer to clarify the requirement for insulation over wet stack. Bidder shall not envisage any insulation over wet stack since same is a wet stack and clad with 2 mm thick Titanium/ C276.	Thermal insulation as specified in Clause No. 3.14, sub-section IV-D, Part-B, Section VI shall be provided by the bidder.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
608.	SECTION-VI PART-A	SUB-SECTION-VII MANDATORY SPARES	1.04.00	Absorber Liner material: 5% coverage of each material and thickness for one unit/Absorber	Absorber shall be provided with 2 mm thickness cladding/ wall paper of Alloy C276/ Alloy 59. Hence bidder shall not envisage any spares for Absorber liners which are supposed to be valid only for rubber lined absorber. Employer is requested to confirm on Bidders understanding	Refer necessary amendment in this regard.
609.	SECTION-VI PART-A	SUB-SECTION-IV TERMINAL POINTS AND EXCLUSIONS	1.14.00	Instrument air at one point (if required)	Bidder shall envisage 2x100% Air Compressors to meet the instrument air requirement for all the equipment's/ plant/ systems for FGD plant and ZLD plant (applicable wherever) as per clause no. 9.01.00 mentioned in Sub-section-V (Salient Design Data and Sizing) under Technical Specification Section VI Part A. Hence there will be	Bidder's understanding is correct. Amendment will be issued in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
					no further supply of instrument air is required at terminal point. Employer is requested to confirm on Bidders understandings.	
610.	SECTION-VI PART-A	SUB-SECTION-III A5 LIME-STONE AND GYPSUM HANDLING PLANT	2.01.11	3 of 6	Bidder shall envisage Vibrating feeders in place of Belt feeders as per bidder's proven practice.	Noted. Bidder to refer amendment in this regard
611.	SECTION-VI PART-A	SUB-SECTION-V SALIENT DESIGN DATA AND SIZING	9.01.00	21 of 26	Bidder understands that the compressor shall be either air cooled or water cooled as per their proven supply.	Specification requirement is clear under the referred cl.no. 9.01.00 . Bidder shall comply with the specification requirements.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
612.	SECTION-VI PART-C	GENERAL TECHNICAL REQUIREMENTS	30.00.00	42 of 83 The equivalent "A" weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/ machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA. However for Ball Mills the noise levels as per following shall also be acceptable: a) Ball Mill: < 90 dBA	As per clause no. 9.01.00 mentioned in Sub-section-V (Salient Design Data and Sizing) under Technical Specification Section VI Part A, Noise level shall not exceed 90 dBA to a reference level of 0.0002 microbar when measured at a distance of 1.5 meter above the floor for Air Compressor. Hence bidder shall follow the same noise level limit for Air Compressor as well and same will be applicable for Limestone Crushers as mentioned below: b) Air Compressor: < 90 dBA c) Crusher: < 102 dBA Employer is requested to confirm on Bidders understanding.	Bidder to refer necessary amendment in this regard.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
613.	SECTION-VI PART-B	SUB-SECTION-I M6 (Limestone Handling Plant)	3.3.0	3 of 73	Employer to clarify the requirement for having Vibrating grizzly/ screening feeder at Crusher upstream. Bidder shall not envisage any Vibrating grizzly/ screening feeder at Crusher upstream. Also bidder shall not recommend any Rod gate/ Rack & Pinion gate before Vibrating grizzly Feeders.	Technical Specifications is clear. Bidder shall comply.
614.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	4.13.15	20 of 73	Bidder shall envisage Gate/ Ball valve for the same.	Technical Specifications is clear. Bidder shall comply.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
615.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	4.13.19	20 of 73	For dust control in limestone storage shed during stacking and handling of limestone, roof extractors, ducting and collection hopper with bag filters shall be provided.	Roof extractor shall not be envisaged. Same shall be dry type dust extraction system comprising of dust collection hoods, ducting, fans, bag filter and dust collection hopper with bag filters.
616.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	4.14.3	21 of 73	Air conditioning system shall be furnished for control room area of main LHP control building (if applicable) and in electrical building.	Bidder shall not envisage any Control Room building for LHP. Hence Air Conditioning system shall not be applicable for LHP Control room building as well.
617.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	1.4.0	58 of 73	Feed size: (-) 250 mm, occasionally 1-2% of 400 mm size	Crusher shall be designed for feed size of (-) 250 maximum not for 400 mm limestone particle size. Employer is requested to provide the limestone particle size distribution for designing the Crusher.
						Technical Specifications is clear. Bidder shall comply.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
618.	SECTION-VI PART-B	SUB-SECTION-I-M6 (Limestone Handling Plant)	1.7.0	Limestone feeding arrangement: Through vibrating screen feeder (However the crusher shall be designed/sized considering zero passage of limestone through screen)	Bidder not envisage any Vibrating screen feeder at Crusher upstream.	Technical Specifications is clear. Bidder shall comply.
	SECTION-VI PART-A	SUB-SECTION-III-A5 (Limestone & Gypsum Handling Plant)	2.01.05	Suitable numbers of vibrating feeders in limestone crusher house to feed the limestone to crushers with drives, dust hoods, all mechanical, electrical accessories and supporting structures etc.		
619.	SECTION-VI PART-A	SUB-SECTION-III-A5 (Limestone & Gypsum Handling Plant)	3.04.00	Complete dust suppression system for control of fugitive dust in gypsum storage shed, complete with pumps, water tanks, drives, hoisting arrangements, ducting, piping, valves etc. electrical, accessories, civil, structural and architectural works.	Bidder shall envisage Dust extraction system comprising of dust collection hoods, ducting, fans, bag filter and dust collection hopper with bag filters, similar to the system proposed for Limestone handling system.	Noted. Bidder to refer amendment in this regard

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
620.	SECTION-VI PART-B	SUB-SECTION-I-M1 (FGD)	7.08.06	Coarse-screen(s) of suitable material at suction-side of the pumps shall be provided.	Bidder shall not envisage any coarse-screen/ suction strainer at Slurry pump suction. Suction strainer shall only be provided inside the Absorber vessel to protect the Slurry recirculation pumps as per clause no. 5.06.22 mentioned in Sub-section-I M1 (FGD) under Technical Specification Section VI Part B.	Specification requirement is clear. Bidder shall comply with the specification requirements.
	SECTION-VI PART-B	SUB-SECTION-I-M1 (FGD)	10.01.00	Coarse-screen(s) at suction-side of these pumps shall be provided.		
621.	SECTION – VI, PART-B	SUB-SECTION-I-M1 TECHNICAL REQUIREMENTS	4.04.00Not e (b)	Although employer envisages to install highly efficient electrostatic precipitator to control particulate emission, however. Bidder shall select the Booster fan components such as blades, hubs, casing etc. to encounter the high dust burden of the order of 250 mg/Nm3 . The minimum wear life of Booster fan components shall not be less than 25000 hours of operation	Bidder would like to clarify that Booster fan components shall not be exposed to high dust load in order of 250 mg/ Nm3 since the same is going to be installed at downstream of highly efficient electrostatic precipitator (ESP). Bidder shall envisage the selection of Booster fan components considering 200 mg/Nm3 dust load as per clause no. 3.01.00 men-	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
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				from the date of commissioning.	tioned in Sub-section-I M1 (FGD) under Technical Specification Section VI Part B. Further if Employer still insists for high dust load, then please inform the maximum duration of such extreme dust load (250 mg/Nm3) condition.	
622.	SECTION – VI, PART-B	SUB SECTION-II-A9	Table-6	36 of 36 /Details	Bidder request Employer to furnish the detail drawings of existing pipe /cable rack near ESP control room. Bidder also request Employer to furnish the distance from "house tac" behind chimney to road in Employer marked FGD area.	Bidder to refer drawings provided at of Sub Section- II- PROJECT INFORMATION (For Various Projects) Section –VI, Part-A for pipe/cable trestle drawings. Bidder to refer Amended GLP being issued separately.
623.	SECTION – VI, PART-A	SUB-SECTION-III-A1 FGD	5.05.00	5 of 9 The gypsum slurry from each absorber shall be fed to a common primary hydroclone tank.....	Bidder understands that the primary hydroclone feed tank may or may not be required depending on the layout and so the primary hydroclone tank is not envisaged for all the projects.	Specification requirement is clear under the referred cl.no.5.05.00. Bidder shall comply with the specification requirements.

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					Employer is requested to confirm on Bidders above clarification.	
624.	SECTION – VI, PART-A	SUB-SECTION-V SALIENT DE-SIGN DATA	1.00.00	1 OF 26 Flue gas data for all 800 MW units: H2O content (%V/v wet) 3.958 for Design point	H2O (%v/v) for design point shall be 13.958. Employer is requested to confirm above clarification.	Bidder to refer necessary amendment in this regard.
625.	SECTION – VI, PART-A	SUB-SECTION-V SALIENT DE-SIGN DATA	10.07.00	22 of 26 The design capacity of the equipment mentioned in the tabular column 110%/150% of the duty requirement	Bidder clarifies that, as per the tender specification the rated capacity of the limestone handling system from existing CHP shall be 1200 TPH up to crusher house. So Bidder understands that the conveying system up to crusher & crushed storage shed/silo shall be designed for 1200TPH including the Crusher. However from crushed storage silo/shed to limestone day silo shall be designed for 150 TPH. Bidder understands that the above clause of 1200 TPH is	Bidder may please refer amendment regarding crushed limestone storage shed/Silo capacity.

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	Part	Sub-section	Clause no.			
626.	SECTION – VI, PART-A	SUB-SECTION-V SALIENT DE-SIGN DATA	11.01.00	25 of 26	only applicable if the existing CHP is used for limestone handling system. The common crushed silo shall be designed for 7 days of the design point consumption.	The rated capacity of 150 MTPH of all gypsum handling conveyors is minimum specified. If gypsum production capacities is more than 150 MTPH, the gypsum conveyors and shed shall accordingly be designed for unit production capacity with 10% margin.

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	Part	Sub-section	Clause no.			
					duction capacity. Employer is requested to confirm on Bidder's understanding.	
627.	SECTION – VI, PART-B SECTION – VI, PART-B	SUB-SECTION-I-M1 (FGD) SUB-SECTION-III-A1 (FGD)	13.03.04 7.03.00	Two (2) clarified water storage tanks along with two numbers of 2x100% clarified Booster water pumps..... One (1) clarified water storage tanks.....	Both clauses are contradictory to each other, so Employer to clarify whether to use one clarifier storage tank or two.	Bidder to refer necessary amendment in this regard.
628.	SECTION – VI, PART-A	SUB SECTION-II-A1 PROJECT INFORMATION, KUDGI 3X800 MW	7.08.00	Barometric Pressure: The minimum average atmospheric pressure was found to be....	Employer to confirm the annual average barometric pressure for designing the FGD.	Specification is quite clear and the details are indicated in page no.23/38.
629.	SECTION – VI, PART-A	SUB SECTION-II-PROJECT INFORMATION FOR ALL PROJECTS	-	General Point	Bidder request Employer to provide the minimum & maximum temperature of cooling water blowdown (Process Water for FGD) and clarified water.	Please refer specification Cl no-4.02.00 (a), Sub-section -I-M5, Part-B, Section-VI for secondary water inlet temperature. Specification is quite clear in this regard.

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630.	SECTION – VI, PART-A	SUB SECTION-II PROJECT INFORMATION FOR ALL PROJECTS	-	General Point	Bidder request to provide TDS of cooling water blow-down (Process Water for FGD) and clarified water	Bidder to refer 'Note' to design Clarified Water Analysis provided in Technical specification. The water quality of CW blow down shall accordingly be arrived by the bidder.
631.	SECTION – VI, PART-B SECTION – VI, PART-A	SUB-SECTION-I-M1 FGD SUB-SECTION-III-A1 FGD	7.08.02 6.02.00	The contractor shall provide 2x100% pump to pump back the slurry from the sump back to the absorber maximum of 8 hrs. The contractor shall provide 1x100% slurry pumps for pumping the slurry back to the absorber of any of the units in 8 hrs (max.).	Both the clauses are contradictory each other, so Employer is requested to confirm the no. of pumps.	Bidder to refer necessary amendment in this regard.
632.	SECTION-VI PART-B	SUB-SECTION-I-M1 (FGD)	6.07.03	The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 10 mm thickness.	Bidder considered 6mm rubber lining thickness inside all ERW Carbon Steel pipe and bends/mitter for DN80 size and above used for slurry handling. Employer is requested to confirm on above consideration.	Bidder shall comply with the specification requirements.

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633.	SECTION-VI, PART-A	SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.04.00	Equipment Cooling Water Normal make up to ECW tank: Contractor shall take a tap off suitably from the existing DM normal make up header (DM normal make up pump discharge) available along C-row at CD bay rack for meeting the makeup water requirement of ECW system. Emergency make up to ECW tank: Contractor shall take a tap off suitably from the existing DM Emergency make up header (condensate transfer pump discharge) available along C-row at CD bay rack for meeting the emergency make up water requirement of ECW system.	Bidder request Employer to furnish the following details: - Please furnish the Terminal Point coordinate of "DM normal makeup pump discharge" for connection of Normal make up ECW tank and markup this TP in the layout drawing. - Please furnish the Terminal Point coordinate of "condensate transfer pump discharge" for connection of Emergency makeup ECW and markup this TP in the layout drawing.	As indicated in the Technical Specification, DM Normal make-up and Emergency Make up headers are available along TG Hall C-row at CD bay rack. Exact Terminal point coordinates shall be finalized during the course of detail engineering.
634.	SECTION-VI, PART-A	SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.03.00	Auxiliary Steam System (For ZLD application) Contractor shall take a tap off suitably from the existing Aux. steam header (Pr. 16 ata, Temp-210	Bidder request Employer to furnish the Terminal Point coordinate of "BC bay deaerator floor" for connection of Auxiliary Steam System	Bidder to comply specification requirements.

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					deg. C) available at BC bay below deaerator floor.	tem (For ZLD application) and markup this TP in the layout drawing.	
635.	SECTION-VI, PART-A	SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.05.00	2 OF 3	<u>Process Water:</u> For FGD system, Contractor shall take a tap off suitably from the existing CW blow down header available near the CW pump house . The pressure available at TP will be 1.9 Ksc (gauge) wrt FGL (approx.).	- Bidder request Employer to furnish the Terminal Point coordinate of "existing CW blowdown header" for connection of Process water and markup this TP in the layout drawing.	Provisions of Technical Specification are clear. Bidder shall comply with the same. Further, exact terminal points shall be finalized during the course of detail engineering.
			1.06.00				
			1.07.00		<u>Gypsum Wash Water (Clarified Water):</u> For Gypsum washing, Contractor shall take a tap off suitably from the existing HVAC header (HVAC make up pump discharge) available along C-row at CD bay rack for meeting the water requirement of Gypsum washing.	- Bidder request Employer to furnish the Terminal Point coordinate of "existing HVAC makeup pump discharge" for connection of Gypsum wash water (clarified water) and markup this TP in the layout drawing.	
					<u>Portable water:</u> Contractor shall take a tap off	- Bidder request Employer to furnish the Terminal Point	

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				suitably from the existing portable water supply header (potable water pump discharge) available along C-row at CD bay rack for meeting the potable water requirement	coordinate of "existing portable water pump discharge in CD bay rack" for connection of Portable water and markup this TP in the layout drawing.	

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636.	SECTION-VI, PART-A	SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.08.00	2 OF 3	Waste Water FGD waste water pipes shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at terminal point shall be 3.0 kg/cm2(g) , pH shall be 7.0 (approx.) and temperature shall be <50°C.	Bidder request Employer to furnish the Terminal Point coordinate of "existing HCSD Mixing Tank in HCSD Silo Area" for terminating the waste water and markup this TP in the layout drawing.	Specification requirement is clear. Bidder shall comply with the specification requirements.
637.	SECTION-VI, PART-A	SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.08.00	2 OF 3	FIRE DETECTION AND PROTECTION SYSTEM (i) Mechanical: Separate Hydrant and spray Hader (within 100 meter) available in plant area for tapping required for Hydrant and spray system for FGD/ZLD facilities. Minimum pressure available for hydrant and spray system shall be 8 Kg/cm2.	Bidder request Employer to furnish the Terminal Point coordinate of "existing Hydrant and spray Hader" for connection of Hydrant and markup this TP in the layout drawing.	Terminal point coordinate of existing hydrant and spray header shall be furnished during detailed engineering based on bidder's requirement. However for existing tap off point for hydrant and spray line, Bidder to refer Cl. No 1.11.00, Sub-section-IV, Part-A of technical specification, Section-VI.
638.	SECTION-VI, PART-A	SUB-SECTION-VII MANDATORY SPARES	1.12.00	10 OF 61	Slurry Line Bends 4 no. of each type and size	Employer to confirm that this clause is applicable for bends used in Recycle Pump discharge & suction lines also.	Bidder's understanding is correct. Bidder shall comply with the specification requirements.

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639.	SECTION-VI, PART-A	SUB SECTION-III-A1 FGD	1.01.00	1 OF 9	Bidder understands that, the pipe connections from Terminal Points to FGD area, Dewatering & ZLD area along with pipe connections between FGD area & Dewatering/ZLD area, Bidder will use Employers Pipe Trestle/Rack, then further distribution within FGD area is in Bidders scope. Employer is requested to confirm on Bidders consideration.	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section –VI, Part-A, shall be complied with w.r.t trestles.
640.	SECTION-VI, PART-B	SUB-SECTION-I-MS (LOW PRESSURE PIPING)	2.02.09	3 OF 16	Bidder has overground pipes in RC pump suction & discharge having size higher than 800 NB and there inspection holes are not being provided. So Bidder understands that this clause may be applicable for underground pipes only. Employer to confirm on Bidders understanding.	Specification requirement is clear. Bidder shall comply with the specification requirements.

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	Part	Sub-section	Clause no.			
641.	SECTION-VI, PART-B	SUB-SECTION-I-MS (LOW PRES-SURE PIPING)	2.02.11	4 OF 16	Bidder understands that this clause is not applicable for Recycle Pump suction & discharge line. Employer to confirm on Bidders understanding.	Specification requirement is clear. Bidder shall comply with the specification requirements.
642.	SECTION-VI, PART-B	SUB-SECTION-I-M8 (LOW PRES-SURE PIPING)	2.02.08	3 OF 16	Bidder understandss this clause is applicable for Pipe sizes DN80 and above. Employer is requested to confirm on Bidders understanding.	Specification requirement is clear. Bidder shall comply with the specification requirements.
643.	SECTION-VI, PART-B	SUB-SECTION-I-M8 (LOW PRES-SURE PIPING)	2.07.02	7 OF 16	Bidder clarifies to use miter bends with rubber lining for size above DN1200, as fittings for the same are not available in standard. Employer is requested to confirm on Bidder's understanding.	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
644.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	2.02.00	2 OF 8	Bidder understands that all temperature transmitter shall be provided by contractor is single input DIN rail mounted type (mounted in JB) for all temperature elements (i.e. for HT motor, package equipment and process instruments) and complying the Clause 3.05.00 (b) of Sub-Section-III-C2, Measuring Instruments, Page 11 of 34, of Technical Specification Section-VI, Part-B.	Bidder's understanding is correct. As per clause 2.02.00/ sub section III-C/ section-VI/ Part-A, single input din rail mounted type temp transmitters (mounted in JB) shall be provided which shall meet the technical specification clause 3.05.00/ sub section-III C2/ section-VI/ Part B.
645.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	4.00.00 (d)	5 OF 8	Bidder requested to Employer to provide the tentative distance between FGD Absorber area and Employers DDCMIS CER for cable estimation purpose. Cables required for interfacing PLC control system with Employers DDCMIS (both SG and BOP) located in CER shall be in bidder's scope. Cables for connectivity of CEMS signals to Employers Unit DDCMIS located in Unit CER shall be in bidders scope.	Bidder to refer clause 9.03.00, PART-A, Sub Section III-C, wherein it is mentioned that “Bidder to visit site to estimate the distance between FGD control room and Employer’s CCR/CER”. Accordingly, bidder to visit site to estimate the cable distance between FGD absorber and employer's DDCMIS placed in CER.

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Sl. No.	Specification Reference		Clause no.	Page	Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section					
646.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	6.03.00	6 OF 8	For each equipment/drives/pumps where Local Operation is envisaged in addition to control system as mentioned in respective Mechanical Sections, Bidder to consider Local Push button station comprising following: a) Start Push Button b) Stop Push Button c) ON Running Lamp d) OFF Lamp e) MCC Disturbance Indicating Lamp	Bidder did not envisage any local Push button station of equipment/drives/pumps for FGD system. Employer is requested to confirm on Bidders consideration.	Bidder's proposal is not acceptable. Bidder to refer the relevant clauses of specification where equipment/drives/pumps for which Local Operation is envisaged has been mentioned. Bidder to provide local push button stations accordingly.
647.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	6.05.00	6 OF 8	The minimum quantity per unit of furniture envisaged in FGD control room is as mentioned below: a) Chair-4 nos. b) Printer table- 1 no c) Computer table- 2 no. d) Key pad- 1 no. e) Locker set -1 no	Bidder understands that these furniture shall be applicable for control room wise like if 2x660 MW having one control room than these furniture shall be applicable. If there is two control room than these furniture shall be provided in double. Employer to confirm on Bidders understanding.	Bidder's understanding is not correct. It is clarified that the quantity of furniture mentioned in clause 6.05.00 a) to e) is on per unit basis . For example: In case of MOUDA-II (2x660MW) project, the quantity of furniture to be supplied shall be twice of the furniture quantity that is mentioned under clause 6.05.00 a) to e), Part-A, Sub Section III-C of the specification. Bidder shall comply with the specification.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
648.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	6.07.00	7 OF 8	Bidder understands that "change over circuitry" shall be applicable for Main UPS only. Non-UPS power shall be evenly distributed from three phase supply bus bar. 24V DC Charger shall have redundant panel. Hence, we are not envisaged "change over circuitry" in field mounted power distribution box.	Bidder's understanding is not correct. Bidder to provide "changeover circuitry" in power supply distribution panels/cabinets/boxes for sub distribution of DC/Main UPS/Utility feeders on as required basis.
649.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	9.01.00	7 OF 8	Bidder envisaged that common Remote Input Output (RIO) panel shall be used for hardwired signal exchange from FGD PLC to BOP DDCMIS. FGD Common system also included in this I/O's. Employer is requested to clarify on Bidders understanding.	Bidder's understanding is not correct. Remote Input Output (RIO) panel, located in respective unit (s) CER, for hardwired signal exchange between FGD PLC and unit's BOP DDCMIS shall be provided on per generating unit basis .

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650.	SECTION – VI, PART-A	SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	9.02.00	8 OF 8	Bidder shall be submitted booster fan blade pitch control logic for “For Information” only. This logic has been provided from (typical) past projects. The plant owners (NTPC) have then used the logic to incorporate the booster fan inlet pressure control into the plant boiler furnace draft control system. Boiler/NTPC shall be revised according to the plant specific control requirements. This revision should involve an integration of ID Fan and Booster Fan draft control with many possible digital/PID loop signals to prevent draft increase/decrease, response to MFT, loss of FSSS communications, and other protections in the design. Employer/NTPC will be the owner and approver for the furnace draft control and the booster fan pressure control.	Bidder's reply is not acceptable. Bidder shall comply with the specification requirement.

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	Part	Sub-section	Clause no.			
651.	SECTION – VI, PART-A	SUB-SECTION-VII, MANDATORY SPARES	Clause 1.25.00 and sub-clause 1.05.00	48 OF 61	The Bidder logic is only given for a possible starting point only. Bidder understands that this clause is applicable for pair cable (Cable type-F & G type for 4 pair and above only) and this clause is not applicable for Core cable. Employer is requested to clarify on Bidders understanding.	Bidder's understanding is not correct. The clause is also applicable for core cables. Bidder shall comply with the specification requirement.

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	Part	Sub-section	Clause no.			
652.	SECTION – VI, PART-B	SUB-SECTION-III-C1, BASIC DESIGN CRITERIA	4.01.00	For PCs, OWS, EWS, Servers, Printers and other peripherals, maximum temperature limit shall be 35 Deg. C. For mini-UPS, the same shall be 40 Deg.C.	Bidder understands that main UPS (Configuration-B) is used for this project and mini-UPS(Configuration-C) is not envisaged.	Bidder's understanding is not correct. Mini UPS is envisaged for 01 (one) no. of OWS cum EWS. Input supply for mini-UPS shall be taken from UPS power distribution board. Refer amendment in this regard.
653.	SECTION – VI, PART-B	SUB-SECTION-III-C1, BASIC DESIGN CRITERIA	4.01.00	Instruments, devices and equipments for location in outdoors/indoor/air-conditioned areas shall be designed to suit the environmental conditions indicated below and shall be suitable for continuous operation in the operating environment of a coal fired utility station and also during periods of air conditioning failure without any loss of function, or departure from the specification requirements covered under this specification.	Bidder understands that this clause is applicable for field mounted panels/cabinets/desks but it is not applicable for field mounted instruments. This is stated in Table that " Ambient Temperature (outside cabinets)" and " Required protection Class of panels/cabinets/desks" to be provided by contractor.	Bidder's understanding is not correct. The referred clause 4.01.00, PART-B, Sub Section-III-C1 is applicable for field mounted instruments also.

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654.	SECTION – VI, PART-B	SUB-SECTION-III-C2, MEASURING INSTRUMENTS	2.05.00	8 OF 34	HART Hand Held Calibrator : Hand held calibrator shall be provided for adjustment/calibration/maintenance of the HART compatibility transmitter. The Hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of Hand held calibrator is not suitable for communicating with all types of transmitters then separate Hand held calibrator will be provided for that specific type of transmitter.	The quantity of hand held HART Calibrator shall be one number per generating unit. For example in MOUDA-II (2x660MW) project, the quantity of hand held HART calibrator shall be two (2) number. Refer amendment in this regard.
655.	SECTION – VI, PART-B	SUB-SECTION-III-C2, MEASURING INSTRUMENTS	7.00.00	15 OF 34	Limit Switches: Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of Fire alarm Control System subject to a minimum of 60V, 6VA rating. Protection class shall be IP-55.	Bidder's understanding is not correct. It is clarified that Limit switches specification is applicable for end position switches provided with Open/close type pneumatic valves/dampers, manual valves/dampers.

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656.	SECTION – VI, PART-B	SUB-SECTION-III-C2, MEASURING INSTRUMENTS	8.00.00	16 OF 34	Bidder understands that this clause shall be applicable for density of gypsum/reagent slurry but this clause indicates the HFO (Heavy Fuel Oil). Employer is requested to clarify on Bidders understanding.	Bidder's understanding is correct. Refer amendment in this regard.
657.	SECTION – VI, PART-B	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	2.02.00	3 OF 27	Wherever Dual processor based PLC system has been specified, each PLC unit shall be provided with two processors (Main processing unit and memories) one for normal operation and one as hot standby.	Bidder's understanding is not correct. It is clarified that all the processors shall be redundant in line with the specification requirement. However, the number of redundant processors shall depend on the number of I/Os and I/O handling capacity of the processors being provided.
658.	SECTION – VI, PART-B	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	9.05.00	19 OF 27	The UPS Power Supply for various systems shall consist of one or more of the following configuration. Bidder shall clearly bring out in the proposal the redundancy feature along with configuration diagram, single line diagram and data sheets etc. & this shall be finalised subject	UPS Configuration-B and UPS Configuration-C does not call for any redundancy criteria of UPS in the said clause. Bidder wishes to understand the redundancy criteria of UPS power supply system from Employer.

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				to employer's approval during details engineering.		
659.	SECTION – VI, PART-E	SCHEME FOR UNINTERRUPTIBLE POWER SUPPLY SYSTEM- CONFIGURATION-B	0000-999-POI-A-019C	Scheme for uninterruptible power supply system- Configuration-B	This scheme does not call for UPS redundancy. Bidder wishes to understand the redundancy criteria of UPS power supply system from Employer.	Bidder's understanding is correct. Refer amended tender drg. no. 0000-999-POI-A-019C in this regard.
660.	SECTION – VI, PART-E	SCHEME OF FGD-ABSORBER SYSTEM (SINGLE UNIT)	- 0011-109-POM-A-001 (a) - 0011-109-POM-A-001	Scheme shows FI (Flow Indicator) and FT (Flow Transmitter) are installed in Booster Fan common discharge flue gas duct.	We understand that Flow Indicator (FI) is a digital display of electronic Flow Transmitter (FT). No separate Flow Indicator (FI) shall be envisaged in addition of Flow Transmitter (FT).	Bidder's proposal is acceptable.

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661.	SECTION – VI, PART-E	SCHEME OF FGD-ABSORBER SYSTEM (SINGLE UNIT)	- 0011-109-POM-A-001 (a) - 0011-109-POM-A-001	Schemes shows DPT with DPI across ME in Absorber.	We understands that DP Indicator (DPI) is a digital display of electronic DP Transmitter (DPT). No separate DP Indicator (DPI) shall be envisaged in addition of DP Transmitter (DPT).	Bidder's understanding is not correct. DP Indicator (DPI) shall be separately provided along with DP Transmitter (DPT). Bidder shall comply with the specification requirement.
662.	SECTION – VI, PART-E	STANDARD CONFIGURATION DIAGRAM FOR PLC BASED OFFSITE CONTROL SYSTEM	0000-151-POI-A-013	Standard configuration diagram for PLC based offsite control system.	Bidder understands that this scheme is applicable for FGD PLC control system in following configuration. For Example:1. 2x660 MW or 2x800 MW : One OWS+One OWS/EWS at FGD Control Room for FGD Operation.2. 3x660 MW or 3x800 MW : Two OWS+One OWS/EWS at FGD Control Room for FGD Operation.3. 4x250 MW : Three OWS+One OWS/EWS at FGD Control Room for FGD Operation. Employer is requested to clarify on Bidders understanding.	Bidder's understanding is not correct. Bidder to refer clause 6.01.00, PART-A, Sub Section- IIC, where in it is mentioned that Operator Work Station (OWS) shall be supplied on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control

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						room)-(N+1) where N is the total number of generating units per project under this package. b) OWS cum EWS (placed in FGD control room)-ONE (1) c) OWS (placed in central control room of each generating unit)-TWO (2). Bidder to refer amendment in this regard.
663.	SECTION – VI, PART-A	SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.13.01	3 of 3	Bidder request Employer to furnish the co-ordinate / Location of Employers Existing HT switchgears / Floor / Building of each plants.	Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI). Switchgear Panel is earmarked in Annexure-A.

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664.	SECTION – VI, PART-A	SUB-SECTION-III-B ELECTRICAL SYSTEM/ EQUIPMENT	1.08.00	2 of 6	Bidder understands that spare cable trays (HT & Control) available in the employers nearest trestle from Employers Existing HT Switchgear building to Proposed FGD area. In case of non availability of spare cable tray in employer's existing trestle, Employer shall make necessary space on the nearest trestle for laying of new FGD cable trays (By Bidder) from Employers Existing HT Switchgear building to Proposed FGD area's. So Bidder not envisaged any new cable trestle for laying of necessary cables from Employers Existing HT Switchgear building to Proposed FGD area's. Bidder request Employer to indicate the existing trestle / cable route where non availability of spare cable tray in	bidder's understanding is NOT correct. Bidder to provide cable tray and its supports for his scope of cable on employer trestle. In case of non availability of space in employers trestle, bidder to make necessary arrangements for cable tray erection and laying. refer clause no:- 1.08.00.2. However bidder may visit the project in order to get itself acquainted with existing electrical of plant

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					employer's trestle (Drg no 0011 -999-POC-F-001).	

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665.	SECTION – VI, PART-E	TENDER DRAWING LIST - Electrical single line diagram for FDG package	Drg No. 001.1-109-POE-J-001/A-E, Rev A	Panel being used for feeding of CHP / AHP HT Transformer shall be suitably modified to DD type for feeding of 11kV FGD TIE switchgear. CHP / AHP HT Transformer shall then inturn be fed from 11kV FGD TIE switchgear. Necessary cabling upto AHP / CHP transformers shall also be in scope of Bidder.	Bidder request Employer to furnish / clarify the following points:1. Feeder details of Employers Existing HT SWGR being used for feeding of CHP / AHP HT Transformers (with Detailed drawings, i.e. GA, IGA, SLD, Schematic diagram, etc..). 2. Availability of existing cable route from Employers Existing HT Switchgear building to Proposed FGD area.3. Coordinate / Location of Existing 11/3.45kV CHP / AHP aux. Transformers and CHP/AHP Electrical Building.4. Rating of Existing 11/3.45kV CHP / AHP aux. Transformers (with Detailed drawings, i.e. GA, Name Plate details, Terminal Box details, etc...).5. Type and size of existing cables being used for Existing HT SWGR to 11/3.45kV CHP / AHP aux. Transformers.6. Availability of existing cable route from	Please refer Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI). Necessary details/GA/Layout drgs regarding co-ordinates and location of Transformers/Switchgear rooms along with details of cables shall be intimated during detailed engineering. bidder's understanding is NOT correct. Bidder to provide cable tray and its supports for his scope of cable on employer trestle. In case of non availability of space in employers trestle, bidder to make necessary arrangements for cable tray erection and laying. refer clause no:- 1.08.00.2. However bidder may visit the project in order to get itself acquainted with existing electrical of plant.

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					Existing 11/3.45kV CHP / AHP aux. Transformers to Proposed FGD area.7. Existing TRF Feeder shall be modified to "DC" Type (Incomer) instead of "DD" type (Bus coupler)	

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
666.	SECTION – VI, PART-E	TENDER DRAWING LIST - Electrical single line diagram for FDG package	Drg No. 001.1-109-POE-J-001/A-E, Rev A	Two Number 11kV Motors per Unit can be Fed from Existing spare Feeders in Station Boards (Spare feeder of MDBFP Rating and spare feeder of Largest TRF. Rating to be used as ID Booster Fans). Necessary augmentation and modification required in switchgear panels for this purpose shall be in scope of Bidder.	Bidder request Employer to furnish the following: 1. Feeder details of Employers Existing HT Station boards being to be used for feeding of Booster Fans Motors (with Detailed drawings, i.e. GA, IGA, SLD, Schematic diagram, etc.). 2. Availability of existing cable route from Employers Existing HT Station boards building to Proposed FGD area for Booster Fans.	1. Please refer Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI). 2. bidder's understanding is NOT correct. Bidder to provide cable tray and its supports for his scope of cable on employer trestle. In case of non availability of space in employers trestle, bidder to make necessary arrangements for cable tray erection and laying. refer clause no:- 1.08.00.2. However bidder may visit the project in order to get itself acquainted with existing electrical of plant
667.	SECTION – VI, PART-E	TENDER DRAWING LIST - Electrical single line diagram for FDG package	Drg No. 001.1-109-POE-J-001/A-E, Rev A	Four Nos. (Two Nos. each Bus section) of spare 11 kV feeder in 11kV FGD TIE Switchgear for Owners USE.	Bidder request Employer to furnish the following regarding the spare feeders: 1) Rating of spare feeder 2) Type of spare feeders (i.e. DA / DAF / DB / DBF) 3) Running mode (i.e. working, standby) 4) Maximum expected load to fed.	Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI).

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668.	SECTION – VI, PART-B	SUB SECTION-II-E-1 General Electrical Specification	2.09.00	DG set(s) shall be capable of meeting 100% of essential load requirements of FGD system including starting of the largest motor (DOL) with other load connected without exceeding the permissible starting voltage drop.	Bidder understands that DG set sizing shall be as per sub-section -II-E-11 (Diesel Generator, Cl. No. 4.04.00, Pg. 3 of 19) Employer is requested to confirm on Bidders above clarification.	Bidder understanding is correct. However bidder shall also comply to the requirements of clause no:- 2.09.00
	SECTION – VI, PART-B	SUB SECTION-II-E-11 Diesel Generators	4.04.00	The DG set shall be capable of starting largest connected motor with terminal voltage drop being restricted to 15%. Generator loading before starting of this motor shall be considered as 50% of generator rating		
669.	SECTION – VI, PART-B	SUB SECTION-II-E-9 HT SWITCHGEAR	1.00.00	All MV Switchboards is provided with one spare motor feeder and one transformer feeder on each section for future requirements.	Bidder understands that spare motor & transformer feeder shall be consider in the SWGR if the motor & transformer feeder is applicable for that switchgear. (for example, IN 3.3kV switchgear Bidder don't have any transformer feeder, then Bidder will not consider any spare transformer feeder in this switchgear). Employer is	This clause is deleted. Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI).

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					requested to clarify the same.	
670.	SECTION – VI, PART-B	SUB SECTION-II- E-10 LT SWITCHGEARS & LT BUSDUCTS	1.01.01	f) ESP consumption for 100% BMCR operation shall be considered and further this load shall be uniformly divided among ESP Switchgear	This clause is not applicable to this project. Employer is requested to confirm the same.	Confirmed.
671.	SECTION – VI, PART-B	SUB SECTION-II- E-10 LT SWITCHGEARS & LT BUSDUCTS	1.01.01	h)) The sizing of Unit Emergency boards shall be in accordance to the DG rating. The Emergency board shall have tie to both sections of unit Service Switchgear for catering unit loads in Blackout Conditions.	Bidder understands that one no. common DG sets along with Emergency Switchgear shall be considered for the common system loads & unit specific system loads. Emergency Switchgear shall feed to unit Emergency boards as per process unit Emergency load requirements. And the sizing of Unit Emergency boards shall be as per process unit Emergency load requirements. Employer is	Supply of FGD Emergency MCC shall be as per selected DG ratings.

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					requested to clarify the same.		
672.	SECTION – VI, PART-B	SUB SECTION-II-E-10 LT SWITCHGEARS & LT BUSDUCTS	1.03.00	2 of 58	All LV Switchboard shall be provided with spare feeders / modules as specified in relevant clause of Part-A of Technical Specification.	Bidder did not found the details of spare feeders / modules requirement in Part-A of Technical Specification. Employer is requested to furnish the same.	This clause is deleted. Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI).
673.							

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674.	SECTION – VI, PART-A	sub Section-III , Electrical system / Equipment	1.12.00	4 of 6	Bidder request Employer to furnish the following inputs / clarifications: a) Bidder request Employer to provide the electricity per unit charges to estimate the electricity cost for construction power. b) Bidder request owner to provide the distance / route of cable from LT SWGR to work site. c) Bidder also understands that the power for Testing & Commissioning shall be provided at free of cost	a) Electricity charges shall be as prevalent rate of DISCOM. Refer subsection-III B, part-A, Construction power. b) Location of construction power feeders shall be provided during detail engineering. c) Bidder's understanding is correct.
675.	SECTION – VI, PART-D	Erection Condition of contract	27.00.02	11 Of 53	Bidder request Employer to furnish the following inputs / clarifications: a) Bidder request Employer to provide contraction water at free of cost b) Bidder understands that	a) Specification requirement is clear at cl.no. 27.00.02. Bidder shall comply with the specification requirements. b)

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC CLARIFICATIONS
	Part	Sub-section	Clause no.			
					Employer shall provide limestone, lime, water, compressed air etc. for Testing and commissioning at free of cost.	Except Limestone which will be provided by Employer, Bidder to arrange for other necessary things required for Testing and commissioning.
676.	SECTION – VI, PART-D	Erection Condition of contract	28.05.02	12 of 53	Bidder requested Employer to provide the First Aid facilities in existing plant Hospital/dispensaries also along with Ambulance services if required.	In case of emergency, the Employer will try to provide the facility in existing plant hospital/dispensaries if available.
677.	SECTION – VI, PART-D	Erection Condition of contract	36.05.00 - F	19 of 53	a) Bidder understands Proper lighting shall be done by Bidder for its scope of work & the designated construction area only. b) As Employer supplying the construction Power from 2nos of 415 V LT feeder, bidder understands that the construction of power ring main is not in the scope of Bidder.	a. Bidder's understanding is correct. b. Bidder's understanding is correct.