

Annexure-1 K PCRI

Sl. No.	Volum e, Part No.	Section No.	Cl. No.	Page No.	Tender Specification requirement	Clarification / Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	Vol. III,	Sec D5,	Cl. no 11.0 and 13.0	SHEET 1 OF 2 & SHEET 2 OF 2	11.0 CONTRACTOR shall establish ground surface water and ambient air quality monitoring stations in a radius of 10 km from the plant premises to keep watch on the ambient air and water quality. The number and location of the monitoring stations shall be decided with Concern R.O.	For ambient air quality monitoring PCRI will supply 4 Continuous Ambient Air Quality Monitoring System (AAQMS), 04 Respirable dust samplers (RDS) and 1 mobile van mounted with AAQMS. The mobile van will be used for ambient air quality monitoring & collection of water samples in a radius of 10 km from the plant premises to keep watch on the ambient air & water quality. The above is envisaged in our offer	As per specification both PM2.5 and PM10 to be measured in AAQMS. 4 no.s Continuous Ambient Air Quality Monitoring System (AAQMS). 10 nos. RDS (capable to carry out monitoring of both PM 2.5 and PM10) required including mobile van

BHEL Ltd is common.

Following points not acceptable

1. SG Auxs - SLV. 2, 14
2. " - GAP - SLV. 1 To 26. (To be drawn and Finalized after award of contract)
3. " - Boiler Auxs - SLV. 10, - SCA shall be minimum 250 with 400mm spacing.
4. " - Boiler Auxs - SLV. 22 - SCATH material shall be Cur Ni
5. EDN Technical specs - Ann 1 CED - SLV. 13

All other deviations - Acceptable. Acceptable
(T.P.)



SL no 1 to 26 of SG and Auxiliaries - Quality (Annexure 1A-TP)
and SL no 10 and SL no. 22 of SG and Auxiliaries - Boiler Auxiliaries (Annexure 1A-TP) shall be finalized after award of the contract during Contract execution.

Acceptable
17/01/13



BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

Power Sector – Marketing

Asian Games Village, NEW DELHI - 110 049, INDIA

Registered Office: BHEL House, Siri Fort, New Delhi-110049, INDIA.

TEL (91) (11) 66337800,

FAX (91) (11) 26493561

Ref No. MS-1-12-E-0003/ SURATGARH / CHHABRA

Dated: January 17 , 2013

Shri A K Sharma,
Dy. Chief Engineer / Thermal Design,
Rajasthan Rajya Vidyut Utpadan Nigam Ltd,
3rd Floor, Vidyut Viniyamak Bhawan,
Sahkar Marg, Near State Motor Garage,
Jaipur-302005 (Rajasthan).

Sub: ICB Tenders for 2x 660 MW Suratgarh and 2x 660 MW Chhabra

Dear Sir,

In continuation to our letters of even reference dated 28-12-2012, 02-01-2013, 04-01-2013, 06-01-2013 and 09-01-2013 and discussions with RVUNL Board of Directors on 17-01-2013 on subject tenders, we would like to clarify as under:

BHEL insists for Arbitration in the Contract between RVUN and Collaborators of BHEL (as per DJUs submitted). We also confirm that there is no other Commercial Deviation except the above.

Kind regards.

Yours sincerely,

(Gaurav Garg)

Dy. General Manager/ Marketing

2 x 660 MW TPS of RVUNL
Clarifications on Tender Document

Annexure to Schedule F-5

S.No.	Reference of Tender Specn.			Spec. Requirement	Clarification Required
	Vol. No	Sec. No.	Cl. No.	Page No	
1.	1	2	22.0	109 of 135	Owner/ Owner's representative decision can not be final for all Disputes between Owner & Contractor and Owner & Collaborator. Appropriate mechanism has to be available for settlement of disputes between Owner and Contractor. Accordingly disputes between Owner & Contractor and Owner & Collaborator of the Contractor (which is a foreign Party). Settlement of all disputes or differences which are not settled by mutual consultation between the parties shall be settled as per following Rules of procedure for arbitration proceedings: In case of a Foreign Contractor: Arbitration proceedings shall be conducted in accordance with the United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules of 1976. In case of a Foreign Collaborator of Indian Contractor: Arbitration proceedings shall be conducted in accordance with the United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules of 1976. In case of an Indian Contractor, the arbitration proceedings: shall be conducted in accordance with Indian Arbitration and Conciliation Act 1996. In case the Indian Contractor is an Indian Public Sector Enterprise/Government Department (but not a State Govt. Undertaking or Joint Sector Undertaking which is not a subsidiary of Central Govt. Undertaking), the dispute arising between the Employer and the Contractor shall be referred for resolution to a Permanent Arbitration Machinery (PAM) of the

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28/12/20

2 x 660 MW TPS of RVUNL
Clarifications on Tender Document

Annexure to Schedule F-5

S.No.	Reference of Tender Specn.			Spec. Requirement	Clarification Required
	Vol. No	Sec. No.	Cl. No.	Page No	
					Department of Public Enterprises, Government of India. Appointing Authority for third Arbitrator : a) President, Institution of Engineers in case of an Indian Contractor. b) President, International Chambers of Commerce, Paris.in case of Foreign Contractor and Foreign Collaborator of Indian Contractor. The place of Arbitration shall be : a) Foreign Contractor and Foreign Collaborator of Indian Contractor: Singapore. b) Indian Contractor: New Delhi. The language to be used in arbitral proceeding shall be English. The award made in such Arbitration shall be final and binding and shall be enforceable in any Court of Competent Jurisdiction. Owner is also requested to take care of this Dispute mechanism as above in the text of the Deed o Joint Undertaking

Signature
28/12/14



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TEL (91) (11)66337800,

FAX (91) (11) 26493561

Ref No. MS-1-12-E-0003/ SURATGARH / CHHABRA

Dated: January 9 , 2013

Shri A K Sharma,

Dy. Chief Engineer / Thermal Design,

Rajasthan Rajya Vidyut Utpadan Nigam Ltd,

3rd Floor, Vidyut Viniyamak Bhawan,

Sahkar Marg, Near State Motor Garage,

Jaipur-302005 (Rajasthan).

Sub: ICB Tenders for 2x 660 MW Suratgarh and 2x 660 MW Chhabra

Dear Sir,

In continuation to our letters of even reference dated 28-12-2012, 02-01-2013, 04-01-2013 and 06-01-2013 we would like to clarify as under in line with the discussions held between RVUNL/TCE and BHEL on 23rd December 2012 and 9th January 2013 as under:

1. It is confirmed that all technical & commercial deviations / clarifications taken in our offer are hereby withdrawn (except below) without any financial implications to RVUN. We confirm to comply with the RVUN tender specification, pre-bid clarification & amendments thereof except for the technical deviations / clarifications enclosed with this letter at Appendix-I comprising of Annexure-1A to Annexure-1K (which are product/technology specific) for technical and Arbitration between RVUN and Collaborators of BHEL (as per DJUs submitted) for commercial. It is confirmed that these are the only deviations and all other technical and commercial deviations stand withdrawn without any financial implications.
2. It is confirmed that all exclusions except those mentioned in the RVUN tender specifications are hereby withdrawn without any financial implications to RVUN and confirm to comply with the tender specifications, pre-bid clarifications and amendment thereof. It is confirmed that all terminal points owner's obligations /responsibilities and scope work and services etc shall be as per tender specifications. (However Appendix-I shall apply).

gama farg

3. It is confirmed that all essentials spares shall be supplied as per the requirement of the specifications. In case any spare indicated in the specification is not applicable for particular equipment then suitable applicable alternate spare have been offered/shall be supplied without any financial implication.
4. It is confirmed that all special tools and tackle shall be supplied as per RVUN tender specification.
5. It is confirmed that all taxes and duties applicable to the bidder as on 7 days prior to the date of techno-commercial bid opening are included in our quoted prices.
6. It is confirmed that completion schedule shall be as per RVUN tender specification without any pre condition/deviation.

In case you require any further clarification on the above you may please inform us. We shall be pleased to clarify the same.

Kind regards.

Yours sincerely,



(Gaurav Garg)

Dy. General Manager/ Marketing

Appendix-1 Comprising of Annexure-1A to Annexure-1K.

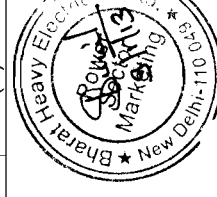
BHARAT HEAVY ELECTRICALS LIMITED

2X660 MW RVUNL PROJECTS

Annexure-1A-TP

SG and Auxiliaries - MECHANICAL

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL. No.	SECTION No.	PAGE No.	CLAUSE No.			
1.	III A	C1	7 of 34	12.2.7.0	All headers in high temperature gas path shall be located outside gas path. All headers shall be located outside the gas path.	Headers in second pass like LTRH, Eco. Headers in low temperature gas path are located inside gas path. Refer GA drawing for the location of headers.	Headers in second pass like LTRH, Eco. Headers in low temperature gas path are located inside gas path. Refer GA drawing for the location of headers.
2.	III A	C1	26 of 34	12.2.18.1	Bidder may consider selective soot blowing system (..... or Smart soot blowing system). Materials of Construction High temp. above 565°C/593°C Superheater/Reheater (Surratgarh): (a) T91 up to 565 deg C (b) T92 for Temperature > 565°C up to 620°C (c) S304H fine grain for Temperature >600°C up to 660°C High temp. above 400°C and up to & including 550°C; Alloy steel to ASTM A 335/ASTM A 213, P-11/T-11, P-22/T-22, P-91/T-91, P-92/T-92 or approved equivalent.	Conventional type SB system is envisaged.	Conventional type SB system is envisaged.
3.	III A	Data sheet A 1 SG & their Auxiliaries	2 of 5	1.20	The allowable temperature for pressure parts material will be as per code. This is as per tender cl. No.4.03, Section-C4, Sheet-1 of 3, Volume-II. "Pressure parts tube metal temperatures shall not exceed the Manufacturer's design limits as per applicable codes". However the following temperature limits will be considered for boiler pressure parts design.	The allowable temperature for pressure parts material will be as per code. This is as per tender cl. No.4.03, Section-C4, Sheet-1 of 3, Volume-II. "Pressure parts tube metal temperatures shall not exceed the Manufacturer's design limits as per applicable codes". However the following temperature limits will be considered for boiler pressure parts design.	The allowable temperature for pressure parts material will be as per code. This is as per tender cl. No.4.03, Section-C4, Sheet-1 of 3, Volume-II. "Pressure parts tube metal temperatures shall not exceed the Manufacturer's design limits as per applicable codes". However the following temperature limits will be considered for boiler pressure parts design.



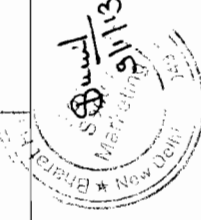
SG and Auxiliaries - MECHANICAL

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL. No.	SECTION No.	PAGE No.	CLAUSE No.			
	III A	Data sheet A 1 SG & their Auxiliaries	2 of 5	1.20	Superheater/Reheater (Chhabra): (a) T91 up to 580 deg C (b) T92 for Temperature > 580°C up to 590 °C	(b) T92 / P92 upto 620°C (c) S304 / TP 347H upto 660°C	(b) T92 / P92 upto 620°C (c) S304 / TP 347H upto 660°C T91,P91 Max temp limit is 605 Deg C.
4.	II	Datasheet A2	1 of 4 SI.No.33	Amendment	Coal Analysis	The Characteristics of the Coal to be used for guarantee test shall be within $\pm 5\%$ of the specified design coal characteristics like proximate, ultimate and ash characteristics, Ash fusion temperatures	The Characteristics of the Coal to be used for guarantee test shall be within $\pm 5\%$ of the specified design coal characteristics like proximate, ultimate and ash characteristics, Ash fusion temperatures
5.	III- A	TCEM4-134-103 Section D	5 of 15	6.6.3	The lowest set pressure of any safety valve shall not be less than 1.1 times the maximum expected working pressure of the system.	The lowest set pressure of any safety valve shall not be less than 1.05 times the maximum expected working pressure of the system.	BHEL informed that the design pressure will be as per ASME code Section I Cl. 67.4.
6.	II	C5	3 of 7	5.2.2	...Interconnecting platforms between SG units and between SG and TG building shall be provided at suitable levels....	The interconnecting platforms between SG and TG building will be provided at 3 elevations. Interconnecting platforms between SG units are not envisaged.	The interconnecting platforms between SG and TG building will be provided at 3 elevations. Interconnecting platforms between SG units are not envisaged.



SG and Auxiliaries - MECHANICAL

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	VOL. No.	SECTION No.	PAGE No.	CLAUSE No.			
7.	V	D5.3	9 of 55	5.4	Superheater tube metal thermocouples shall be provided by Bidders on every fourth tube connected to the intermediate SH outlet header The Power Plant shall be designed for base coal operation working life of thirty (30) years. Cold start : 10 Nos. per year Warm start : 40 Nos. per year Hot start : 160 Nos. per year.	The number/location of thermocouples is as per BHEL design practice.	BHEL clarified that the total number of thermocouples provided on SH & RH section is 215.
8.	II	C3	4 of 20	3.10.3 3.10.4		As per BHEL practice, the following are envisaged for 25 years of operation: Cold start : 150 Warm start : 1000 Hot start : 4000	BHEL informed that the plant will be designed for 30 Years.
9.	VII II	Drawing TCE- 5750A-511- SK-1003 C1	2 of 44	1.1.1.6	Scheme of steam and water system : Two stage attemperation has been shown Two stage attemperation system for superheaters	The boiler is designed with two stages of Superheaters and One stage attemperation in between.	The boiler is designed with two stages of Superheaters and One stage attemperation in between.
10.	II	C-3	4 of -20	3.10.2	Cold start - 270 min Warm start - 130 min	We presume that this is only TG start up time. Considering combined Boiler-Turbine start-ups, this time will be more	BHEL confirmed The combined start-up time (Boiler & TG) will be as follows: Cold Start: 400 Mins Warm Start: 250 Mins.



SG and Auxiliaries - MECHANICAL

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	VOL. No.	SECTION No.	PAGE No.	CLAUSE No.			
11.	II	C-3	6 of 20	3.14.3 b(ii)	SH/RH temperature control limits between 50% to 90% at 4%/min. - +/- 10C	Control limit will be +/- 10 C for SH and +/- 14 C for RH	Control limit will be +/- 10 C for SH and +/- 14 C for RH
12.	II	C-3	6 of 20	3.14.3 b(iii)	SH/RH temperature control limits between 90% to 100% at 2%/min. - +/- 10C	Control limit will be +/- 10 C for SH and +/- 14 C for RH	Control limit will be +/- 10 C for SH and +/- 14 C for RH
13.	IIIA	C1	3 of 34	12.2.2.6	Suitable wear bars shall be provided above the furnace bottom hopper	Wear bars are not provided on the spiral configured furnace hopper area due to the obstruction of ash flow to the furnace throat.	Because of spiral wall construction, BHEL will provide extra thickness for protection of water wall tubes.
Mills :							
14.	II	C1	9 of 45	1.1.8.0 (a)	Vertical medium speed --- dynamic classifier, wear parts, ----, aux. gear, ----	The mills being offered are with Static classifier which would meet the Pulverised Fuel Fineness requirements of the Boiler, meeting the tender specification requirements. The mill design does not call for an aux. drive.	Bidders view point is for the type of Mills offered and considering Mill Loading criterion as specified, dynamic classifier is not required and hence not offered



SG and Auxiliaries - MECHANICAL

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL. No.	SECTION No.	PAGE No.	CLAUSE No.			
15.	II	C3	3 of 20	3.8.3	All the equipment in the power plant would be designed/operated to have the noise level not exceeding 85 - 90 db (A) measured at a distance of 1.0 m from the equipment and height of 1.5 m.	The Mill noise level shall be 95 dB (marginally more than the specified value and intermittently). In normal operation, noise level shall be 85dB. This is as per our standard practice.	The Mill noise level shall be 95 dB (marginally more than the specified value and intermittently). In normal operation, noise level shall be 85dB. This is as per our standard practice.
16.	Not Used						
17.	II	C15	3 of 8	15.8.2	The following correction curves shall be furnished for coal mill performance -----	The mill performance curves shall be provided after receipt of the order for the project.	Three different curves will be provided during contract as Mill capacity Vs HGI Vs moisture Vs fineness
18.	Not Used						
19.	IIIA	C1	24 of 34	12.2.17.11	For drawing coal samples (Iso-kinetic sampling of coal) for testing the fineness of the ground coal, a minimum of four tapping points at right angles to each other shall be provided on the straight length of pipe at each coal mill outlet. Compessed air purging connections shall be provided at the tapping points to clear the opening prior to sample collection.	Two tapping points are provided at right angles on the straight length of pipe at each coal mill outlet. Iso-kinetic sampling method for sample collection according to ISO 9931 is used.	Two tapping points are provided at right angles on the straight length of pipe at each coal mill outlet. Iso-kinetic sampling method for sample collection according to ISO 9931 is used.



SG and Auxiliaries - MECHANICAL

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	VOL. No.	SECTION No.	PAGE No.	CLAUSE No.		
20.	IIIA	PART-A	1 of 2	1.7.6	Minimum wear part life - 20000 Hrs for seals. 25000 Hrs for classifier cone and other items lined with ceramics material, and 25000 Hrs for classifier vane. - Not applicable as there are no mechanical face seals. - 25000 hours shall be for classifier cone only which is ceramic lined.	- Not applicable as there are no mechanical face seals. - 25000 hours shall be for classifier cone only which is ceramic lined.

Note : The deviations of this annexure are applicable for Chhabra 2 x 660 MW proposal also, except for a few minor changes in page no/Clause no.



SG - CONTROLS AND INSTRUMENTATION

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VO L. No.	SEC-TION No.	PAGE No.	CLAUSE No.			
1.	V	D5.2	12	21.0	Furnace flame monitoring and thermo graphic flame analysis system complete with all hardware, software and accessories including display arrangement in CCR. The flame monitoring and analysis system shall provide..... thermo-graphic analysis of the flame in the furnace and also for each burner. FLAME ANALYSIS SYSTEM HARDWARE/ SOFTWARE/ INTERFACING REQUIREMENT.	Two numbers of cameras with one monitor per boiler are offered for furnace flame viewing. Flame analysis system including thermo graphic analysis is not envisaged.	BHEL is ready to provide 2 cameras and one Monitor per boiler. Thermo-graphic flame analysis system as available in the market shall be provided.
2.	V	D5.3	50	29.20	Flame Scanner: The scanner electronics shall be mounted in Control room and shall include the following signals to DCS: 4-20 mA output for Flame Quality TCP/IP OPC Communication link to the DCS.	BHEL's standard BHELSCAN system (microprocessor based) is offered for flame scanning in visible light spectrum. This scanner will provide 4-20mA Flame intensity signal to DCS for monitoring. RS-232 serial link facility is available for all set values, actual frequency, fault status signals. This is a proven system for BHEL's coal fired boilers.	BHEL confirmed that the offered system is suitable for the flame flickering frequency of the complete range of fuels (oil, coal including blending etc.).



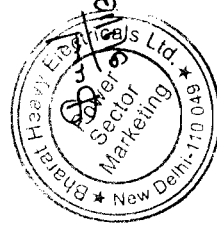
SG - CONTROLS AND INSTRUMENTATION

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VO L. No	SEC-TION No.	PAGE No.	CLAUSE No.			
3.	V	D5.3	2	5.2	A no-coal flow detector complete with amplifier and pick-up located at the outlet of each coal feeder shall be provided to detect no-coal flow.	Coal Flow/No coal flow detector is provided at bunker outlet/feeder inlet. For detecting coal flow at feeder outlet a switch is provided integral to the feeder. Therefore 'no-coal flow detector' at coal feeder outlet is not envisaged.	BHEL clarified that acoustic type flow detector at the feeder inlet and feeder integral coal flow switch.
4.	V	D5.3	53	31.10	Control valves/dampers shall be supplied with all accessories including non-contact type position transmitters.	Position transmitters are not envisaged for secondary air dampers due to high ambient temperature working condition where these dampers are located.	Position transmitters are not envisaged for secondary air dampers due to high ambient temperature working condition where these dampers are located.
5.	V	Table-13	25	7	Boiler Tube Leak Detection System	BHEL's Standard Microprocessor based BHELSONIC system is offered for boiler tube leak detection. This is a proven system with Airborne sensors made of SS 304. This system is suitable for detecting steam leakage in BHEL supplied boilers.	RRVUNL/TCE insisted the material shall be SS316. BHEL will explore the possibility to provide the same during detail engineering.



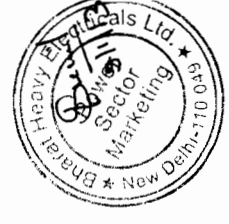
SG - CONTROLS AND INSTRUMENTATION

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	VO L. No.	SEC-TION No.	PAGE No.	CLAUSE No.			
6.	II	C12	14/15	12.6.12	BIDDER shall furnish a detailed Quality Assurance/Quality Control Plan (QA/ QC) for each Electrical, Instrument/system covered under this specification for PURCHASER/CONSULTANT'S review and approval. The QAP shall be subject to PURCHASER's approval	BHEL will submit quality plans for the following major electrical/ instrumentation equipment/system. 1. Flame scanner cable 2. SBMCC panel 3. Power and control cable 4. Pneumatic actuators For other systems by BHEL-Trichy, BHEL standard system will be followed	BHEL will submit the QAP for major that will be discussed during detailed engineering.
7.	V	D5.4	37	9	Quality Assurance: Bidder shall furnish a detailed quality assurance/quality control plan (QA/QC) for each instrument/system covered under this specification for Owner/Consultant review and approval.		
8.	V	Table-13	35	9.2.9	SSBC System FEGT measurement.	Furnace Exit Gas Temperature measurement through pyrometer is not envisaged as measurements are not reliable.	Not applicable as conventional SB system is envisaged. (Ref Mech Deviation : 1A-TP/ SI.no 2).
			38	9.3.7	FEGT shall be measured through pyrometer of either optical or acoustic type.		



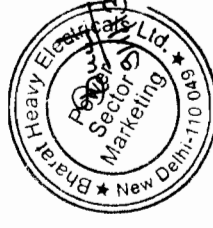
SG - CONTROLS AND INSTRUMENTATION

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VO L. No	SEC-TION No.	PAGE No.	CLAUSE No.			
9.	V	D 5.4	17	1.47.2	- Instrumentation cable: The conductor size shall be minimum 0.8 sq.mm - As per amendments (Sl.No.91)- Read Cl.no. 29.15 as "Instrumentation & Control (I&C) Cables shall have the following size: 0.8 sq.mm –Stranded FS/FRLS Instrumentation cable Vol. IV, section D16, clause 1.4, page 1, it is mentioned that "The instrumentation cables shall be Annealed, tinned stranded copper conductor, 0.5 sq mm".	Please note that, as per the std. IEC 60189 there is no cable of size 0.8sq.mm. Therefore BHEL shall offer its standard instrumentation cable of size 0.5sq.mm.	BHEL clarified that the conductor will be 0.8 mm dia with 0.5 sq.mm area.



SG and Auxiliaries - QUALITY

Sl. No.	Volume/Part	Section No.	Cl. No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	I	1	27	61 of 91	Quality Plan: For in-house fabrication, all welding procedure shall be submitted for Owner's approval within four weeks from the date of contract agreement.	BHEL established all welding procedures and are being followed for all the projects we handle. Hence, the welding procedures submission for approval by the owner is not envisaged, Owner may review the welding procedure during his inspection at shops. However, if a new procedure is to be established, the same shall be submitted for approval.	BHEL established all welding procedures and are being followed for all the projects we handle. Hence, the welding procedures submission for approval by the owner is not envisaged, Owner may review the welding procedure during his inspection at shops. However, if a new procedure is to be established, the same shall be submitted for approval.



SG and Auxiliaries - QUALITY

Sl. No.	Volume/Part	Section No.	Cl. No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
2.	1	1	27	61 of 91	Quality assurance documents: The contractor shall be required to submit the following quality assurance documents at least one week prior to dispatch of the equipment; i) All NDE procedures, SR and weld repair procedures actually used during fabrication. ii) Material mill test reports on components as specified by the technical specification. iii) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment. iv) All NDE result reports including radiography interpretation reports. v) SR, time-temperature charts. vi) Factory test results for testing required as per applicable codes and standards referred to in the specifications.	All the required documents will be submitted based on the mutually agreed quality plan.	Shall be provided after the award of contract.
3.	1	2	5.1.2	63 of 135	In the event the owner establishes that the contractor is not carrying out all such inspection and quality control aspects, the owner has the right to appoint at contractor's cost third party inspection agencies (such as Lloyd's Register of shipping/Bureau Veritas).	BHEL assures the inspection will be carried out as agreed in the quality plan. Please note that no third party inspection is allowed for pressure parts coming under IBR. However, customer can witness these items.	BHEL assures the inspection will be carried out as agreed in the quality plan. Please note that no third party inspection is allowed for pressure parts coming under IBR. However, customer can witness these items.



SG and Auxiliaries - QUALITY

Sl. No.	Volume/Part	Section No.	Cl. No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
4.	II	E4	4.2	4 of 7	Welding procedures and welders qualifications shall be approved by the consultant.	All welding procedures are well established and being followed for all the projects. Also welders are qualified as per IBR. Hence, no approval is envisaged for the welding procedures and the welders. However, customer may review the welding procedure and welder qualification during his visit of inspection.	All welding procedures are well established and being followed for all the projects. Also welders are qualified as per IBR. Hence, no approval is envisaged for the welding procedures and the welders. However, customer may review the welding procedure and welder qualification during his visit of inspection.
5.	II	TCE.M4-185-02A Separator	1.1	1 of 2	Bend test as per IBR and hot tensile test as per S7 of ASME SA20, check for IBR clearance	It is to clarify that separators are manufactured from pipes. Hence pipe requirements will be followed.	It is to clarify that separators are manufactured from pipes. Hence pipe requirements will be followed.
6.	II	TCE.M4-185-02A	Note	1 of 2	All the materials should be procured from well-known steel makers approved by IBR.	Only Pressure part materials will be procured from well-known steel makers approved by IBR.	Only Pressure part materials will be procured from well-known steel makers approved by IBR.
7.	II	TCE.M4-185-02A	2.6	1 of 2	Manhole cut out portion - Tensile test.	Tensile test on man hole cut outs is not envisaged since the drum plates are tested for simulated normalizing and stress relieving conditions as done for the finished dished ends. Since there is no drum, this test is not applicable.	Tensile test on man hole cut outs is not envisaged since the drum plates are tested for simulated normalizing and stress relieving conditions as done for the finished dished ends. Since there is no drum, this test is not applicable.



SG and Auxiliaries - QUALITY

Sl. No.	Volume/Part	Section No.	Cl. No.	Page No.	SPECIFICATION REQUIREMENT	COM-MENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
8.	II	D TCE.M4-185-05 Tubular elements	2 (b)	1 of 2	Macro etch test of fusion welded and fin welded panel before welding, before start of fabrication. -cat B.	Records of previous established process will be furnished for review. In case previous records are not available, macro etch fusion test will be carried out-cat C	Records of previous established process will be furnished for review. In case previous records are not available, macro etch fusion test will be carried out-cat C
9.	II	D TCE.M4-185-05	2 (F)	1 of 2	First off trail check for bending-cat B	Records of previous established process will be furnished for review. In case previous records are not available, new FOT will be carried.-cat C.	Records of previous established process will be furnished for review. In case previous records are not available, new FOT will be carried.-cat C.
10.	II	D TCE.M4-185-05	2 (H)	1 of 2	Hardness check of T91,T92 and T23 welds.-cat B	BHEL do not carry out hardness checks on the tubular welds. Hence not envisaged.	BHEL do not carry out hardness checks on the tubular welds. Hence not envisaged. One number test coupon can be tested for hardness.
11.	II	D TCE.M4-185-05	3(C)	2 of 2	Trial assembly of panels-10%-cat B	Trail assembly of 2 bend panels is envisaged-cat B.	Trail assembly of 2 bend panels is envisaged-cat B.
12.	II	D TCE.M4-185-15 structures	2(B) i	1 of 2	Macro etch test (auto welding)-one sample-Cat B.	Reports may be reviewed for the already qualified sample-cat C.	Reports may be reviewed for the already qualified sample-cat C.
13.	II	D TCE.M4-185-16	1(D)	1 of 2	Body and bonnet of cast carbon and stainless steel valves (600 rating and above), ferrite alloy steel valves(all ratings)-100% RT-Cat C.	Only 5% RT for body of all ratings and all materials since body is not a pressure containing part in SV & SRV-cat C	Only 5% RT for body of all ratings and all materials since body is not a pressure containing part in SV & SRV-cat C
14.	II	D TCE.M4-185-16	1(E)	1 of 2	Body and bonnet of forged steel valves (1500 rating and above)-100% UT-cat A	100% UT on bar dia.>=50mm	100% UT on bar dia.>=50mm.

SG and Auxiliaries - QUALITY

Sl. No.	Volume/Part	Section No.	Cl. No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
15.	II	D TCE.M4-185-16	1(F)	1 of 2	Body and bonnet of all valves-100% MT(PT for non-magnetic particles)-cat A	Hydro test of body & bonnet for all SV/SRV carried out. Hence no PT/MT is envisaged.	Hydro test of body & bonnet for all SV/SRV carried out. Hence no PT/MT is envisaged.
16.	II	D TCE.M4-185-16	2(B)	1 of 2	Hydro test for base assembly-cat B.	Hydro test for base assembly-cat C	Hydro test for base assembly-cat C
17.	II	D TCE.M4-185-17	1(a)	1 of 2	Composition for Gr 91.	Will be procured as per ASME SA217.	Will be procured as per ASME SA217.
18.	II	D TCE.M4-185-17	2(h)	2 of 2	Hardness for CSEF weld material (250 max.).	Maximum hardness for Gr91 is 303 HB.	Maximum hardness for Gr91 is 303 HB.
19.	II	D TCE.M4-185-28	B(a & c)	1 of 4	Welding procedure & welders qualification as per ASME sec IX/IBR, impact testing for CSEF steels -Cat A	All welding procedures are well established and welders are qualified under IBR. Hence cat C is envisaged. Impact testing on CSEF is not envisaged, however qualification is done based on ASME sec IX/IBR.	All welding procedures are well established and welders are qualified under IBR. Hence cat C is envisaged. Impact testing on CSEF is not envisaged, however qualification is done based on ASME sec IX/IBR.
20.	II	D TCE.M4-185-28	2(c)	2 of 4	Microstructure for CSEF steel-1 per heat-cat C	Microstructure for CSEF steel-1 per heat treatment batch-cat C.	Microstructure for CSEF steel-1 per heat treatment batch-cat C.
21.	II	D TCE.M4-185-28	2(f)	2 of 4	Dimension and hardness check for CSEF steels-100%-cat B.	Dimension check-5%-cat B. Hardness check-100%-cat C.	Dimension check-5%-cat B. Hardness check-100%-cat C.
22.	Not Used						



SG and Auxiliaries - QUALITY

Sl. No.	Volume/Part	Section No.	Cl. No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
23.	II	D TCE.M4-185-38	B (1) a	1 of 3	Welding procedure qualification as per ASME sec IX-cat B.	All welding procedures are qualified as per ASME sec IX. Hence may be reviewed at the time of inspection-cat C	All welding procedures are qualified as per ASME sec IX. Hence may be reviewed at the time of inspection-cat C
24.	II	D TCE.M4-185-38	B (1) b	1 of 3	Welders and welding operators performance qualification as per ASME sec IX-cat B.	All welders and welding operators are qualified as per IBR. Hence may be reviewed at the time of inspection-cat C	All welders and welding operators are qualified as per IBR. Hence may be reviewed at the time of inspection-cat C
25.	II	D TCE.M4-185-38	B (2) b	1 of 3	Bend area-(i) 10% MT & (ii) 10% thickness check-cat C.	For cold bends first off inspection records can be reviewed.-cat C. For hot bends-no MT or thickness check is envisaged.	For cold bends first off inspection records can be reviewed.-cat C. For hot bends-no MT or thickness check is envisaged.
26.	II	D TCE.M4-185-43	B (1)	1 of 3	Material test certificates review-for CSEF material microstructure, impact and hardness test shall be included-cat C.	All parameters except impact will be included in the TC-cat C.	All parameters except impact will be included in the TC-cat C.
	Painting						
27.	Not Used						
28.	Not Used						
29.	Not Used						
30.	Not Used						
31.	Not Used						
32.	Not Used						

Note : The deviations of this annexure are applicable for Chhabra 2 x 660 MW proposal also, except for a few minor changes in page no/Clause no.



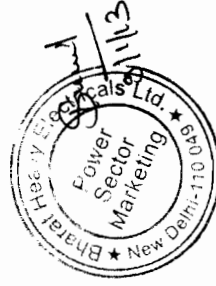
SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./Part	Sub Sec.	Clause No.			
1.	Volume IIIA	C1	12.2.9.11	16 OF 34	BHEL design is not of roof pierced with rapper rods. ESP equipments like TR sets and rapping motors located over ESP roof are designed for outdoor duty conditions and hence pent house is not required. So, pent house is not envisaged in our scope. Many installation supplied by us are working without pent-house. However, provision of Aluminium gutter and 100 cm high safety handrail will be provided.	BHEL design is not of roof pierced with rapper rods. ESP equipments like TR sets and rapping motors located over ESP roof are designed for outdoor duty conditions and hence pent house is not required. So, pent house is not envisaged in our scope. Many installation supplied by us are working without pent-house. However, provision of Aluminium gutter and 100 cm high safety handrail will be provided.
2.	Volume IIIA	C1	12.2.9.12	16 OF 34	In our design, each support insulator housing is provided with Separate thermostatically controlled tubular type electric heaters. The heater arrangement is simple and requires practically no maintenance and does not occupy additional space. Such system of heaters is working satisfactorily in more than 1500 ESP installations. Hence air blowers, filters, air purging provision for insulator compartment is not envisaged for support insulator housings.	In our design, each support insulator housing is provided with Separate thermostatically controlled tubular type electric heaters. The heater arrangement is simple and requires practically no maintenance and does not occupy additional space. Such system of heaters is working satisfactorily in more than 1500 ESP installations. Hence air blowers, filters, air purging provision for insulator compartment is not envisaged for support insulator housings.
	Volume IIIA	Datasheet A10	1.8.4	3 OF 3	Weather-proof enclosure for insulator compartment with heaters, air blowers, filters, controls, etc...	



SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Require-	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./Part	Sub Sec.	Clause No.				
3.	Volume IIIA	C1	12.2.9.14	16 OF 34	 Necessary rapping arrangement with controls shall be provided for perforated gas distribution plate at inlet and outlet from the ESP ...	Rapping arrangement with controls is provided for perforated gas distribution at inlet of ESP only. Rapping arrangement is not envisaged for gas distribution screen sheet at outlet of ESP, since clean flue gas free from dust is passing through at ESP outlet side.. All our ESPs supplied so far do not have any rapping system at the outlet gas distribution screen.	Rapping arrangement with controls is provided for perforated gas distribution at inlet of ESP only. Rapping arrangement is not envisaged for gas distribution screen sheet at outlet of ESP, since clean flue gas free from dust is passing through at ESP outlet side.. All our ESPs supplied so far do not have any rapping system at the outlet gas distribution screen.



SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./ Part	Sub Sec.	Clause No.	Page No.		
4.	Volume IIIA	C1	12.2.9.15	17 OF 34	Each field can be electrically isolated using disconnecting switch which is located in ESP roof with proper sequential safety lock arrangement. Such isolations are envisaged for inspection and repair of internals using the access doors provided in casing. However for complete replacement of internals the inner and outer roof is required to be cut and removed completely where in all suspension of EE and CE are to be disturbed. During such rare occasion of maintenance, the high voltage electrical suspension system is to be disturbed.	Each field can be electrically isolated using disconnecting switch which is located in ESP roof with proper sequential safety lock arrangement. Such isolations are envisaged for inspection and repair of internals using the access doors provided in casing. However for complete replacement of internals the inner and outer roof is required to be cut and removed completely where in all suspension of EE and CE are to be disturbed. During such rare occasion of maintenance, the high voltage electrical suspension system is to be disturbed.
5.	Not Used					
6.	Volume III A	Datasheet A10	1.8.7	3 OF 3	We are not providing exclusive walk way between fields or inside the ESP for maintenance access purpose. However, sufficient inter-field gap is provided for free movement of maintenance personnel using ladder on emitting frame and structures between fields to all parts of internals.	We are not providing exclusive walk way between fields or inside the ESP for maintenance access purpose. However, sufficient inter-field gap is provided for free movement of maintenance personnel using ladder on emitting frame and structures between fields to all parts of internals.
	Volume II	C1	1.1.6.0 (a)	7 OF 43	 interior access walkways,....	



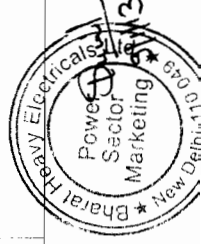
SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification				Specification Requirement	Require-ment	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)	
	Vol./Sec./ Part	Sub Sec.	Clause No.	Page No.					
7.	Volume III A	Datasheet A10	1.8.7	3 OF 3	... galvanised hand rails of 40 mm pipe...	... handrails of 40 mm GI pipe...	We are envisaging galvanized hand rail of 32 mm pipe, which is sufficient for safety purpose. Our design is standardized with 32 mm pipe and hence followed for this proposal.	We are envisaging galvanized hand rail of 32 mm pipe, which is sufficient for safety purpose. Our design is standardized with 32 mm pipe and hence followed for this proposal.	
8.	Not Used								
9.	Volume II	C15	15.8.3	4 OF 8	The following correction curves shall be furnished for ESP Correction factor Vs ESP inlet gas temperature Correction factor Vs ESP inlet gas flow Correction factor Vs ESP inlet and conc. Correction factor Vs Sulphur content in the coal Correction factor Vs Moisture content in the gas Correction factor Vs Alkali Oxide content in the ash.				As per our standard practice, we will furnish correction curves only for variation in inlet gas temperature, inlet gas flow and inlet dust concentration which are the major factors affecting ESP performance during contract stage. Will be finalised during detail engineering.



SG and Auxiliaries -Boiler auxiliaries

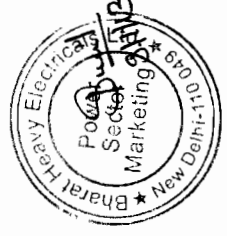
Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./ Part	Sub Sec.	Clause No.	Page No.		
10.	Volume IIIA	Data sheet A10	1.4.6	1 OF 3 (prebid reply)	As per the pre-bid clarification from Purchaser/Consultant, it is indicated that SCA shall be 280 m2/m3/s for 400mm electrode spacing and shall be greater than 300 m2/m3/s for 300 m2/m3/s for 300mm spacing with one field out of service condition at BMCR worst coal firing condition. Based on this we are submitting our technical offer meeting the SCA of 300 m2/m3/s @ 300mm spacing with (N-1) fields at BMCR-WC. However, it may be noted that when the SCA of 300 m2/m3/s @ 300mm spacing is converted to 400mm pitch, it would be equivalent to 225 m2/m3/s @ 400 mm spacing (i.e. $300 \times 300 / 400 = 225$) with same performance. Further, the 400mm pitch design is the contemporary design and will have following advantages over 300mm pitch design: - Better and Stable Electrical conditions - Better alignment tolerance for internals - More space & easy maintenance for internals - Lesser Number of Electrodes and associated components - Reduction in ESP weight Hence we can offer 400mm pitch design with minimum SCA of 225 m2/m3/s instead of SCA of 300 m2/m3/s with 300mm pitch if customer desires.	As per the pre-bid clarification from Purchaser/Consultant, it is indicated that SCA shall be 280 m2/m3/s for 400mm electrode spacing and shall be greater than 300 m2/m3/s for 300mm spacing with one field out of service condition at BMCR worst coal firing condition. Based on this we are submitting our technical offer meeting the SCA of 300 m2/m3/s @ 300mm spacing with (N-1) fields at BMCR-WC. However, it may be noted that when the SCA of 300 m2/m3/s @ 300mm spacing is converted to 400mm pitch, it would be equivalent to 225 m2/m3/s @ 400 mm spacing (i.e. $300 \times 300 / 400 = 225$) with same performance. Further, the 400mm pitch design is the contemporary design and will have following advantages over 300mm pitch design: - Better and Stable Electrical conditions - Better alignment tolerance for internals - More space & easy maintenance for internals - Lesser Number of Electrodes and associated components - Reduction in ESP weight Hence we can offer 400mm pitch design with minimum SCA of 225 m2/m3/s instead of SCA of 300 m2/m3/s with 300mm pitch if customer desires.



Annexure-1A-TP

SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./ Part	Sub Sec.	Clause No.	Page No.		
11.	Volume IIIA	C1	17 OF 34	12.2.11.2	The ESP hoppers are designed for a valley angle of 60°. This is as per our standard design practice and also in line with CEA guidelines for Thermal Power Plants. The corresponding plate angle works out to be 66.5° and 69.8°.	The ESP hoppers are designed for a valley angle of 60°. This is as per our standard design practice and also in line with CEA guidelines for Thermal Power Plants. The corresponding plate angle works out to be 66.5° and 69.8°.
12.	Volume IIIA	C1	12.2.12.1.2	Sheet 18 of 34	Since the ESP rectifier Transformers (TR set) are controlled with microprocessor based controller, the ESP Rectifier Transformer does not require primary taps. Hence primary taps are not provided. This is in line with our TR sets designed and supplied for all ESP contracts including those contracts for which TCE is also the consultant and they are all working satisfactorily.	Since the ESP rectifier Transformers (TR set) are controlled with microprocessor based controller, the ESP Rectifier Transformer does not require primary taps. Hence primary taps are not provided. This is in line with our TR sets designed and supplied for all ESP contracts including those contracts for which TCE is also the consultant and they are all working satisfactorily.



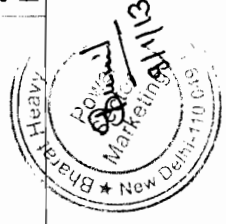
SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./ Part	Sub Sec.	Clause No.	Page No.		
20.	Vol-II	Section - C1	1.1.4.4	6 of 43	Permanent fire fighting system and fire sensing equipment at both cold & hot ends and in both air and flue gas sides along with necessary piping..... Provision for fire safety...	Two numbers deluge pipes located one at gas inlet and another at gas outlet are more than adequate to quench the APH in the event of a fire. Also, provision of additional deluge pipe on airside will result in deluge water carry over through air ducts and flooding of PA and FD fan impellers, which is not desirable. Hence, deluge pipes on airside are redundant and not recommended.
21.	Not Used			9 of 34		
22.	Vol-III A	Datasheet A19	1.6	1 of 1	Based on our experience, Carbon Steel Tubes with Aluminium Fins are more effective. In fact, we have replaced a Cu Ni SCAPH with Carbon steel SCAPH for Trombay # 5 Contract. Hence we envisage Carbon Steel Tubes with Aluminium fins.	Based on our experience, Carbon Steel Tubes with Aluminium Fins are more effective. In fact, we have replaced a Cu Ni SCAPH with Carbon steel SCAPH for Trombay # 5 Contract. Hence we envisage Carbon Steel Tubes with Aluminium fins.



SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Require-ment	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./ Part	Sub Sec.	Clause No.				
23.	Vol-III A	Datasheet A2	1.5.3	1 of 1	Rotor and intermediate elements: Corrosion resistant low alloy steel.	As per the coal analysis provided in the tender, the corrosion potential is minimum. Hence, Carbon steel is sufficient for Rotor & Intermediate elements in-line with our supply to all coal fired boilers. Cold end elements will be of Corten steel.	As per the coal analysis provided in the tender, the corrosion potential is minimum. Hence, Carbon steel is sufficient for Rotor & Intermediate elements in-line with our supply to all coal fired boilers. Cold end elements will be of Corten steel.
24.	Vol-III A	Datasheet A2	1.4.2	1 of 1	Hand operated barring device -Yes	In Vol. II, Section-C1, sheet 6 of 43, Clause 1.1.4.4, Tender document calls for replacement of hand operation by an extra motor operation (in total two motor drives and one air drive systems). Hence hand barring device is not applicable.	In Vol. II, Section-C1, sheet 6 of 43, Clause 1.1.4.4, Tender document calls for replacement of hand operation by an extra motor operation (in total two motor drives and one air drive systems). Hence hand barring device is not applicable.
25.	Vol-III A	Section - C1	12.2.8.11.a	10 of 34	The rotor shall be over-speed tested to atleast 10% above the maximum operating speed	Over-speed test cannot be done.	Shall be discussed during detailed engineering
26.	Vol-III A	Section - C1	12.2.8.11.g	10 of 34	Each fan bearing shall be provided with oil level indicator/Flow sight glass...	Bearings of axial reaction type FD, ID and PA fans are inside the fans. Hence, oil level indicators cannot be provided for fan bearings. However, Flow sight glasses are provided in the return oil lines.	Bearings of axial reaction type FD, ID and PA fans are inside the fans. Hence, oil level indicators cannot be provided for fan bearings. However, Flow sight glasses are provided in the return oil lines.



SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./Part	Sub Sec.	Clause No.			
27.	Vol-III A	Section - C1	12.2.8.11 (j)	11 of 34 The shaft material shall be of 15MO3 or better.	FD, ID and PA fan shaft material shall be 42Cr Mo4.	FD, ID and PA fan shaft material shall be 42Cr Mo4.
28.	Vol-III A	Data Sheet A4 (Axial Fans)	1.8.3	Sh 1 of 2 Materials Of Construction Shaft : SAE 1045 or equivalent forged normalized and tempered steel	FD, ID and PA fan shaft material shall be 42 Cr Mo4 .	FD, ID and PA fan shaft material shall be 42 Cr Mo4 .
29.	Not Used					
30.	Vol-IV A	--	1.1 (Sl. no of 48 Amendments on Tender Specifications)	VFD shall be provided for Seal air fans.	VFD is not required for seal air fan operation. Hence, the same is not considered.	VFD is not required for seal air fan operation. Hence, the same is not considered.
31.	Not Used					
32.	Vol-III A	Section-C1	12.2.8.24	SHEET 14 OF 34 The dampers shall have guaranteed gas tightness efficiency (on flow) of not less than 99.98%.	Dampers shall have guaranteed gas tightness efficiency (on flow) of 100% (With Seal Air) for Hot Air/ Flue Gas applications.	Dampers shall have guaranteed gas tightness efficiency (on flow) of 100% (With Seal Air) for Hot Air/ Flue Gas applications.
33.	Vol-III A	--	1.6.1	DATA-SHEET A11 - DAM-PERS SHEET 1 OF 2 Isolation damper ... Zero leakage guillotine type/multi-louver type (with guaranteed gas tightness efficiency of 100%)		



SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./Part	Sub Sec.	Clause No.			
34.	Vol-I	Section 1 Contract Quality Assurance	27	Pg 59 of 91 Bidders shall include in his proposal the Quality assurance programme containing the over all Quality management and procedures that he possesses to follow in the performance of the works during various phases as detailed in relevant clause of the technical specification volume-II.	BAP is an ISO 9001-2008 certified Company. Our Quality Manual contains all these requirements and the Quality Management System (QMS) are well established since 1993, continuously measured, monitored and the results are analysed in periodic Management reviews.	BAP is an ISO 9001-2008 certified Company. Our Quality Manual contains all these requirements and the Quality Management System (QMS) are well established since 1993, continuously measured, monitored and the results are analysed in periodic Management reviews.
					Our Quality Manual defines about this and this will be submitted to you during contract execution stage.	Our Quality Manual defines about this and this will be submitted to you during contract execution stage.
					Our products are proven over 30 years. We have "Standard & Reference Quality Plans" for all the Electrical and Mechanical sub-deliveries. These QPs will be submitted for your approval.	Our products are proven over 30 years. We have "Standard & Reference Quality Plans" for all the Electrical and Mechanical sub-deliveries. These QPs will be submitted for your approval.



Annexure-1A-TP

SG and Auxiliaries -Boiler auxiliaries

Sl. No	Enquiry Specification			Specification Requirement	Comments / Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol./Sec./Part	Sub Sec.	Clause No.			
35.				This section defines the technical requirements for surface preparation selection and application of paints on equipment, vessels, machinery, piping, ducts, etc. However, manufacturers shall follow their standard procedures for painting and equipment. The bidder shall submit a detailed painting procedure for approval of OWNER/ OWNERS representative after the award of Contract.	Please refer Annexure-I	Prior approval from owner shall be obtained. BHEL Confirmed

Note : The deviations of this annexure are applicable for Chhabra 2 x 660 MW proposal also, except for a few minor changes in page no./Clause no.

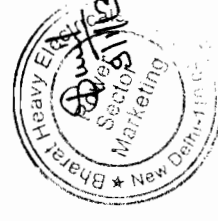


SG and Auxiliaries -Boiler auxiliaries

ANNEXURE IPAINT SYSTEMS FOLLOWED BY BAP

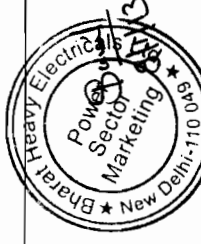
BAP has evolved some logics for use of paints on various components, based on our experience over the years. This is being followed strictly in all cases. We are going to the extent of explaining the logics to customers and get our proposals accepted in almost all cases. The paint systems designed are carefully done in order to minimize cost, cycle time and wastage without compromising quality. Following table gives our paint systems for various environments and components with varying working conditions like exposure to atmosphere, insulation, service temperature etc.

Sl. No	Substrate Details	Environment	Paint system	Remarks	Resolution
01	Un-insulated components working temp. up to 95°C Structures, supports, gratings, floor grills, hand rails, posts, ladders, etc	Normal Industrial Atmosphere	a. Power tool cleaning b. One coat of Red-oxide Zn PO4 to IS 12744 (30µm) c. Two Coats of synthetic Enamel IS 2932 (2x20µ) Smoke Grey shade d. Total DFT = 70 µ m.	Permanently exposed to atmosphere & sun light – Needs Protection against Ultra Violet rays & provide aesthetic value. Hence finish paint is required.	Prior approval from owner shall be obtained. BHEL Confirmed
02	Components insulated and those coming in the gas path.	All Atmospheres	a) Power tool cleaning b) 2 coat of Red-oxide Zn PO4 to IS 12744(60µm) or Red oxide zinc chromate to IS 2074(60µm).	Needs only temporary protection till erection. No need for finish paint. One coat of primer paint fails in holiday test (pin-holes present). Hence, 2 coats of primer required.	Prior approval from owner shall be obtained. BHEL Confirmed



SG and Auxiliaries - PIPING

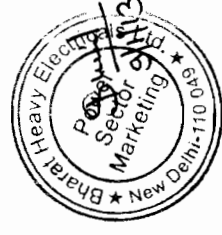
SL. NO.	TENDER VOL.	SEC/PAGE/ CL.NO.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1	VOL-III A	C1/Page 4 of 34 / 12.2.4.0	Atmospheric flash tank – The flashed steam shall be led to the atmosphere through a silencer above the boiler roof and the remaining condensate shall be led into a condensate collection tank. The condensate from the condensate collection tank shall then be transferred to the condenser by the provision of 2X100% condensate transfer pumps for minimizing the make-up water requirement.	The vent is adequately sized to ensure that the noise level is less than 85 dBA. Hence there is no requirement of silencer 2 x 50% condensate transfer pumps are envisaged instead of 2 x 100%. The pumps are designed for the worst operating scenario including the start up without BCW pump in operation and entire flow diverted to condenser.	The vent is adequately sized to ensure that the noise level is less than 85 dBA. Hence there is no requirement of silencer Shall be as per specification or alternatively bidder can offer 3 X 50% pumps
2	VOL-III A	C3/Page 1 of 15 / 3.1.1	Line sizing for Steam Super heated steam – 75m/s.	To limit the sizes of HP Bypass and LP Bypass D/s lines which are not under regular operation, the design velocity shall be greater than 76 m/s and less than 100 m/s in line with accepted practice.	To limit the sizes of HP Bypass and LP Bypass D/s lines which are not under regular operation, the design velocity shall be greater than 76 m/s and less than 100 m/s in line with accepted practice.
3	VOL-III A	C3/Page 8 of 15 / 3.7.1	All pipes shall be hydro-tested at shops for pressures as per standards and all erected piping shall be tested 1.5 times the design pressure.	Hydro-testing of pipes is not envisaged at shop and shall be carried out after erection of the piping system in line with reg 343(3) of IBR which permits NDE techniques at shop instead of hydro-test.	Hydro-testing of pipes is not envisaged at shop and shall be carried out after erection of the piping system in line with reg 343(3) of IBR which permits NDE techniques at shop instead of hydro-test.
4	Vol-III A	Data sheet A16, /Page 3 of 12 / Cl 1.8 Piping Materials	DM Water Nb 65 and above – Material shall be CS with rubber lining	Stainless steel SA312TP304L(ERW) pipes shall be offered instead of Rubber lined CS pipes for DM Water system.	Stainless steel SA312TP304L(ERW) pipes shall be offered instead of Rubber lined CS pipes for DM Water system.



SG and Auxiliaries - PIPING

SL. NO.	TENDER VOL.	SEC/PAGE/CL.NO.	SPECIFICATION REQUIREMENT	COMMENTS/CLARIFICATIONS	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
5	Vol-III A	Data sheet A16, Page 6 of 12/ Cl 1.10 Piping Materials	River Water – Nb 50 mm and below ASTM A312TP304(ERW)	In line with the amendment issued for large diameter sizes for the same application eliminating rubber lining, pipes Nb 50 and below shall be of IS 1239 (black).	In line with the amendment issued for large diameter sizes for the same application eliminating rubber lining, pipes Nb 50 and below shall be of IS 1239 (black).
6	Vol-III A	Data sheet A16 / Page 6 of 12/, Cl 1.9, 1.10, 1.11 Piping Materials	1.9 – Aux Cooling water - Fitting materials for sizes Nb 150 and below – ASTM A105 / A234WPB 1.10 – River water - Fitting material for sizes Nb 150 and below – ASTM A105 /A234WPB 1.11 - Potable water/ Instrument Air – Fitting material for sizes Nb 150 and below – ASTM A105 (Gal)/ A234WPB (Gal).	The fitting material for systems where the pipe material is IS1239 (black)/ IS1239 (gal) for sizes less than or equal to Nb150 shall also be of IS1239 (black)/IS1239 (gal) material instead of A105/A234WPB.	The fitting material for systems where the pipe material is IS1239 (black)/ IS1239 (gal) for sizes less than or equal to Nb150 shall also be of IS1239 (black)/IS1239 (gal) material instead of A105/A234WPB.
7	Vol-V	Table 10 / Sheet 3 of 9/Material and Rating for impulse pipes	Impulse pipe material for Main Steam and Hot Reheat - SA335P92	The material for impulse pipes and fittings for Main Steam and Hot Reheat shall be SA335P91 since the main pipe is also of P91 material for the above systems.	The material for impulse pipes and fittings for Main Steam and Hot Reheat shall be SA335P91 since the main pipe is also of P91 material for the above systems.

Note : The deviations of this annexure are applicable for Chhabra 2 x 660 MW proposal also, except for a few minor changes in page no/Clause no.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement) Controls and Instrumentation	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	IIIA	/ C2	6 of 81	2.7.5	Provision shall be made for tripping of the turbine from the unit control room and for local manual trip from the steam turbine front pedestal.	Hand trip is provided in Hydraulic Power Supply Unit (HPSU) of the governing system as a local manual trip.	Hand trip is provided in Hydraulic Power Supply Unit (HPSU) of the governing system as a local manual trip.
2.	IIIA	/ C2	9 of 81	/2.11.2	Each bearing oil drain lines shall have thermowells for inserting a thermocouple as well as a thermometer. And RTDs for remote sensing shall be provided.	RTDs will be provided in bearing drain lines. In view of the same, Thermocouples are not provided.	RTDs will be provided in bearing drain lines. In view of the same, Thermocouples are not provided.
3.	IIIA	/ C2	9 of 81	/ 2.11.2	Atleast two probes at 45 degrees apart for vibration measurements and also as input to the package.....(PADO).	Both the probes will either be in X or Y direction. This will be hooked up to TSI system.	BHEL clarified that the same is Siemens design specific.
4.	IIIA	/ C2	10 of 81	/ 2.12B/2	A pressure switch shall be provided on the main bearing oil header to provide the necessary interlock for preventing the starting of turning gear.	The specified functionality is available in the proposed system however the exact type of instrumentation ie PS or PT shall be as per the standard practice of	The specified functionality is available in the proposed system however the exact type of instrumentation ie PS or PT shall be as per the standard practice of

Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					until adequate oil pressure has been established.	BHEL/Siemens.	BHEL/Siemens.
5.	IIIA	/ C2	12 of 81	/ 2.14.4	The contactors shall be arranged for de-energised to start.	The contactors shall be energized to start.	The contactors shall be energized to start.
6.	IIIA	/ C2	13 of 81	/ 2.14.20	It shall be provided with removable type stainless steel strainers and two oil level indicators. Level transmitters(2 nos) and level switches to be connected to the supervisory control panel annunciation system	One oil level indicator is provided. The level transmitters provided for high and low level measurements are connected to the DCS and alarms are available in the HMI. No separate annunciation panel is required.	One oil level indicator is provided. The level transmitters provided for high and low level measurements are connected to the DCS and alarms are available in the HMI. No separate annunciation panel is required.
7.	IIIA	/ C2	21 of 81	/ 2.16.2	The governor shall be configured in dual redundant hot standby system architecture to ensure continuity and safety to failure for all single defects and for a very high proportion of multiple defects.	Siemens will provide one digital control system for protection and control, which complies with the IEC61508 and meets international approved standards. The system is redundantly designed with self monitoring features and failsafe capability in case of power loss and equipped with CPUs in hot standby.	Siemens will provide one digital control system for protection and control, which complies with the IEC61508 and meets international approved standards. The system is redundantly designed with self monitoring features and failsafe capability in case of power loss and equipped with CPUs in hot standby. All protection relevant



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						All protection relevant measurements will be continuously monitored.	measurements will be continuously monitored.
8.	IIIA	/ C2	22 of 81	/ 2.16.9	Emergency Overspeed Trip The steam turbine shall be equipped with independent safety devices in the form of duplicate emergency governor(s). These shall be mounted on the steam turbine shaft and shall be arranged to actuate a tripping device ...	As per Siemens standard practice, these functional requirements are implemented as protection functions in the digital control system. Dedicated separate hydro mechanical devices are not envisaged.	As per Siemens standard practice, these functional requirements are implemented as protection functions in the digital control system. Dedicated separate hydro mechanical devices are not envisaged.
9.	IIIA	/ C2	23 of 81	/2.16.10	In addition to the above, as a third safety element to protect the turbogenerator in the event of failure of over speed limiter or turbine stop valve close a trip shall be provided in the form of trip signal generated from the speed measuring element of the governing system to close	No separate signal for closing of boiler stop valve as mentioned in the specification is provided.	No separate signal for closing of boiler stop valve as mentioned in the specification is provided.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					the motorized boiler stop valve.		
10.	IIIA	/ C2	23 of 81	/ 2.16. 11	<u>Load Limiter & Speed Changer</u> The Turbine shall be provided with electronic type speed changer to control its speed or power output within limits remotely from the turbine generator supervisory panel.	A separate supervisory panel is not available. The operation and monitoring system of the ST will be from 2 computer stations in the main control room	A separate supervisory panel is not available. The operation and monitoring system of the ST will be from 2 computer stations in the main control room
11.	IIIA	/ C2	23 of 81	/ 2.17.2	The turbine tripping system shall be triplex system operation on the basis of two out of three majority voting. All critical trip functions shall have separate triplicated initiating contacts where applicable and logic processing shall be carried out by three independent channels of electronic logic circuits..	The automation system provides redundancy in 1of 2 design in hot standby mode, protection measurements will be acquired in 2 out of 3 logic (exceptions: vibration signals and external binary trip signals - dual redundant).	The automation system provides redundancy in 1of 2 design in hot standby mode, protection measurements will be acquired in 2 out of 3 logic (exceptions: vibration signals and external binary trip signals - dual redundant).



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
12.	IIIA	/ C2	23 of 80	/ 2.17.3	Essentially the protection system shall include but not limited to the following:- (c) Manual trip lever on turbine front pedestal or trip mechanism realized electronically with minimum 2 out of 3 redundancy. (i) Relative vibration high trip (j) Main steam temperature high trip (with triple sensors) (q) Power failure for turbine control and protection system (triple signals) (r) Turbine shaft vibration protection (RJB& DJB vibration of HP, IP & LP turbines) (s) Top & bottom casing differential temperature protection or measurement sensors for	(c) PB will be provided locally and in the CER. However Local PB will be provided on the HPSU of control fluid system. (i) For bearing vibration trip absolute measurement is considered. (j) Main steam temp high is not envisaged. Monitoring is provided as per collaborator's standard practice to take care of machine safety and thermal stressing. (q) As the turbine protection is of failsafe design and de-energize to trip, thereby power failure leads to turbine trip. (r) Tripping is not provided for relative shaft vibration however monitoring is provided.	BHEL clarified that the same is Siemens design specific.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					alarm. (u) Top & bottom turbine casing differential expansion protection	s) Trip is not provided on top and bottom casing differential temp. Only monitoring is provided as per collaborators standard design practice.	
					w) DCS trip, rotor stress evaluator (RSE) trip or residual stress alarm.	u) Thermal expansion is considered during all static and transient operations in the design stage. Furthermore differential expansion is limited by monitoring various temperature measurements (turbine stress evaluator). Direct expansion measurements are not necessary for Siemens steam turbines, hence will not be provided.	
					(x) DEHC-RSE hardware serious malfunctioning. (z) Any other trips recommended by manufacturer (which shall be triple sensors).		

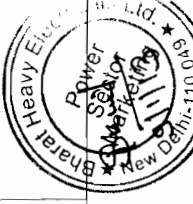


Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						(w) The term DCS trip is not clear. On DCS failure, turbine is tripped. Rotor stress evaluator is not used for protection, but for operator guidance. (x) The hardware used is of failsafe design. The term serious malfunctioning is not clear. No such condition exists for Siemens system. z) All important, protection relevant measurements will be triplicated (exception: absolute bearing casing vibration, external binary trip signals - dual redundant).	
13.	IIIA	/ C2	26 of 81	/ 2.17.4/(c) - (ii)	Provision shall be made for on-load testing with signalising of the individual non-return valve. Group testing will not be accepted.	Automatic turbine valve testing sequence is an implemented function of the ST I&C operator initiated from operating terminal. Turbine control, stop valves, Cold reheat non return valve and HP drain non return valve are	Automatic turbine valve testing sequence is an implemented function of the ST I&C operator initiated from operating terminal. Turbine control, stop valves, Cold reheat non return valve and HP drain non return valve are

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
14.	IIIA	/ C2	27 of 81	/ 2.18.1	Steam supervisory equipment (b) Shaft eccentricity (c) Differential expansion (e) Overall expansion (k) Load limiter position (l) Speed changer position (m) Inlet steam temperatures and pressures (n) Metal temperature (o) Cylinder/flange metal temperatures, top and bottom casing temperature including	drain non return valve are included in the test sequence. (b)At low speeds, shaft vibration is an indication of eccentricity. Separate eccentricity probe is therefore not provided. (c) Direct expansion measurements are not necessary for Siemens steam turbines, hence not envisaged. (e) Thermal expansion is considered during all static and transient operations in the design stage. Furthermore differential expansion is limited by monitoring various temperature measurements (turbine stress evaluator). (k)Load limiter is realized electronically and therefore position measurement not required.	included in the test sequence. BHEL clarified that expansion measurement at HP front end and LP rear end shall be provided in addition to the measurements already indicated which is as per the Siemens design standard. BHEL clarified that raw buffered output for vibration analysis will be provided.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					differentials. (p) Bearing metal temperatures (q) Body metal temperature of main and reheat steam stop and control valves. (s) Turbine stress evaluator capable of maintaining the thermal stress within allowable limits and suitable integrated in to plant DCS. (r) Oil drain temperature stress evaluator capable of maintaining the thermal stress within allowable limits and suitable integrated in to plant DCS.	(l) Speed changer is realized electronically and therefore position measurement not required. (m) Inlet steam temperatures and pressures is not part of TSI however measurements are provided in the DCS. (n) Metal temperature is not part of TSI however measurements of bearing temperature, turbine valves and other components are provided in the DCS. (o) Cylinder/flange metal temp, top & bottom casing including differentials is not part of TSI however measurements are provided in the DCS. (p) Bearing metal temperature is not part of TSI however measurements are provided in the DCS. (q) Thermocouples are provided in HP ESV/CV	



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						and IP ESV as per Siemens standard practice but is not part of TSI. (r) Connectivity to TSI not provided, however measurements are provided. For drain oil measurements local indicators provided. (s) Turbine stress evaluator capable of maintaining the thermal stresses within allowable limits and suitably integrated into turbine control system.	
15.	IIIA	/ C2	28 of 81	/2.18.5	Suitable twin element thermocouples for measurement of temperature of steam in High pressure Casing (HPC) after Curtis wheel, HPC exhaust bowl, intermediate pressure casing (IPC) , inlet bowl, etc., shall be provided. Twin element thermocouples shall also	Measurement of steam in High pressure casing after Curtis wheel and IP casing is not required for the offered design of machines. Steam measurement at inlet bowl is not applicable for the offered design. Metal temperature measurement of IPT steam admission pipes are not applicable since the valves are	

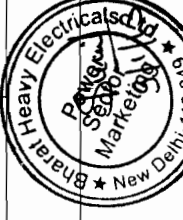


Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					be provided for the measurement of metal temperature of ESV bodies, interceptor valve bodies, <i>IPT steam admission pipes</i> , HPC (upper and lower), IPC (upper and lower), metal of bearings of turbine etc. <i>Two resistance thermometers</i> each for measurement of temperature of steam in <i>LPC exhaust</i> and of the <i>temperature of drain oil</i> from the bearings of turbine, generator etc. shall be provided.	applicable since the valves are casing mounted. Two RTDs each for steam temperature in LPC exhaust. Metal temperature is measured at LP exhaust using thermocouples. And of the temperature of drain oil Local gauges provided.	casing mounted. Two RTDs each for steam temperature in LPC exhaust. Metal temperature is measured at LP exhaust using thermocouples. And of the temperature of drain oil Local gauges provided.
16.	IIIA V	/ C2 /D5.3	29 of 81 1 of 55	/ 2.19.3 / 1.1	The TG set shall be equipped with ATRS to enable the turbine to run automatically from zero speed to synchronizing speed and The offered I&C system shall be based on State of the art "START TO	Zero Speed to synchronizing speed or "Start to Synchronize" group level control with a single push button START is not practical since a large number of drives are involved. However, this can be achieved with several sub group level commands	Single Push Button Start / Automatic plant startup is not called for. As per Vol.V, D5.3, 1.1, "START to SYNCHRONIZE" in automatic sequence with selective manual interventions.

Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					SYNCHRONIZE" in automatic sequence with selective minimum manual interventions.	which are largely automated. Single Push Button Start / Automatic plant startup and shutdown sequence (APS) is not envisaged. TG start up is automated through ATRS using multiple subgroups.	
17.	IIIA	/ C2	29 of 81	/ 2.20	Automatic Turbine Testing System(ATTs) An automatic sequence for testing safety devices shall be provided. The testing shall not cause any unintentional shutdown and shall provide full protection to turbine during testing. It shall cover the following safety devices. (a) Trip solenoid valves (b) Overspeed trip. (c) Loss of vacuum trip (d) Thrust bearing failure trip (from software) (e) Low lube oil pressure trip	The protection system itself is redundantly designed with self monitoring features and failsafe design in case of power loss. All protection relevant measurements will be continuously monitored. Dedicated online testing sequences are:- overspeed test with test signal generator automatically initiated in regular intervals- turbine valves/trip system test (with full stroke valve testing) operator initiated every 4 weeks	BHEL clarified that the same is Siemens design specific.

Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					A local gauge board housing the indicating instruments.....	A test of overspeed trip, loss of vacuum, thrust bearing failure, low lube oil pressure is not foreseen. TG set is remotely operated. Local gauge board is not applicable.	
18.	IVA	/D2	2 of 15	/ 3.2	Local control panel to be provided with all necessary switches, lamps, indicators, power supplies etc along with the instruments, necessary outputs to DCS.	The generator hydrogen system interface directly with TG/C&I system which allows remote monitoring and control of the generator auxiliary systems. All other indicators provided on MMI-CRT	Bidder clarified that local control panel has not been envisaged as per Siemens standard practice
19.	IVA	/D2	4 of 15	/ 4.7.1	Local control panel to be provided with all necessary switches, lamps, indicators, power supplies etc along with the instruments, necessary outputs to DCS. Starting and stopping control of the pumps for testing purpose shall be provided on from MCC.	The generator seal oil system interface directly with TG/C&I system which allows remote monitoring and control of the generator auxiliary systems. A separate local generator auxiliary control cabinet is not provided.	Bidder clarified that local control panel has not been envisaged as per Siemens standard practice.
						Starting and stopping control of the DC Seal Oil	Starting and stopping control of the DC Seal Oil pump for

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
20.	IVB	/D15	2 of 4	/4	Local pushbutton stations shall be provided for all the drive motors of the plant(415V motors...)(Start/Stop pushbuttons for unidirectional motors, forward/reverse/stop push buttons for bi-directional motors & only start push button for emergency motor) as per scheme requirements	pump for testing purpose shall be provided on from the DC SOP Starter panel. TG auxiliary systems interface directly with the TG C&I system which allows remote monitoring and control. Local operation is not envisaged.	testing purpose shall be provided on from the DC SOP Starter panel. Bidder clarified that local control panel has not been envisaged as per Siemens standard practice.
21.	IVB	/D16	1 of 9	/1.0 to 12.0	<u>CABLES & CABLE CARRIER SYSTEM</u>	Power cables and control cables will be as per BHEL's/ Siemen's standard practice for TG integral system. The supply will be inline with cables as supplied in other RRVUNL projects of 250/500 MW and as supplied for other supercritical sets.	Bidder clarified that the instrumentation cable colour coding shall be as per Siemens standards.
22.	Not Used						



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
23.	V	/D5.1	3 of 5	/ 2.1.6/(a)	Emergency stop push button -.....for STG.....	TG auxiliary systems interface directly with the TG C&I system which allows remote monitoring and control. Local operation is not envisaged.	BHEL clarified that the same is Siemens design specific due to safety of the TG and hence local stop PB can not be provided.
24.	V	/D5.1	4 of 5	/ 3.3(a)	Turbine integral controls shall be.....interfaced with plant DCS through redundant bi-directional OPC link with Ethernet based TCP/I-P protocol. However for time critical signals hardwired interfacing shall be provided.	TG C&I connectivity to a third party system will be given via OPC for monitoring. From BOP or third party system to main TG C & I connectivity will be through hardwired system. Two OPC links will be provided. However, these will not be redundant.	BHEL clarified that the same is Siemens design specific.
	V	/D5.2	6 of 17	3.3 (b)	 This system shall be interfaced with plant DCS through redundant bi-directional OPC link with Ethernet based TCP/I-P protocol. However for time critical signals hardwired interfacing shall be provided.		
	V	/D5.2		/2.3.7.1 (b)	DCS SYSTEM INTERFACING		



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					REQUIREMENT One(1) no. independent redundant bi-directional OPC link with Ethernet based TCP/IP protocol for Steam Turbine Control/Protection System per unit.		
25.	V	/D5.1	5 of 5	/ 3.3/(b)	Turbine protection system shall be implemented in microprocessor based DCS with SIL 3 certification as per relevant IEC standard. Fail-safe and fault tolerant type STG protection system conforming to SIL 3 as per IEC 61511 standard with certification from an authorized agency shall be provided. STG protection system shall be complete with all hardware, software and interfaces and shall be independent for each unit. The SIL-3 STG protection system shall be interfaced	For ST the failsafe system is according SIL 1 or SIL 2 or SIL 3, depending on hazard evaluation. Steam turbine division has introduced a Functional Safety Management (FSM) according to IEC61508/61511. On the basis of this FSM a confirmation will be given that requirements of the IEC standards are fulfilled for each safety integrated system (SIS). Certification of the various SIS by a recognized European certifying body (e.g. TÜV) is not intended.	RRVUNL/TCE asked BHEL to provide the different protections grouped under SIL1, SIL2 or SIL3 criteria. BHEL clarified as: Overspeed Trip is SIL 3 Condenser protection is SIL 2 and other protections maybe SIL0/1/2 according to the Siemens risk Evaluation.
	V	/D5.2	1 of 17	/ 1.3/(b)			
	V	/D5.3	45 of 55	/ 24.1.4			



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					to DCS through communication link. System shall be(type) certified for SIL 3 level compliance by an authorized agency.		
26.	V/D5 .2 V/D5 .3		2 of 17 45 of 55 46 of 55	/ 1.5 / 24.2.2 / 26	Sequence of Event Recording System integral to DCS. System shall have integrated sequence of event recording and alarming facility with... Sequence of Event Recording(SER)	SOE signals related to TG integral system shall be hardwired to DCS SOE system	SOE signals related to TG integral system shall be hardwired to DCS SOE system
27.	V	/D5.2	2 of 17	/ 1.13	This panel include hardware for limited back up manual safe shutdown operation.	Hard-wired console push buttons are not supported by Siemens Automation System. Safe shutdown is ensured through automation system.	BHEL confirmed that Turbine trip PB will be provided in control room and TG hall.
28.	V	/D5.2	2 of 17	/ 1.14	Standalone hardwired annunciation system mounted in the UCP.	Hardwired Annunciation system is not supported by Siemens Automation system and accordingly not included in TG system.	BHEL clarified that for Siemens STG, the hardwired signals are not applicable.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
29.	V	/D5.2	2 of 17 12 of 17	/ 1.17 /19	Smart Maintenance Transmitter facility. Smart transmitter facility common for both the units.	No maintenance facility is considered for Siemens C & I system due to safety reasons.	If OEM has reservations on connecting their transmitters to centralised STMS considering the safety of the equipment, then these transmitters need not be connected to STMS. However, the transmitter shall be SMART with HART protocol for which 2 nos. hand held calibrator shall be provided for calibration of these transmitters at field.
30.	V	/D5.2	3 of 17 15 of 17 15 of 17	/ 1.32 / 33.1 / 33.2	Inspection and testing of I & C system equipment. Inspection and testing for I & C system equipment. The owner or owner's representative reserves the right to inspect and approve the material, equipment and workmanship at all stages of manufacturing of all the main I&C equipment including DCS inspection and testing requirements for different	Turbine control system (SPPA T3000) is predesigned as per international standard and based on experience gained over the years by Siemens in Supercritical Turbine. Control system has been engineered in consideration of maximum reliability and availability. Tests are conducted as per Siemens internal standard practice and quality procedure (QST) and not subject to customer	Refer sl.no.65 below



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					I&C system equipment are tabulated in section D5.5 and Table-14 of this specification	approval. However final work test can be witnessed by customer.	
31.	V	/D5.2	16 of 17	/38.1	Uniformity of Hardware	It may not be feasible to supply primary and secondary instruments of the same make as various units of BHEL and Siemens are involved in procurement.	BHEL clarified that the same is Siemens design specific.
	V	/D5.3	53 of 55	/31.14	Similar make and model shall be provided for same type of I&C system equipment. This shall specifically apply for field transmitters, control valves etc		
32.	V	/D5.3	1 of 55	/ 2.1.1	MEASUREMENT SYSTEM(MS) All the transmitters shall be SMART type using HART protocol and with remote calibration station including configuration and diagnostic software. Each of the analog transmitters shall be SMART type with the following (ii) HART protocol based digital communication. All transmitters shall be	Pressure transmitters will be supplied with HART protocol. HART protocol however is not released for manipulation of transmitters from third party systems. Use of handheld terminal is allowed.	Please refer our reply under Pt.29 above.
	V	/D5.3	2 of 55	/ 2.1.2/(f)			
	V	/D5.3	53 of 55	/31.11			



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					SMART type with integral LCD indication and HART protocol.		
33.	V	/D5.3	3 of 55	/ 2.4	<u>Different Levels of Controls</u>	Levels of controls for TG C&I shall be as per Siemens standard and proven practice.	BHEL clarified that the same is Siemens design specific.
34.	V	/D5.3	5 of 55	/3	Closed Loop Control System	Shall be as per Siemens proven solution for TG sets.	BHEL clarified that the same is Siemens design specific.
35.	V	/D5.3	6 of 55	/4	Open Loop Control System	Shall be as per Siemens proven solution for TG sets.	BHEL clarified that the same is Siemens design specific.
36.	V	/D5.3	9 of 55	/6.1	Turbo supervisory instrumentation (TSI): (a) Shaft eccentricity (b) Absolute and ...shaft vibration in both X & Y direction for steam Turbine and Generator (c) Differential expansion of HP,IP&LP sections of steam turbine. (d) Overall expansion of HP&IP section of steam turbine.	(a) Due to the concept of a turning gear with shaft temperature monitoring, temperature bow can be avoided and therefore a separate eccentricity measurement is not necessary. (b) Only relative shaft vibration measurement is provided. Absolute shaft vibration measurement is not required and envisaged (c) Direct expansion	BHEL clarified that the same is Siemens design specific.

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					(e) Absolute bearing vibration in both X&Y direction. (f) Bearing...and drain oil temperature (h) Turbine Metal temperature (i) Main stop and control valve position (j) Main steam and reheat steam temperature	measurements are not necessary for Siemens steam turbines, hence not envisaged. (d) Thermal expansion is considered during all static and transient operations in the design stage. Furthermore differential expansion is limited by monitoring various temperature measurements (turbine stress evaluator). (e) Absolute bearing vibration in X or Y Direction is provided. (f) & (h) to (j) Connectivity to TSI not provided, however measurements are provided. For drain oil local indicators provided.	
37.	V	/D5.3	12 of 55	/ 9.1	Redundancy And Availability Requirements Measurement system, closed loop control system and open loop control	Dual I/O modules will be provided as per system criticality and inline with Siemens standard practice. The application BUS of the	BHEL clarified that the same is Siemens design specific.
				9.2			

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
				9.4	system shall be configured with redundancy at processor modules, communication modules, databus and power supply modules. Both CLCS & OLCS shall be configured with Redundant I/O channels for each sensor/signals.....sh all be dual redundant. Redundant sensors shall be provided for all control applications.	SPPA T3000 system is a one failure tolerant ring bus. OPC link to third party system is dual but not redundant.	
38.	V	/D5.3	12 of 55	/ 10.1 10.3	SENSOR/REDUNDANCY - PHILOSOPHY Two out of three measurements philosophy shall be adopted for control of all critical.....operation. The control system shall select the median value for the normal control purpose. For all other control parameters the number of sensors/transmitters shall	i) All the sensors for Turbine protection shall be 2V3, except bearing vibration which shall be 2V2. For other control parameters, generally 1 out of 2 philosophy shall be followed. For open loop single sensor shall be provided. ii) The control system	BHEL clarified that the same is Siemens design specific.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					be two. One out of two.....shall be followed.	selection of the values (average, median, mean etc) between three measurements will be as per OEM's design.	
39.	V	/D5.3	13 of 55	/ 10.6	Separate transmitters shall be used for measurement and control.	Separate sensors for control and measurements are not provided.	BHEL clarified that the same is Siemens design specific.
40.	V	/D5.3	13 of 55	/ 10.8	Sensor redundancy for OLCS	Sensor redundancy for OLCS shall be as per Siemens standard practice	BHEL clarified that the same is Siemens design specific.
41.	V	/D5.3	14 of 55	/ 10.9	Sensor redundancy for CLCS	Sensor redundancy for CLCS shall be as per Siemens standard practice	BHEL clarified that the same is Siemens design specific.
42.	V	/D5.3	14 of 55	/ 12	Critical Control Loops Following CLCS loops are considered critical, for which triple redundant sensors shall be provided for all involved parameters involved in the loop. (i) LP Bypass steam pressure and temperature control.	For LP bypass system 2/3 sensors are provided.	
43.	V	/D5.3	15 of 55	/ 13	Control Loop Grouping Philosophy The following critical loops would be implemented in	Grouping of controller shall be as per Siemens proven solution for TG sets.	BHEL clarified that the same is Siemens design specific.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					separate dedicated controllers.....ensured. 15. Turbine protection. 16. EHTC 19. ATRS-1 20. ATRS-2 21. ATRS-3 22. TSE/TSI 23. ATT OF GROUPING OF CONTROLLERS		
44.	V	/D5.3	16 of 55	/ 14	Basis for provision of Instruments, selection of ranges and details of tapping points.	Turbine instrumentation, design are standardized and of proven design. Sufficient local instrumentation is included. Siemens standard instrumentation and design shall be supplied which can partly deviate from the specification.	BHEL clarified that the same is Siemens design specific.
45.	V	/D5.3	21 of 55	/ 14.23.2	FTCs shall be provided for...	Field termination cabinets are not envisaged. Cables will be wired field or equipment mounted JB's to system cabinets	Field termination cabinets are not envisaged. Cables will be wired field or equipment mounted JB's to system cabinets
46.	V	/D5.3	29 of 55	/ 19.2/(a)	Interoperability – Ability to work together with third	From TG C&I to third party OPC link is provided and	From TG C&I to third party OPC link is provided and from

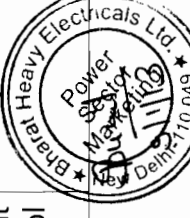
Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
47.	V	/D5.3	32 of 55	/ 20.4	party hardware/software without any customization required to be carried out. The main bus shall have dual redundancy.	from third party system to TG I&C hardwired system provided for critical applications. The application BUS of the SPPA T3000 system is a one failure tolerant ring bus. OPC link to third party system is dual but not redundant.	third party system to TG I&C hardwired system provided for critical applications. BHEL clarified that the same is Siemens design specific.
48.	V	/D5.3	33 of 55	/ 21.1.1	...Memory expandability of 150% of offered capacity shall be provided.	Memory expandability after commissioning of TG C&I is not required as per OEM standard practice.	BHEL clarified that the same is Siemens design specific.
49.	V	/D5.3	34 of 55	/ 21.1.3	INPUT/OUTPUT MODULES	I/O module features shall be as available in Siemens SPPA T3000 system. The functional requirement of TG sets are taken care of.	BHEL clarified that the same is Siemens design specific.
50.	V	/D5.3	36 of 55	/ 21.2.4	The system shall have 1:1 redundancy with respect to the processor modules, power supply modules, communication modules and network interface. The system shall be.....back up controller without operator's intervention.	The features shall be as available in Siemens SPPA T3000 system. The functional requirement of TG sets are taken care of.	BHEL clarified that the same is Siemens design specific.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
51.	V	/D5.3	39 of 55	/ 21.5	DATA BUS SYSTEM Data Bus system.....Redundant hot standby provision for 25 % expandability	As per OEM standards. A one failure tolerant ring bus structure will be used for the turbo set I&C buses as shown in the I&C overview drawing. Since the turbo set is a closed system where future expansions are not applicable	BHEL clarified that the same is Siemens design specific.
52.	V	/D5.3	41 of 55	/ 22	DCS SYSTEM PERFORMANCE REQUIREMENTS (under worst loading conditions)	This shall be as per Siemens standard for TG C&I system for large rating Turbo sets.	BHEL clarified that the same is Siemens design specific.
53.	V	/D5.3	42 of 55	/ 22.3.1	The basic system design objective for availability is an annual availability that exceeds 99.7% for certain number of years.	Calculated availability of typical TG C&I system is better than 99.7%. However same is not guaranteed and no availability test is envisaged.	BHEL clarified that the same is Siemens design specific.
	V	/D5.5	45 of 55 4 of 5/5	/ 23.14	System availability shall be 99.9%. Bidder to furnish proof for the same.		
					Availability Guarantee test for DCS system		
54.	V	/D5.3	46 of 55	/ 25.3	TSI system shall be interfaced with Turbine integral control system	Raw TG Vibration signals are provided at the terminals of TSI.	Raw buffered output signals for vibration from TSI shall be hardwired to Vibration analysis



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					through redundant communication link.		system. BHEL confirmed the same.
55.	V	/D5.3	47 of 55	/ 27	SPARE PHILOSOPHY FOR DCS/SER I/O CHANNELS	As TG C&I system is optimized and no further expansion is necessary after commissioning, spare capacity shall be as available in the solution configured for TG sets.	20% wired overall I/O spares will be provided per IO type.
56.	V	/D5.3	49 of 55	/ 29.11	All field instrument enclosure shall be IP-65	TCs/RTDs for TG integral systems shall have IP55 degree of protection. Local DC starter panel shall have IP52 degree of protection.	1. TCs/RTDs shall be with IP 65 protection. 2. IP protection for local DC starter please refer Vol.IV D15.
57.	V	/D5.3	49 of 55	/ 29.12.1	All regulating type final control elements shall have actuators of pneumatic type excepting.....	For cold gas, primary water and lub oil temperature control valves, electrical actuators are provided.	BHEL clarified that the same is Siemens design specific.
58.	V	/D5.3	52 of 55	/ 31.5 to 31.8	General Technical Requirements	Cabinets for ST automation system will be of Siemens standard design with proper coating.	BHEL clarified that the same is Siemens design specific.
59.	V	/D5.3	53 of 55	/ 31.12	and field mounted temperature transmitter shall be provided for all temperature measurement applications. Direct wiring	For TG integral system, Temperature sensor will be routed directly to the input cards of the turbine control system(single	BHEL clarified that the same is Siemens design specific.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					of RTDs or TCs to DCS or PLC is not preferred.	input). Transmitters are not necessary and not envisaged.	
60.	V	/D5.3	53 of 55	/ 31.15	Smart positioners shall be provided for all control valves/dampers	SMART positioners can be offered. However this will be independent of DCS. Diagonistics can be accessed through Hand Held communicator.	BHEL clarified that the same is Siemens design specific. BHEL further clarified that 2 nos. Hand held communicator will be provided.
61.	V	/D5.4	1 of 42	/1	Specifications for instruments to be supplied are as follows:-	The TG control instruments will generally be inline with the specification and shall meet the equipment functional requirements as per proven practice of BHEL.	The TG control instruments will generally be inline with the specification and shall meet the equipment functional requirements as per proven practice of BHEL.
62.	V	/D5.4	7 of 42 8 of 42	/ 1.22 / 1.25	Junction System cabinets	Junction boxes and system cabinets for TG control system, will generally be in compliance with the specification. However, some features may be as per BHEL / Siemens standard practice and may partly deviate with reference to specification	Junction boxes and system cabinets for TG control system, will generally be in compliance with the specification. However, some features may be as per BHEL / Siemens standard practice and may partly deviate with reference to specification
63.	V	/D5.4	8 of 42	/ 1.26	Marshalling Cabinets	Marshalling cabinets will not be provided for reference to specification	BHEL clarified that the same is Siemens design specific.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						control system. Field sensors are wired directly or via junction boxes. A relay panel for interfacing with other systems is provided.	
64.	V	/D5.4	7 of 42	/ 1.24	Interposing relay	For TG integral system, this will be as per Siemens standard practice.	BHEL clarified that the same is Siemens design specific.
65.	V	/D5.5	1 of 5	/ 1	Tests and inspection for instruments (including Table-14)	Turbine control system (SPPA T3000) is predesigned as per international standard and based on experience gained over the years by Siemens in Supercritical Turbine. Control system has been engineered in consideration of maximum reliability and availability. Tests are conducted as per Siemens internal standard practice and quality procedure (QST) and not subject to customer approval. However final work test can be witnessed by customer.	BHEL clarified that the same is Siemens standard and the QST procedure will be submitted to owner.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
66.	V	/D5.5	1, 2 of 5	/ 2.0	Tests and inspection for DCS(including Table-14) Factory acceptance test(FAT) Site Test(SAT)	Tests are conducted as per Siemens internal standard practice and quality procedure (QST) and not subject to customer approval. However final work test can be witnessed by customer. SAT for complete Turbo set is considered. Separate SAT for TG I&C is not applicable.	BHEL clarified that the same is Siemens standard and the QST procedure will be submitted to owner.
67.	V	/D5.5	2 of 5	/3	Trial operation of the DCS system	This shall be as per Siemens standard practice.	BHEL clarified that the same is Siemens design specific.
68.	V	/D5.5	2 of 5	/ 4	Performance Guarantee Test for I&C system	PG test for complete Turbo set is considered. Separate PG test for TG I&C is not applicable.	BHEL clarified that the same is Siemens design specific.
69.	V	/D5.6	1 of 1	/3	BIDDER shall furnish a detailed Assurance/ Quality Control Plan (QA/QC) for each Instrument/System covered under this specification for OWNER / PROJECT MANAGER/ Consultant review and	QA/ QC for I&C system shall be as per SAG QST. It shall not be subject to customer approval.	Please refer resolution point 66 above.

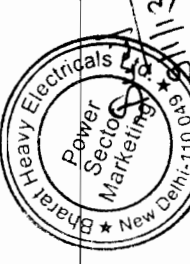


Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
Mechanical and Electrical Deviation							
70.	Vol- II,	Sec- C1,	12 of 44	1.2.1.1 (a)	Removable steam strainers	Valve design for the offered steam turbine has permanent integral strainers in main steam & hot reheat valves. These strainers do not need to be replaced after commissioning for regular operation. However same can be cleaned during maintenance period.	Valve design for the offered steam turbine has permanent integral strainers in main steam & hot reheat valves. These strainers do not need to be replaced after commissioning for regular operation. However same can be cleaned during maintenance period.
71.	Vol- III-A,	Sec C-2	6 of 80	2.7.4	Each valve shall be equipped with a test device to permit complete closing of one valve at a time, while the unit is carrying full load.	This function is realised electrically and testing of control valve is done at 80% load	This function is realised electrically and testing of control valve is done at 80% load
72.	Vol- III-A,	Sec C-2	7 of 80	2.8.4	The limits of vibration shall be within the limits as per ISO-10816 band A for bearing vibrations and ISO-7919 band A for shaft	Bearing pedestal vibration shall be acc. to: ISO 10816-2, Zone limit A/B + 25% Relative Shaft vibration	Bidder Clarified that both bearing & shaft vibration shall be within zone A + 25%.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					vibrations.	shall be acc. to: ISO 7919-2, Zone limit A/B + 25%	
73.	Vol-III-A,	Sec C-2	9 of 80	2.12 B 1.	Turning Gear : The steam turbine shall be equipped with an hydraulic rotor turning gear or AC motor driven turning gear for rotating the steam turbine rotor at the required speed during a start up or shut down	Hydraulic motor as turning device is offered. The hydro motor is connected to the turbine rotor via an over running clutch.	Hydraulic motor as turning device is offered. The hydro motor is connected to the turbine rotor via an over running clutch.
74.	Vol-III-A,	Sec C-2	10 of 80	2.12 B 2.	The turning gear shall be capable of being started both locally and from unit control room	Local operation is not included since the operation concept for the whole turbine is based on remote operation. For manual turning, hand barring facility is available.	Local operation is not included since the operation concept for the whole turbine is based on remote operation. For manual turning, hand barring facility is available.
75.	Vol IIIA	/Sec C2,	18,20 & 23 of 80	2.14.52, 2.16 & 2.17	Steam Turbine control fluid & governing and protection system	High pressure Electro-Hydraulic Actuation system is envisaged for turbine stop & control valves as per our latest design practice. Control fluid supply system is a compact, High pressure (HPSU) fluid tank, pump, filter, cooling	High pressure Electro-Hydraulic Actuation system is envisaged for turbine stop & control valves as per our latest design practice. Control fluid supply system is a compact, High pressure supply unit (HPSU) consisting of control fluid tank, pump, filter, cooling

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						consisting of control fluid tank, pump, filter, cooling & purification system. Actuators and power cylinders are mounted on stop & control valves. Interfacing with electrical controller is through servo valves/ pilot valves in the actuators. Functions of trip devices such as over speed, low vacuum, axial shift etc are realized electrically. Electrical protection system acts on trip solenoid valves mounted on the actuator block. For further details refer to description in proposal.	& purification system. Actuators and power cylinders are mounted on stop & control valves. Interfacing with electrical controller is through servo valves/ pilot valves in the actuators. Functions of trip devices such as over speed, low vacuum, axial shift etc are realized electrically. Electrical protection system acts on trip solenoid valves mounted on the actuator block. For further details refer to description in proposal.
76.	Vol-III-A,	Sec C-2	21 of 80	2.16.3 (d)	The control system shall facilitate on-load testing of all steam stop valves individually on a periodic basis sequentially. On-load testing of turbine protections individually sequentially on a periodic	As the protection devices are not hydraulic type hence testing is not applicable for these devices.	BHEL clarified that on load testing of Main Valves are done at regular interval through AVT. All the protective devices are electronically realised, so they can be tested manually at stand still condition.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					basis; annunciation contacts for use for suspended conditions during sequential testing.		
77.	Vol-III-A,	Sec C-2	22 of 80	2.16.7	The Governing System shall include other governing system equipment viz. Load Shedding Relay for main steam control valve , interceptor valve etc.	Due to the digital turbine controller, a load shedding relay is not used. However, load rejection logic is realized in software in turbine controller.	Due to the digital turbine controller, a load shedding relay is not used. However, load rejection logic is realized in software in turbine controller.
78.	Vol-III-A,	Sec C-2	22 of 80	2.16.6	The steady state speed regulation shall be within the range of not less than 3.5% and not more than 5% when the speed changer specified herein is set to give rated speed with rated power output and shall be capable of adjustment between 2.5% and 7%, inclusive, at this setting, in steps not exceeding 0.5%.	The droop will be adjusted during commissioning (normal value 5%) from the engineering station and can not be changed by operators during normal operation.	BHEL further clarified that Speed droop setting can be adjusted by engineer, but can not be changed by the operator.
79.	Vol-III-A,	Sec C-2,	23 of 80	2.16.11	The speed changer provided shall be capable of adjusting the speed of the turbo generator set to	The Steam Turbine Controller provides an adjustment range from 95% to 103%.	The Steam Turbine Controller provides an adjustment range from 95% to 103%.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					any value upto a maximum of 103% to 105% of rated speed (manual/auto) for the synchronising the generator with the bus.		
80.	Vol-III-A,	Sec C-2,	26 of 80	2.17.5	The Turbine exhaust shall be suitable for connecting to condenser through dog bone type stainless steel expansion Joint or any other proven expansion facility.	The LP outer casing is rigidly welded to the condenser neck.	The LP outer casing is rigidly welded to the condenser neck.
81.	Vol-III-A,	Sec C-2,	26 of 80	2.17.6	Pressure Relief Diaphragms : The exhaust hood shall be equipped with pressure relief self closing type disc of sufficient area to pass the MCR condenser flow. These pressure relief self closing type disc shall open if the exhaust hood pressure reaches a predetermined value and closed by self weight.	Atmospheric Relief Diaphragm (rupture disc) is provided to protect the turbine against excessive pressure and is sized for flow as per collaborator practice based on VGB guide line. Rapture disc shall burst to excessive pressure & to be replaced subsequently.	Atmospheric Relief Diaphragm (rupture disc) is provided to protect the turbine against excessive pressure and is sized for flow as per collaborator practice based on VGB guide line. Rapture disc shall burst to excessive pressure & to be replaced subsequently.
82.	Vol-III-A	Sec C-2,	30 of 80	2.21.1	Steam Turbine LP By Pass System:	Low noise trim is not envisaged as per current	Low noise trim is not envisaged as per current



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol-III A	Data Sheet A2	2 of 3	1.20 (b)	Low noise trim shall be provided to limit the noise level to 85 dBA of a distance of 1.5 m from outline of valve at all operating condition.	practice as LP Bypass operation is intermittent operation for a very short time & the noise level may go up to 100 dBA for this period.	practice as LP Bypass operation is intermittent operation for a very short time & the noise level may go up to 100 dBA for this period.
	Vol-II	Sec-C1,	15 of 44	1.2.1.2 I)	Steam Throw-off device / baffles (as required) for LP by pass exhaust. LP By Pass system Throw-off device	The LP bypass system shall be furnished with dump tube arrangement to bring down the noise level in place of steam throw off device.	The LP bypass system shall be furnished with dump tube arrangement to bring down the noise level in place of steam throw off device.
83.	Vol-III-A,	Data Sheet A1,	1 of 7	SI No.1.1.4	Duty & variations in rated steam temperature & pressure as per IEC 45	Allowable Temperature Variation shall be as under : + 4 °C duration not limited (*) + 10 °C for a maximum of 400 hrs / annum (*) + 24 °C for a maximum of 80 hrs / annum, single event limited to 15 min (*) (*) subject to the average steam temperature over any 12 months of operation	Bidder clarified that the Main steam pressure variation shall be as per IEC-45. However, temperature variation shall be as per the Bidder's clarifications. BHEL further confirmed that clarified temperature variation shall be furnished to Boiler manufacturer for compliance. SG outlet temperature variation shall match the

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						not exceeding the rated initial temperature.	
84.	Vol-III,	Sec D33,	12 of 14	7.1	Steam Insulation; Steam turbine & its integral piping shall be lagged with calcium silicate plastic composition in multiple layers.	Steam turbine thermal insulation consists of both spray type & pad type insulation with aluminium / SS cladding sheet. Pad type insulation will be of CMS (Calcium Magnesium Silicates) fibre / Rockwool mattresses type as per the component requirement.	Steam turbine thermal insulation consists of both spray type & pad type insulation with aluminium / SS cladding sheet. Pad type insulation will be of CMS (Calcium Magnesium Silicates) fibre / Rockwool mattresses type as per the component requirement.
	Vol-II	Sec -C1	14 of 44	1.2.1.1 q)	Steam Turbine aesthetic and acoustic enclosure (removable type) with necessary ventilation & lighting system.	The thermal insulation shall be provided based on collaborator standard practice, which also acts as acoustic enclosure to meet 85 dBA noise level. Hence, separate acoustic enclosure with ventilation & lighting system is not necessary and therefore not offered.	Further Bidder clarified that noise level of TG set shall be within 85 dBA with background noise correction. Aesthetic and Acoustic enclosure is not envisaged.
85.	Not Used						
86.	Vol-II	Sec C10	3 of 6	10.3.2	The performance test procedure,..... For the purpose of heat rate	Efficiency of Boiler is determined by loss method with no corrections	PG test of SG & STG shall be carried out separately. However bidder shall carry out

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					guarantee, the SG & STG tests shall be carried out simultaneously. Though the test codes for SG & STG are different, the correction curves shall be based on common measurement points and only those correction factors which affect overall heat rate alone would be applicable. The correction curves for the common guarantee test require to be submitted alongwith the bid. No additional corrections will be allowed.	terminal parameters. But turbine heat rate is determined by correcting for effect of terminal parameters including those between equipments. Due to these technicalities, BHEL shall apply all corrections as recommended by test codes of SG and STG because of different requirement of the respective test codes.	the PG test as per test code and prove the guaranteed heat rate.
87.	Not Used						
88.	Vol- II, Vol- IIIA, 1	Sec- C1 DAT ASH EET A Secti on-	13 of 44 4 of 7	1.2.1.1 d) 1.2.1.1 e) 1.2.14 a) b) 2.9.2	Main turbine shaft driven main oil pump(if applicable) Two full capacity (2 x 100%) AC motor driven auxiliary oil pumps Turbine Oil Pumps AOP	In place of turbine shaft driven main oil pump and two full capacity (2 x 100%) AC motor driven auxiliary oil pumps, 2x100% AC motor driven main oil pumps shall be provided as per standard & proven practice of BHEL/Siemens.	In place of turbine shaft driven main oil pump and two full capacity (2 x 100%) AC motor driven auxiliary oil pumps, 2x100% AC motor driven main oil pumps shall be provided as per standard & proven practice of BHEL/Siemens.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol-II,	C18	30 of 92		Number of pumps per unit 2x100% Drive AC motor Auxiliary oil Pump		
89.	Vol-III A, Vol-II,	Sec- C2 Secti on- C3	17 of 80 11 of 20	2.14.47 3.14.8.7.3	The polishing filter shall be capable of filtering moisture and particle above 2 micron... Oil Purifier i. Particle size at outlet of centrifuge- 10 micron ii. Particle size at outlet of polishing filter- 5 micron	The particle size at the outlet of oil purification system shall be class 15/12 as per ISO 4406. The total (free + dissolved) moisture content shall be maximum 300 to 500 ppm at the outlet of oil purification system. This is as per BHEL's standard and proven practice.	
90.	Customer's drawing no.: TCE. 5750 A-201-GA-		Sheet 1 (FLO OR PLAN AT EL 18.00	Zone: D5,6& D13,14	<u>OIL CANAL</u>	Oil canal shall be at left side when seen from turbine towards generator as per standard & proven practice of BHEL/Siemens.	Oil canal shall be at left side when seen from turbine towards generator as per standard & proven practice of BHEL/Siemens.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	1009 Issue -P2 (FLO OR PLA NAT EL 18.0 0 & 28.0 0)						
91.	Vol IIIA/P art A/	Data sheet A3	1 of 2	1.9	Allowable vibration level ... in Vacuum Pump shall be as per ISO 10816-1 CL II Zone A/ B	Vacuum pump assembly vibration shall be inline of ISO 10816-1 CL II Zone A/ B. However main pump body vibration shall be maximum upto 4.5 mm/sec as per pump manufacturers' standard practice.	Vacuum pump assembly vibration shall be inline of ISO 10816-1 CL II Zone A/ B. However main pump body vibration shall be maximum upto 4.5 mm/sec as per pump manufacturers' standard practice.
92.	Vol IIA	/ Sec D	1 of 2	1	Condenser Shell plates, cover plates...UT on plates...100%.	For condenser, shell plates shall be 100% UT tested for plates having thickness above 40 mm This is in line with IS 2062	For condenser, shell plates shall be 100% UT tested for plates having thickness above 40 mm This is in line with IS 2062
93.	Vol-IVA,	SEC D1	1/1	2.1.1	Fire Detection and Protection of the generator	Fire Detection System for Generator is not applicable	Fire Detection System for Generator is not applicable for

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	Vol-IVA,	Data sheet A	2/19	1.18	Details of fire detection/protection.... with writeup	for Hydrogen/Water cooled generators. Moreover, the insulation used for stator winding is epoxy based VPI insulation which is low flammable and self extinguishing type. As such Fire Detection and protection system for generator is not required.	Hydrogen/Water cooled generators. Moreover, the insulation used for stator winding is epoxy based VPI insulation which is low flammable and self extinguishing type. As such Fire Detection and protection system for generator is not required.
94.	Vol-IVA, IVA,	SEC D2, Data sheet A	7/15, 11/19	5.7, 9.2.1.1(f)	The ceiling voltage shall be at least 200% of the normal required voltage.	The ceiling voltage shall be limited to 170% of exciter voltage corresponding to generator MCR output.	The ceiling voltage shall be limited to 170% of exciter voltage corresponding to generator MCR output.
95.	Vol-IVA,	SEC D2	7/15	5.8	The total no. of diode arms shall be such that failure of up to 25% diode arms in any leg of the three phase rectifier bridge shall not cause restriction on the unit operation at its rated conditions including field forcing.	In one leg of the three phase rectifier there are 10 diode arms. With 2 diode arms (i.e. 20%) out of circuit generator can be operated at rated conditions. However field forcing is possible with one diode arm out of circuit.	In one leg of the three phase rectifier there are 10 diode arms. With 2 diode arms (i.e. 20%) out of circuit generator can be operated at rated conditions. However field forcing is possible with one diode arm out of circuit.
96.	Vol-IVA,	SEC D2	7/15	5.8	Suitable arrangement shall be made for	As per our standard practice, visual detection of	As per our standard practice, visual detection of fuse failure

Power
Sector
Bharat Heavy Electricals Ltd.

Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
					monitoring rotating diodes and fuses for remote alarm.	fuse failure using stroboscope shall be provided. Remote alarm for monitoring shall not be provided.	using stroboscope shall be provided. Remote alarm for monitoring shall not be provided.
97.	Vol-IVA,	SEC D2	8/15	7.3.1(v)	One Duplex RTD for measurement of water temperature in each stator winding bar	Simplex temperature detectors will be provided for each water cooled stator bar.	Simplex temperature detectors will be provided for each water cooled stator bar.
98.	Vol-IVA,	SEC D2	9/15	7.3.1(vii)	Two(2) thermocouple(E type) per bearing for measuring babbit metal and drain oil temperature. Additionally one spare TC per bearing shall be provided.	Total of Two(2) thermocouples(K type) shall be provided in each bearing. For bearing drain oil temperature one local indicator shall be provided.	Further Bidder confirmed that the 2 nos. TCs (Type K) provided in the bearing are of Triplex type.
99.	Vol-IVA,	SEC D2	9/15	7.3.1 (viii)	Six Nos. of Duplex RTDs for Rotor Temperature Measurement.	The rotor winding is not accessible for temperature measuring devices. It is sufficient to measure the exciter current which together with the thermal heat runs data, gives a representative value for the temperature in the rotor.	Further Bidder confirmed provision of remote metering (DCS) by indirect method.
100	Vol-IVA,	SEC D2	9/15	7.3.1	All the RTDs shall be duplex type	As per our standard design, Simplex, Duplex or triplex temperature detectors are	As per our standard design, Simplex, Duplex or triplex temperature detectors are



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						detectors are used for measurement of temperature of various generator components	used for measurement of temperature of various generator components except for sl.no.97. (RTD for measurement of water temperature in each stator winding bar shall be of simplex type). However, wherever (except for stator winding bar) simplex type RTD is offered in place of duplex type RTD it shall be 2 nos. of simplex in place of one no. duplex.
101	Vol-IVA,	SEC D2	11 / 15	9.2.1, 9.2.2 & 9.4.1 (a,b)	Routine Electrical Tests on each generator & Routine Mechanical Tests on each Generator. Electrical tests on Excitation Equipment	The Generator & Exciter shall be subjected to only those tests which are conducted under static conditions. Tests requiring running of generator i.e tests at Cl. Nos. 9.2.1(v, vi, vii, viii, ix, x, xiii, xiv, xvi, xviii, xix, xx, xxi, xxii, xxiii) & 9.4.1(a.-i, ii, iii and b-i,ii) shall not	Running tests (Routine tests) shall be carried out on generator and exciter manufactured at BHEL works. Generator and exciter supplied by Siemens AG, if any, will be tested under static condition.



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						be carried out. The running test certificates of earlier tested generator & exciter shall be furnished..	
102	Vol-IVA,	SEC D2	11/15	9.2.1	i) & xiv) Measurement of the Insulation resistance of the following before & after high voltage test: Embedded resistance temperature detectors Bearing Pedestal Insulation Space Heaters	High voltage of Embedded resistance thermometers is not carried out at BHEL's works. It is carried out by vendor at their works & test certificate carries the record of HV test. Bearing Pedestal Insulation is not subjected to type test.. However Bearing Pedestal Insulation is measured during assembly of generator/ stage test. Space heaters are not provided in Generator and exciter hence this test is not applicable for space heaters. Instead hot air blowing system is provided. Portable type Hot air blowing system is suggested by Bidder.	High voltage of Embedded resistance thermometers is not carried out at BHEL's works. It is carried out by vendor at their works & test certificate carries the record of HV test. Bearing Pedestal Insulation is not subjected to type test.. However Bearing Pedestal Insulation is measured during assembly of generator/ stage test. Space heaters are not provided in Generator and exciter hence this test is not applicable for space heaters. Instead hot air blowing system is provided. Portable type Hot air blowing system is suggested by Bidder.



Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
103	Vol-IVA,	SEC D2	12/15	9.2.3	Type Tests on one Generator :-	Type test certificate of earlier tested generator shall be submitted. The type tests shall not be carried out on the machine offered.	Type test certificate of earlier tested generator shall be submitted. The type tests shall not be carried out on the machine offered.
104	Vol-IVA,	SEC D2	12/15	9.2.3	Impulse withstand voltage test on the terminal bushings	The supplier's type test certificates for the tests conducted by supplier on the same type of bushings shall be furnished.	The supplier's type test certificates for the tests conducted by supplier on the same type of bushings shall be furnished.
105	Vol-IVA,	SEC D2	13/15	9.2.3	Measurement of bearing current	Shaft voltage is only measured during works testing.	Shaft voltage is only measured during works testing.
106	Vol-IVA,	SEC D2	12/19	9.2.1.4 9.2.2.4	Degree of protection for the exciter enclosure: IP-54 Degree of protection for the PMG enclosure :IP-54	As per our standard design, Degree of protection of the Exciter & PMG enclosure shall be IP 40.	BHEL stated that only IP 40 can be given as per standard design. This is Technology specific.
107	Vol-IVA, DAT A SHE ET-A GEN ERA	SEC D2	16/19	12.8	Reduced MVA operation at 110% of rated voltage	Continuous operation at 110% rated voltage; even at reduced MVA is not permitted. Intermittent operation shall be as per curve no. TG-THDF11567-015	Continuous operation at 110% rated voltage; even at reduced MVA is not permitted. Intermittent operation shall be as per curve no. TG-THDF11567-015



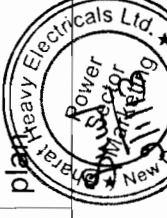
Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	TOR & AUX						
108	Vol-IVA, DAT A SHE ET-A GEN ERA TOR & AUX	SEC D2	19/19	15.2	Running Trials shall be conducted in the shop with the generator, exciter and AVR connected up and combined as a unit on the test	The generator, exciter and AVR are manufactured at separate units having different production schedules. Thus it is not possible to carry out combined test with AVR at our works.	Running Trials shall be conducted in the shop on the generator, exciter and AVR separately. Combined tests shall be carried out at site.
109	Vol. II	/E-4	4 of 7	4.2	Welding procedures....appthe welding procedure submissionroved by ..CONSULTANT..welders shll be tested...on the job.	BHEL being an ISO 9001 certified company has well established systems & procedures, hence approval by the owner is not envisaged.	BHEL have established all welding procedure specifications and are being followed for all projects we handle. Hence, the welding procedure submission for approval by the owner is not envisaged. Owner may refer the welding procedure specification during inspection at shop. However, if a new procedure is to be established, the same shall be submitted for approval.
	Vol.I	/1	60 of 91	27	The contractor ..furnish welding, NDT, heat treatment, qualification record ..prior to ..manufacture...welding procedure..Owners approval..within four weeks... Contract		



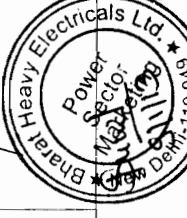
Sl. No	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
110	Vol. II	/C-12	1 of 17	12.0.2	The minimum inspection requirements..are as..attached documents[Refer (QP) enclosed]	For BHEL supplied equipments : In line with the bid stipulations, a comprehensive standard Quality Assurance Plan (QAP) is submitted for quality checks/tests on Turbine, Generator & their Auxiliaries which is based on our Collaborator's established design and manufacturing process. The QAP shall be subject to approval by the Customer. Customer Interfaces in the Q.P for BHEL supplied equipments shall be as per mutually agreed.	For BHEL Scope: In general, inspection requirements will be as per specification. However, RVUNL involvement will be as per mutually agreed quality plan.
			8 of 17	12.4.5.4	Non-destructive Examination (NDE)		
	Vol.II		Printed page 441	QAPs	Minimum inspection requirements for manufactured items of Steam Turbine & its Auxiliaries		For Siemens scope: Customer Interfaces shall be as per Siemens standard practice and these are technology specific.
For SIEMENS AG scope of supply: Customer Interfaces shall be as per Siemens standard practice which are as follows : 1)HP Turbine-2 witness points							



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						2) IP Turbine – 2 witness points 3) LP Turbine – 2 witness points & 4) Gen Rotor – 2 witness points.	
111	Vol- IV/Pa rt- A	Section- D2	12 of 15	9.2.1 (xx)	Momentary over current test.	This test is not performed.	BHEL confirmed that the machine is suitable for 150 % over load for 30 sec. as per IEC 34-3. However no testing would be done in this regard.
112	VOL II	SEC – E1	6 of 10	7.3	SUB-VENDOR---access at all times ---- works are manufactured -- OWNER - inspection and expediting work.	Customer interface at vendor works is not acceptable BHEL has its own controls at its vendor works. As such customer interface at vendor works given in the spec no below	In general, inspection requirements will be as per specification. However, RVUNL involvement will be as per mutually agreed quality plan.



Sl. No	Vol No.	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						is not envisaged.	
						SPEC NO. TCE-M4-185-21 MINIMUM INSPECTION REQUIREMENTS FOR STEAM TURBINE ROTORS (HP, IP, LP) & TURBINE ASSEMBLY	
						SPEC NO. TCE-M4-185-22 MINIMUM INSPECTION REQUIREMENTS FOR STEAM TURBINE CASINGS	
						SPEC NO. TCE-M4-185-23 MINIMUM INSPECTION REQUIREMENTS FOR HP HEATERS/LP HEATERS	
						SPEC NO. TCE-M4-185-30 MINIMUM INSPECTION REQUIREMENTS FOR VALVES & SPECIALITIES - CAST STEEL, FORGED STEEL & BRONZE (ANSI CLASS BELOW 600)	
						SPEC NO. TCE-M4-185-31 MINIMUM INSPECTION REQUIREMENTS FOR BUTTERFLY VALVES	
						SPEC NO. TCE-M4-185-38 MINIMUM INSPECTION REQUIREMENTS FOR POWER PLANT PIPING (NON IBR)	



Sl. No.	Vol No,	Sec.	Pg No.	Clause No.	Description (Specification Requirement)	Clarifications	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						SPECNO. TCE-M4-185-43 MINIMUM INSPECTION REQUIREMENTS FOR PIPE FITTINGS SPEC NO. TCE-M4-185-53 MINIMUM INSPECTION REQUIREMENTS FOR CONTROL VALVES SPEC NO. TCE-M4-185-68 MINIMUM INSPECTION REQUIREMENTS FOR STRAINERS & FILTERS SPEC NO. TCE-M4-185-70 MINIMUM INSPECTION REQUIREMENT FOR PLATE TYPE HEAT EXCHANGERS SPEC NO. TCE-M4-185-79 MINIMUM INSPECTION REQUIREMENTS FOR CORRUGATED METALLIC EXPANSION JOINTS	



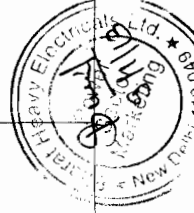
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
1.	V/D2	4 of 15	5	EXCITATION SYSTEM Excitation system shall be of brushless/ static type.	It is clarified that Excitation system shall be brushless type with DAVR.	It is clarified that Excitation system shall be brushless type with DAVR.
2.	IV/D2	13 of 15	9.3	Electrical Tests on AVR i) Accuracy test. ii) Sensitivity test. iii) Response ratio test vii) Impulse input response test.	It is clarified that • Accuracy Test can be carried out at Site since it has to be conducted in closed loop only. • Sensitivity has not been defined in IEEE421.1 and hence this test is not applicable • The response ratio can be verified by checking the ability of the Excitation system to pump the ceiling voltage required by the machine and calculating the response ratio using the formula for high initial response system. • Impulse input response test can be carried out at Site since it has to be conducted in closed loop only.	It is clarified that • Accuracy Test can be carried out at Site since it has to be conducted in closed loop only. • Sensitivity has not been defined in IEEE421.1 and hence this test is not applicable • The response ratio can be verified by checking the ability of the Excitation system to pump the ceiling voltage required by the machine and calculating the response ratio using the formula for high initial response system. • Impulse input response test can be carried out at Site since it has to be conducted in closed loop only.



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	VOL/ SEC	CLAU SE	PAGE			
3.	Not Used					
4.	IV/D1	1 of 1	2.2	VARIABLE FREQUENCY DRIVES (VFD) 2.2.1 Variable frequency drives shall be provided wherever specified. Refer Section Vol IV, Part-A, Section D3 for details. List of Spares Variable Speed Drive for Fans / Pumps Power Supply unit - 1 no. of each type.	It is clarified that Since axial type of ID fan being offered, VFD for ID Fan is not applicable and hence not offered. Further, VFD is not called for other drives, hence the same is not offered for other drives also. Accordingly mandatory spares for VFD are not applicable and hence not offered.	Bidder clarified that VFD is not applicable and hence not envisaged for ID fans and Seal air fans. However, bidder confirmed to provide VFD (including mandatory spares for VFD if applicable) for Raw coal feeders.
5.	IV/D1	5 of 10	2.7.1	230V AC, Single phase Uninterruptable power supply having 2 X 100 % Batteries, dual redundant inverters, and Static switches, standby regulated bypass supply,	It is clarified that 230V AC UPS power supply system has been offered for SG, TG, Station C&I, Plant auxiliaries and offsite DCS based control systems. 24V DC power supply required for the system cabinets shall be derived	Bidder confirmed that the required no. UPS systems shall be as per specification. 24V DC power supply required for turbine control is acceptable. Bidder confirmed that separate



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S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
	IV/D11	1 of 4	1.1	AC distribution board. UPS shall be sized to feed the critical loads, instruments and DCS, PLCs of the entire power plant. The Uninterruptible power supply system (UPS System) shall cater to the complete plant instrumentation and control system loads and DCS system loads and auxiliary system such as DM plant, coal handling and ash handling (or any other required) system. Requirement of the 24V DC or any other voltage level system for PLC and	in the panel itself using AC/DC power converters. 24V DC power supply system has been separately offered for turbine controls pertaining to SIEMENS turbine control system. The configuration of 24V DC power supply system offered for SIEMENS turbine control system shall be as detailed below: 2X100% Float cum Boost Chargers 2X100% Lead acisplanet Battery.	24V DC systems shall be offered for both units. 24V DCDB per unit also shall be provided. All cabling will be in Bidder's scope. Further, bidder confirmed that each 24V DC system (for turbine control) shall be of 2X100% Float cum Boost Chargers and 2X100% Lead acid plante Batteries.
	IV/D11	1 of 4	1.4			



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S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
				other system if any shall be derived from the UPS supply. The UPS shall be sized for The same. A separate 24V DCDB shall be provided for distributing feeders to the 24V DC system.		
6.	IV/D5	50 of 68	16.31	A SCADA marshalling panel and SCADA I/O cabinet (RTU) shall be provided for the Input/ Output signals (not covered by the serial links). 14.23.2 FTCs shall be provided for: (a) Connecting group of	It is clarified that Signals from field JB's shall be terminated at terminal blocks in system cabinets of DCS. Separate filed termination cabinets (FTC) in field or marshalling cabinets in control room are not envisaged for termination of field signals in DCS. This is BHEL's factory standard adopted for all power plants engineered so far.	
	D5.3	21 of	5.3		It is clarified that Signals from field JB's shall be terminated at terminal blocks in system cabinets of DCS. Separate filed termination cabinets (FTC) in field or marshalling cabinets in control room are not envisaged for termination of field signals in DCS. This is BHEL's factory standard adopted for all power plants engineered so far.	



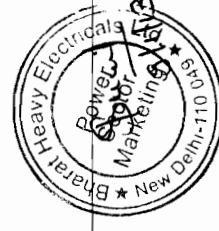
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
		55		JBs area wise. (b) FTC shall be designed to provide multiple units in Boiler and Turbine areas. FTCs reduce the number of cables entering the control room. Depending on the size of the multi core cable, one or two cables shall link to marshalling cabinet in the control room.	plants engineered so far.	
	V/D5.4	8 of 42	1.26	Marshalling Cabinets		
7.	Not Used					
8.	IV/D26	3 of 10	13	LIST OF SUB VENDORS / SUB CONTRACTORS SCADA	It is clarified that SCADA is an integral part of proposed Metso DNA DCS system. SCADA shall	It is clarified that SCADA is an integral part of proposed Metso DNA DCS system. SCADA shall



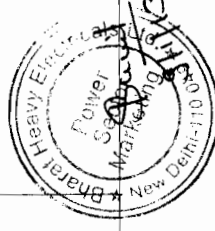
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
				SIEMENS ABB AREVA State of the art Distributed Digital Control System (DCS) of uniform hardware for main plant comprising Boiler..... Station electrical system but excluding Switchyard complete with data highways One (1) No. Remote terminal unit (RTU) for linkage with SCADA panel at Switchyard control room to Main Control Room.	be configured with same HW & SW as main plant DCS to provide RRVUNL advantages of unified automation. The SCADA system shall be interfaced with main plant DCS system seamlessly for optional control and monitoring. No. separate RTU is required for interfacing SCADA system with main plant DCS.	be configured with same HW & SW as main plant DCS to provide RRVUNL advantages of unified automation. The SCADA system shall be interfaced with main plant DCS system seamlessly for optional control and monitoring. No. separate RTU is required for interfacing SCADA system with main plant DCS.
	IV/D5.2	1 of 17	1.1			
	IV/D5.2	35 of 68	15/e			



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S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
9.				External River water intake system will be operated and monitored from CCR only through DCS OS/LVS.	DCS/ PLC for External River water system for Chhabra project is not in the scope of BHEL.	BHEL confirmed that separate Operator cum Engineering station – 2 nos. will be provided at the local control room for Suratgarh External River Water system. There will not be communication links between Plant DCS and External river water control system.
	V/D5.1	3 of 5	2.1.4	The utility and auxiliary systems viz., Coal handling plant / Ash handling plant / DM Plant/ External river water system / Switchyard system etc., will be primarily operated / monitored locally from respective utility plant located local control rooms (LCR). However, facility for monitoring from CCR as detailed above	External river water control system for suratgarh project shall be independent Metso DNA based DCS system. The External River Water System for both suratgarh and Chhabra projects shall not be interfaced with main plant DCS due to the following technical reasons. 1. The river water system is far away from the main plant and outside the plant boundary. 2. Fiber optic connectivity or any other connectivity like wireless over such long distances is not technically proven solution and	
	IV/D1 (Chhabra)	9 of 10 (Chhabra)	2.20.3 (Chhabra)			



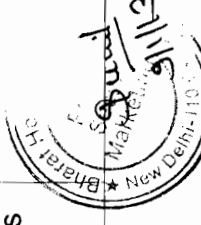
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
				shall be provided. Utility plant operation / monitoring will be through independent VDU/ KB based OS. The source of water is from three different locations (pump houses). Communication with River Intake system (Supplied by Others) shall be by Wireless Communication system. Necessary interfacing equipment shall be provided by this Contractor. The furthestmost pump house is about 100km from the power house building.	hence cannot be provided. In view of above, Connectivity of external river water system with main plant DCS through Fiber optic cable/ Wireless etc., for both suratgarh & Chhabra projects has been excluded from BHEL scope.	



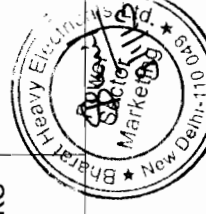
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
10.	V/D5.1	4 of 5	3.2	BMS & Boiler protection system shall be implemented in separate and independent microprocessor based DCS with SIL 3 certification as per relevant IEC standard and conforming to latest NFPA requirements. This system shall be interfaced with DCS through redundant bi-directional OPC link with Ethernet based TCP/I-P protocol. However for time critical signals hardwired interfacing shall be provided.	It is clarified that BMS shall be configured in MetsoDNA DCS hardware and software using proven failsafe configuration in line with NFPA 8502 guidelines. Boiler Protection shall be as per Machine manufacturer's recommendations.	BHEL clarified that this is design/ Technology specific.
	V/D5.2	8 of 17	3.0	Boiler protection portion of BMS is implemented as a Triple Modular Redundant system with three independent controllers each acquiring signals from three independent sensor. All inputs required for BoilerProtection are hardwired and outputs are backed up with hardwired tripping circuits to enhance availability of the	Boiler protection portion of BMS is implemented as a Triple Modular Redundant system with three independent controllers each acquiring signals from three independent sensor. All inputs required for BoilerProtection are hardwired and outputs are backed up with hardwired tripping circuits to enhance availability of the	



EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
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	V/D5.2	6 of 17	2.3.7.1 /a	SIL 3 CERTIFIED BMS & BOILER PROTECTION SYSTEM BMS & Boiler Protection system is included in Bidder's scope and shall be as detailed in Section D5.3 of this specification. One (1) no independent redundant bi-directional OPC link with Ethernet based TCP/IP protocol for BMS & Boiler protection system per unit.	Protection systems. This configuration follows all safety guidelines to meet the intent of the Protection systems. Several such systems have been engineered by BHEL and are under implementation/in successful operation in various power plants on DDC platform for rating 125MW, 250MW, 270 MW, 500MW, 600MW, 660 MW etc. The operational and implementation experience has been sufficiently imbibed into the design to take care of all safety requirements. The implementation is being vetted with certified safety engineer regularly. In view of the above, third party certification like SIL3 is not envisaged.	



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11.	V/D5.1	5 of 5	3.4	PLC based control systems are envisaged for all other unit specific and plant common systems utility and auxiliary plants like condenser polishing unit, DM Plant, CHP, AHP, Compressed air system, Smart soot blower control system etc. which are not covered in DCS based control systems.	It is clarified that Metso DNA based DCS system has been offered for CHP, AHP, Fuel oil handling, External river water system. The offered DCS system is same as the main plant DCS system providing the advantages of unified automation and better spares management. Main operation shall be carried out from the PC based operator stations in respective process control room.	It is clarified that Metso DNA based DCS system has been offered for CHP, AHP, Fuel oil handling, External river water system. The offered DCS system is same as the main plant DCS system providing the advantages of unified automation and better spares management. Main operation shall be carried out from the PC based operator stations in respective process control room.
12.	V/D5.2	3 of 17	1.36	Video projector and Video conferencing facility including 60" LCD video displayunit + Video conferencing camera, micro-phone facility, control unit, etc. alongwith Operator PC and	It is clarified that Video projector and video conferencing facility has been offered consisting of following: 1. Projector - 1 No. 2. PTZ Camera - 1 No. 3. Web Conference microphone	BHEL further clarified that the size of the LCD shall 60" LCD or above as available from the market and an operator desktop PC along with video conferencing software.



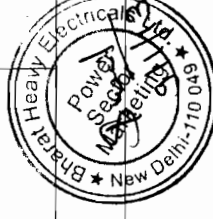
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
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				necessary software to make the video conferencing system complete shall be included in the scope of supply.	with 3 unidirectional microphones and speakers - 1 No. 4. LCD video display - 1 No. 5. video conferencing software - 1 set The above facility (1 set) shall be provided at one location in the power plant for 10 people capacity. The location shall be finalized by RRVUNL during detailed engineering. However, video conferencing external to this facility is not in the purview of BHEL scope. Further, any recurring charges for video conferencing shall not be in scope of BHEL and shall be borne by RRVUNL.	
13.	V/D5.2	3 of 17	1.37	Smart soot blower control system shall be PLC	It is clarified that the PADO package proposed includes	BHEL confirmed that conventional soot blower is done in DCS but



EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
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		16 of 17	36.0	based complete with all hardware, software and interfaces and shall be independent for each unit. SMART SOOT BLOWER CONTROL SYSTEM Smart soot blower control system shall be PLC based complete with all hardware, software and accessories with necessary interfaces for plant DCS shall be provided for each unit. The system is detailed in Table-13 of this specification.	optimal soot blowing software module to carry out the functionalities of smart soot blowing in offline mode. Also smart soot blowing PLC controls has not yet been sufficiently proven and hence not envisaged. Hence conventional soot blower controls on Metso DNA DCS platform has been envisaged.	clarified that separate Smart soot blowing is not offered.
14.	Not Used					



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S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
15.	V/D5.2	6 of 17	2.3.6	Historical Data Storage & Retrieval system / Unit: Historical Data Storage & Retrieval system (HDSR) shall be redundant server (2x100%) and shall comprise two (2) nos. terminal stations, each with single VDU and single Keyboard/mouse separate from OS/ES stations along with a color laser printer. Historical data for plant common system shall be stored in both the units HDSR system.	It is clarified that redundancy requirement in Historian is met by the CIM-IO station which takes over the recording function in the remote event of Historian Station failure. The CIM-IO also is a server grade machine like the Historian Station.	BHEL confirmed that 1 no. Historian with terminal station and a CIM-IO station without terminal station and 1 no. Historian with terminal station in off-line mode will be configured to meet the specification requirement. In case of main historian failure, the CIM-IO station will handle the functionality of the historian till the off-line historian brought back to on-line and the data from CIM-IO will be synchronized automatically.
16.	V/D5.2	10 of 17	12.2	Measurement for Stack Emission Monitoring system as listed below : (a) NOX	It is clarified that One No. multicomponent analyzer catering to NOX, SO2, CO, O2 and CO2 analyzers is proposed instead of	Further for the multi-component analyser it was clarified that the same shall be subject to conforming to other specification



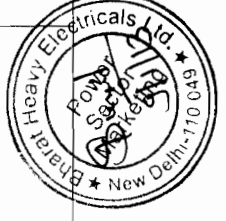
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
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				(b) SO2 (c) CO (d) O2 (e) Particulate Emission (PEM) PM2.5 and PM10 (g) CO2....	discrete analyzers. This is a state of art solution available from all approved vendors.	requirements. It was also clarified that all other measurements shall be provided as per the specification requirements.
17.	V/D5.2	16 of 17	38.1	Uniformity of Hardware To provide smooth and optimal maintenance, easy interchange ability and optimal spare parts management of I&C instruments/equipment, the bidder shall ensure that all the similar equipments shall be of the same make, series and family of hardware	RRVUNL/ TCE may kindly note that, C&I equipments are procured by and supplied from different units of BHEL through competitive buying. As such it may not be possible to supply C&I equipment of same make / series / family of hardware owing to this procedural constraint. However BHEL shall make all efforts in minimizing the type of makes etc.	Uniformity of the hardware shall be ensured to the maximum extent. However, if there is any specific case where OEM's recommendation has to be followed, the make and model shall be submitted for owner's review and approval.
18.	V/D5.4	21 of	2.1	SERVER HARDWARE SPECIFICATION	It is clarified that the server hardware specification is very	BHEL clarified that the server configuration offered is tested and



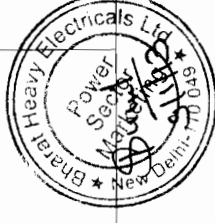
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

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		42		(d) RAM 24 GB, DDR-3 ECC RAM expandable to 192 GB (e) Hard Drives Min. of 3.6 TB expandable to 14.4 TB	high end used typically for national/ International data centers and not required for power plant applications. The server hardware specifications as recommended by our collaborator are as mentioned below: Dual Quad Core Intel Xeon Processor, 8 GB RAM, 3 Nos. x 600Gb, SAS Hot Plug Hard Disks., RAID5 implementation, 16X DVD +/- RW DRIVE, 2 Nos. Of Ethernet Ports, Windows 2008 Server Standard Edition OS. The above server hardware specification is sufficient for and proven in power plant applications.	proven for their MetsoDNA applications. However BHEL confirmed that in case their Metso application software is tested on any latest configuration before the supply of the system to this project will be supplied without any additional commercial/ price implication..



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19.	V/D5.6	1 of 1	1.3	CONTRACTOR's personnel at site, shall continuously and intensively instruct and train adequate number of the OWNER's operating and maintenance personnel at site during erection and commissioning of the equipment to enable them to take over the proper operation and maintenance of the equipment after commissioning. These engineers shall be given special training in shop, laboratory and drawing office of the It is clarified that BHEL EDN shall design a comprehensive training programmed to address the training requirements specified by RRVUNL at BHEL EDN works/ RRVUNL site. This training programmed is adequate to make the O&M personnel self-sufficient in power plant DCS operation. Separate training program at another power plant is therefore not required and hence not envisaged.	It is clarified that BHEL EDN shall design a comprehensive training programmed to address the training requirements specified by RRVUNL at BHEL EDN works/ RRVUNL site. This training programmed is adequate to make the O&M personnel self-sufficient in power plant DCS operation. Separate training program at another power plant is therefore not required and hence not envisaged.
			1.1		



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				CONTRACTOR, where the Instrumentation and Control Equipment will be designed, and manufactured and in any other power plant where similar type...		
20.	II/C16	1 of 7	16.1	Project Information Management Systems (PIMS)	It is clarified that a well proven Project Management system exists in BHEL. Necessary software tools required for Project Information Management are already in place and being utilized in all projects being executed by BHEL. Similar Project Information Management Systems will be followed for RRVUNL projects also not only by BHEL's job site offices but also by Project	Further BHEL also explained that third party PIMS cannot be provided and only their standard project information procedures as proposed can be offered.



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				Management Groups and other Units of BHEL to ensure Smooth Project Management and Documentation / information flow. Separate third party software for PIMS is not envisaged. The Project Information Management System followed at BHEL shall be elaborated by BHEL during contract execution.	
21.	IV/D5	39 of 68	Membrane type keyboard shall be provided for Operator Interface with Process for Switchyard controls and display functions to access data in conjunction with control TFTs.	It is clarified that Membrane type keyboards are prone to damage and hence not recommended. As a product standard BHEL proposes conventional ASCII (QWERTY) type keyboards along with OWS and EWS.	It is clarified that Membrane type keyboards are prone to damage and hence not recommended. As a product standard BHEL proposes conventional ASCII (QWERTY) type keyboards along with OWS and EWS.



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22.	IV/D5	48 of 68	16.24	The configuration of the station HMI shall be made using the operator station in the Windows NT environment. The various functionality shall be customized by easy to use interactive configuration tools. Configuration shall include the visual presentation of the object, adaptations needed in process database, and adaptations of the communication configuration data.	It is clarified that Windows NT is obsolete and also as per Metso DNA product standard, Metso DNA HMI is based on Windows 7 OS. Hence all OWS/EWS operate on Windows 7 OS.	It is clarified that Windows NT is obsolete and also as per Metso DNA product standard, Metso DNA HMI is based on Windows 7 OS. Hence all OWS/EWS operate on Windows 7 OS.
23.		1 of 55	1.1	The offered I&C system shall be based on State of the art practices prevailing in the	It is clarified that "Start to Synchronize" group level control with a single push button START is not practical since a large	Further it was clarified that single Push Button Start / Automatic plant startup is not called for. As per Vol.V, 1.1, "START to



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S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
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				field of Control & Instrumentation for Thermal Power Stations, designed to have a fully automated plant control using Group level control concept to achieve "START to SYNCHRONIZE" in automatic sequence with selective minimum manual interventions.	number of drives are involved and the same is not proven in large coal based thermal power stations. However, this can be achieved with several sub group level commands with operator interventions. The control philosophy will be as per machine manufacturer recommendation and BHEL standard practice as implemented for 500/600/660/700 MW projects where applicable.	SYNCHRONIZE" in automatic sequence with selective minimum manual interventions.
	V/D5.3	2 of 55	2.3.1	In order to minimize the burden on the unit operator, all control functions within the operational load range shall be fully automated. The control system shall be structured in		
		5 of 55	2.5.2			



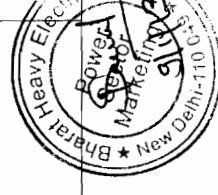
EDN TECHNICAL DEVIATION/CLARIFICATIONS FOR RRVUNL PROJECTS

S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
				accordance with a well-defined control hierarchy to permit operator intervention at appropriate levels during abnormal modes of operation. The unit shall be remotely controlled, but a fully automatic system of the plant shall be provided,		
24.	V/D5.3	5 of 55	3.2	Provision of predictive and/or adaptive controls in addition to PID controls as required by the system like Super-heater control, Re-heater control, etc.	It is clarified that the CLCS functions are configured in the DCS as per the process requirements to suit the process dynamics and response times required. Predictive and / or adaptive	It is clarified that the CLCS functions are configured in the DCS as per the process requirements to suit the process dynamics and response times required. Predictive and / or adaptive



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S.NO	SPECIFICATION REFERENCE		SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
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				controls are not envisaged. State Variable Controls are provided for some critical loops like SH Temperature control, Re-Heater Control etc. This is a standard design feature adopted and proven in all Power plants engineered by BHEL so far for 500/ 600/ 660/ 700MW.	controls are not envisaged. State Variable Controls are provided for some critical loops like SH Temperature control, Re-Heater Control etc. This is a standard design feature adopted and proven in all Power plants engineered by BHEL so far for 500/ 600/ 660/ 700MW.
25.		18 of 55	Compensating cable shall be provided with all thermocouples. All Temperature sensors shall be Duplex type and field mounted temperature transmitter shall be provided for all temperature measurement	IN view of the contradicting specification requirements, it is clarified that all the temperature elements shall be directly wired to the DCS using conventional instrumentation cables for RTD's and compensating cables for T/C's. Temperature transmitters are not envisaged.	Further it was clarified that temperature transmitters shall be provided for all the temperature sensors except motor winding, bearing and metal tube temperature measurements.
	IV/D5.3	31.12 of 53			



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S.NO	SPECIFICATION REFERENCE			SPECIFICATION REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL/ SEC	CLAU SE	PAGE			
		55		applications. Direct wiring of RTD or T/C to DCS or PLC is not preferred. (Except for Winding and bearing temperature sensors).		
26.	IV/D5	36 of 68	36/n	Dual redundant bi-directional OPC communication link between Power Plant DCS and SCADA system. All cabling for the communication links are included in the Contractor's scope. Two physically separate fiber optic cable shall be provided in different routes.	It is clarified that Metso DNA DCS system is based on Ring Network topology which shall provide network redundancy through Ring Network. Therefore separate physical redundant cable is not required and hence not envisaged. Third party PLC systems shall be interfaced with DCS system (Except for Ext River Water System) on OPC/MODBUS	BHEL explained Ring Network topology (single) has been offered for Metso DNA DCS system which shall cater to redundancy upto single point failure.



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				Redundant bi directional OPC communication link with Ethernet TCP/IP Protocol between DCS & respective plant control system	protocol for monitoring purpose only.	
27.	Not Used					
28.	Not Used					



2 x 660 MW Suratgarh TPS						
Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
1	Volume V	Table 17	Control valve sub vendors list	Sheet 4 of 16	The vendor list provided are all non indigenous	As per BHEL policy instruments and control components shall be provided from approved vendor list. Packaged systems shall contain such components as per vendor standard practise
2	Volume V	Table 17	ANNUBAR SUB VENDOR LIST	Sheet 11 of 16	Only two vendors are in the list	As per BHEL policy instruments and control components shall be provided from approved vendor list. Packaged systems shall contain such components as per vendor standard practise
3	Volume V	D5.3	14.15.2	Sheet 19 of 55	During detailed engineering if there is change in type of actuator from pneumatic to motorized-	For control valves we have considered only pneumatic type actuators for requirement of fast response time of power plant applications
4	Volume V	D5.3	29.13.1	Sheet 19 of 55	The control valves shall be capable of handling at least 130 percent of required maximum flow at full open condition	The control valve sizing along with maximum flow rating shall be submitted for Owner's approval.
5	Volume V	D5.4	1.37	Sheet 13 of 42	Constant bleed type AFR with an accuracy of +/- 0.1%	Further, BHEL confirmed to provide the the accuracy as available from the approved vendor but subject to a min of 1%.
6	Volume V	D5.4	1.30.2	Sheet 10 of 42	Noise reduction shall be made through inherent design and not through external means.	Further, BHEL confirmed to provide the valve with noise to a max. of 90 db without any noise pack.
7	Volume V	D5.1	3.5	Sheet 5 of 5	All PLC based system shall have same make of the control panels	Further, BHEL clarified that the same make/model PLC for different packages are not possible. The same can be discussed upon during detailed engineering.



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Deviation on Tender Documents							
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
8	Volume V	Table 1			Packages – CPU and electro chlorination plant shall be PLC based with complete operation and maintenance from CCR as well as LCR	Remote operation philosophy shall be as per main equipment supplier recommendations.	Further, BHEL agreed to provide start/stop operation in addition to monitoring parameters in DCS.
9	Volume V	Table 1	Table 1		Fuel oil unloading and storage and River water extraction shall be PLC	Fuel oil unloading and storage system and river water extraction shall be DCS based.	Fuel oil unloading and storage system and river water extraction shall be DCS based.
10	Volume IV	SECTION: D13	1.9.	SHEET2OF7	All H ⁺ motors shall be provided with vibration pads for mounting vibration detectors. Vibration monitoring devices shall be provided on DE and NDE side in X & Y direction with remote DCS monitoring, alarms and tripping	Vibration sensors for compressor HT motors are not recommended/provided by all the compressor manufacturers	Agreed same as per specification. However, the same shall be discussed/finalised during detailed engineering for compressor HT motors
11	Volume V	D5.3		1.1 1 OF 55	The offered I&C system shall be based on State of the art practices prevailing in the field of Control & Instrumentation for Thermal Power Stations, designed to have a fully automated plant control using Group level control concept to achieve "START to SYNCHRONIZE" in selective minimum manual interventions.	"Start to Synchronize" group level control with a single push button START is not envisaged. However several group/sub group level commands with operator interventions will be provided for plant startup. The control philosophy will be as per machine manufacturer recommendation and BHEL standard practice as implemented for 500/600/660/700 MW projects where applicable.	Single Push Button Start / Automatic plant startup is not called for. As per Vol.V, D5.3, 1.1, "START to SYNCHRONIZE" in automatic sequence with selective minimum manual interventions.
12	Volume VII, Mechanical drawings	TCE 5750A-540-SK-1002	zone c1		Feed control station shown after HP heaters	Feed Control station shall be located before HP heaters as per provision permitted by IBR. It is in line with other supercritical projects engineered for TCE & other customer/consultant.	Feed Control station shall be located before HP heaters as per provision permitted by IBR. It is in line with other supercritical projects engineered for TCE & other customer/consultant.



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Deviation on Tender Documents

Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
13	Volume VII, Mechanical drawings	TCE 5750A-540-SK-1002	zone B1		Isolation valve shown downstream of HP heaters after control station	As per IBR Amendment 2007 in regulation 520- feed water discharge piping for feed water system without economizer inlet isolating valve can be designed based on boiler design pressure with provision of mechanical relief device.	As per IBR Amendment 2007 in regulation 520- feed water discharge piping for feed water system without economizer inlet isolating valve can be designed based on boiler design pressure with provision of mechanical relief device. However upto isolation valve after BFP discharge the piping has to be designed for shut off head of BFP. Bidder agreed.
14	Vol-III A & Volume VII, Mechanical drawings	Section-C1 & TCE 5750A-540-SK-1002	12.2.19.2 & zone B1	sheet 27 of 34	Auxiliary steam system-----quick closing block valves-----same during detailed engineering for approval The Spray Water for desuperheating station shall be-----from Boiler Feed Pump or interstage tap-off. The contractor shall provide pressure and temperature control valves to meet the requirement of auxiliary steam system. & Spray water for desuperheating station for APRDS shall be supplied from Condensate Extraction pump(CEP) discharge mentioned in Customer Tender drawing no. TCE 5750A-540-SK-1002.	Since Spray water for desuperheating station for APRDS shall be supplied from Condensate Extraction pump(CEP) discharge inline with Customer Tender drawing no. TCE 5750A-540-SK-1002. Hence, Quick closing block valve and pressure control valve is not required.	Since Spray water for desuperheating station for APRDS shall be supplied from Condensate Extraction pump(CEP) discharge inline with Customer Tender drawing no. TCE 5750A-540-SK-1002. Hence, Quick closing block valve and pressure control valve is not required.
15	Vol-III A	Data Sheet A5	1.6.2	sheet 1 of 4	Design Criteria for HP Heaters: Tube side design pressure - 105% of combined BFP's maximum discharge pressure corresponding to BFP cold shut-off head	Feed Control Station shall be located upstream of HP Heaters (refer our offer PID 'Steam, Condensate & Feed Water System Diagram, drg. No. PE-DG-J50-100-N101). Hence, tube side design pressure for HP heaters shall be the maximum pressure expected from boiler side as per provision permitted by IBR.	Feed Control Station shall be located upstream of HP Heaters (refer our offer PID 'Steam, Condensate & Feed Water System Diagram, drg. No. PE-DG-J50-100-N101). Hence, tube side design pressure for HP heaters shall be the maximum pressure expected from boiler side as per provision permitted by IBR.



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Deviation on Tender Documents

Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
16	Vol-III A	Data Sheet A8	Capacity of Clean Oil & Dirty Oil Transfer Pump	sheet 1 of 3	Clean oil transfer pump shall be selected such that the entire oil of one steam turbine generator unit shall be transferred to main oil tank in two hours Dirty oil transfer pump shall have capacity equal to the oil purifier capacity.	Capacity of Clean Oil Transfer Pump shall equal to Central Lube Oil Purifier Capacity, i.e same as Dirty Oil Transfer Pump.	Capacity of Clean Oil Transfer Pump shall equal to Central Lube Oil Purifier Capacity, i.e same as Dirty Oil Transfer Pump.
17	Not Used.						
18	Vol-III A & Volume VII, Mechanical drawings	Section-C1 & TCE-5750A-540-SK-1002	12.2.19.2 & zone B1	sheet 27 of 34	The interconnection between auxiliary steam systems of both the units shall also be provided with separate isolating valves on both the sides with required steam trapping equipment.	Specification requirement is being met. However the interconnection of Auxiliary Steam Headers (HT & LT) with the existing units are not envisaged.	Specification requirement is being met. However the interconnection of Auxiliary Steam Headers (HT & LT) with the existing units are not envisaged.
19	Not Used.						
20	III	D4	8.2 e) and f)	15 of 23	Pumps and PHEs for Station Auxiliary	Please note that pumps and PHEs for SG auxiliary shall cater the water requirement for station auxiliary also. Separate pumps and PHEs are not envisaged for station auxiliary as this is BHEL standard practice and followed for all previous projects by BHEL.	Bidder agreed as per specification. However the issue shall be discussed/reviewed during detailed engg.
21	Vol IV	Section-D 26	S.No. 43 of LIST OF SUB VENDORS / SUB CONTRACTORS	8 OF 10	LIST OF SUB VENDORS / SUB CONTRACTORS	Vendors shall be as per list enclosed with bid. If required, approval of additional vendors, shall be taken up with customer during detailed engineering.	This will be mutually decided during detailed engineering
22	Vol IV	Section: D14 / Data sheet A	2 of 3 / sheet 3 of 4	2.15.1/ 3.14 (e)	Operating devices: Hand cranking device in the m/c room & Emergency exit required.	As per IS emergency exit is not mandatory. In place emergency exit a standard feature of ARD shall be provided. Further in light of above hand cranking device in the m/c room is not considered and ARD shall be provided. Customer to kindly confirm acceptance.	Further Bidder confirmed that the hand cranking device shall be provided in the machine room. Bidder shall furnish the ARD details during detailed engineering.



2 x 660 MW Suratgarh TPS

Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
23	Vol IV	Section: D14	Clause 2.0 (S.no 2.4)	1 of 3	Lift degree of protection mentioned in specs is IP 55.	Kindly note that we shall house the elevator machine in a closed machine room which shall be duly ventilated as per tender spec requirement. Accordingly the degree of protection for motor and controller (to be housed in enclosed ventilated room) shall be IP 54 and IP 21 respectively, which shall suit the environment being considered/ provided for the elevator. Further pl. note other components (COP/LOP/TB, etc) shall be IP 54.
24	Vol IIIB	Section: D16	Clause 1.0	1 of 11	Belt conveyor type system is envisaged in specs.	We have quoted for pneumatic type reject conveying system in place of belt conveyor type system in line with replies to prebid clif. and system shall be supplied in line with write-up submitted/enclosed with bid.
25	Vol IIIB	Section: D16	Clause 3.1.33	5 of 11	The chutes shall be constructed out of 10 mm MS mother plate with 6mm thick SS-304 liners confirming to AISI.	For MRS system (pneu. type system offered) liners for the chutes are not required/ envisaged as velocity of material will be very low and hence 10mm thick MS chutes without liners are offered. No adverse feedback has been received from earlier executed projects.
26	Not Used.					
27	Not Used.					
28	VI	D 4.5	8.2	15 OF 57	Geometric parameters of hopper and lining material shall be decided considering the findings of flowability study...	We have considered bunker hopper angle as 73 deg. to ensure flow ability of coal and coal flowability study shall not be carried out. In case, coal flowability study is to be conducted, the following may please be noted: a) Graded Coal Sample of 500 kg will have to be provided by customer on zero date. b) Minimum four (4) months are required by conducting agency for conducting the flowability study of bunkers after receipt of coal samples which will delay project schedule and will have to be added to the project schedule. c) Bunker hopper valley angle shall be as per recommendation of coal flowability study.
29	Not Used.					
30	IIIB	D10	8		Type of girder: Box	Girder for all double girder cranes shall be Plate box construction. For single girder cranes where required sections are not of large size, rolled sections (ISMB+ISMC) are used as crane girder.
					DATA SHEET A- Electrically operated travelling crane (Overhead & Underhung)	Girder for all double girder cranes shall be Plate box construction. For single girder cranes where required sections are not of large size, rolled sections (ISMB+ISMC) are used as crane girder.



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Deviation on Tender Documents

Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
31	IIIB	D10	14.1 & 14.2	DATA SHEET A- Electrically operated travelling crane (Overhead & Underslung)	Type of hook: Main: Ramshorn Auxiliary : Plain shank	For cranes in areas such as CWP, Workshop building, raw water pump house etc there shall be only main hook and no auxiliary hook since, one hook is sufficient for handling all equipments/component. Further the hook shall be plain shank type in line with Cl no 8.1.2 of IS 3177.	However requirement of auxiliary hook in CW Pump house will be reviewed during detailed engineering.
32	IIIB	D10	25 & 26	DATA SHEET A- Electrically operated travelling crane (Overhead & Underslung)	Main hoists: Electro hydraulic Auxiliary hoists: Electro hydraulic	For cranes in areas such as CWP, Workshop building, raw water pump house etc there shall be only main hoisting and no auxiliary hoisting since, one hook is sufficient for handling all equipments/component. Further Electro hydraulic brakes shall be provided in double girder cranes only for single girder cranes only DCEM brakes can be provided.	For cranes in areas such as CWP, Workshop building, raw water pump house etc there shall be only main hoisting and no auxiliary hoisting since, one hook is sufficient for handling all equipments/component. Further Electro hydraulic brakes shall be provided in double girder cranes only for single girder cranes only DCEM brakes can be provided.
33	IIIB	D10	27	DATA SHEET A- Electrically operated travelling crane (Overhead & Underslung)	Long travel and cross travel: Electro hydraulic	Electro hydraulic brakes shall be provided in double girder cranes only, for single girder cranes only DCEM brakes can be provided.	Electro hydraulic brakes shall be provided in double girder cranes only, for single girder cranes only DCEM brakes can be provided
34	IIIB	D-10	23 & 24	1 of 2 Data Sheet -A Electrically operated hoists	Hoist speed -4 M/min & Trolley Speed- 4 to 5 M/min	Hoist speed shall be 2.5 to 3 m/min and Cross travel speed : 7 to 10 m/min in line with BHEL's standard practice	Hoist speed shall be 2.5 to 3 m/min and Cross travel speed : 7 to 10 m/min in line with BHEL's standard practice
35	IIIB	D-10	10	1 of 2 Data Sheet -A Chain pulley blocks	Type: Trolley	Type shall be with trolley or without trolley depending on actual requirement from application point of view	Type shall be with trolley or without trolley depending on actual requirement from application point of view.
36	II	C1	1 12.8	42 of 43	The bidder shall obtain all statutory approvals required, but the responsibility of obtaining statutory approvals is that of the bidder.	We understand that all the environmental and statutory approvals for the project shall be arranged by Owner. However any specific requirement by statutory agencies regarding project, the bidder shall help RRVUNL to obtain the same.	It shall be as per Vol. I section 2 sh 131 of 135 annexure -G of specification. Bidder agreed
II		C20	20	1 of 4	The contractor shall be responsible for obtaining all necessary approvals, licenses, programme can be achieved.		

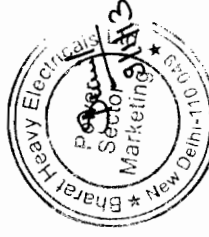
37 Not Used.
38 Not Used.



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Deviation on Tender Documents

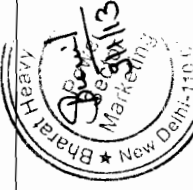
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
39	II	C3	water DM Plant	17 of 19	The design condition for tube settler/ lamella clarifier shall be as per following: (vi) Suspended solids, Not exceeding 100 mg/litre (vii) Particle size of suspended solids, Shall pass 850 microns IS sieve. (viii) Biochemical oxygen demand (5 days at 20 Deg C), mg/L: 30	(vi) The suspended solid value at outlet of lamella clarifier / tube settler shall be 100 mg/ltr. (vii) Customer to please note that it is practically impossible to ensure the limit on particle size of suspended solids at the outlet of ETP as the influent size is not known, in view of this we request customer not to insist for this condition. (viii) BOD is taken care in Sewage Treatment Plant and not in the effluent treatment plant	Bidder confirmed that particle size limits will be guaranteed if insisted by state regulatory authority during detailed engineering, rest of the points are being complied by bidder as per specification
40	II	C19	27	9 of 12	List of sub vendors / sub contractor	In addition to the Sub vendors listed in customer tender specification, BHEL registered vendor shall also be considered.	Shall be discussed/finalized during detailed engineering.
41	Not Used.						
42	II	Section C1	1.5.1.1	30 of 44	PLC based control system for the plant utility systems such as ESP, Condensate polishing Unit, Coal Handling Plant, Ash Handling Plant, Water Treatment Plant, etc (Refer Table-1 for the detailed list of BOP utilities) . All PLCs shall be of same make & model.	PLC /control panel of different systems may be of different make as the PLC is purchased along with respective BOP packages. Hence PLC panel make may be of different makes for different packages	Same shall be discussed/finalized during detailed engineering.
43	Not Used.						
44	III	D 4.2	1.01 A 5)	1 of 9	The on-site generator manufacturer must have a minimum 20 years of experience supplying the specified technology	We request customer to please accept BHEL approved vendor list also for on site generator manufacturer	Same shall be discussed/finalized during detailed engineering
45	III	D5	2 e)	1 of 2	The source of plant effluent are mainly boiler blow down	Being a super critical project no boiler blow down is there and is not envisaged in the scope of ETP	Being a super critical project no boiler blow down is there and is not envisaged in the scope of ETP



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Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
46	III	D5	6	1 of 2	Plant drains from SG/TG areas shall be led to a sump which shall also collect oily wastes from transformer area and fuel oil farm area. These oily effluents shall be further treated in an oil water separator for removal of oil traces. Oil separators shall be provided at individual locations and should include Transformer yard area. The clear water shall be led to the CMB after treatment process and the dirty oil shall be disposed off in drums separately. Boiler blow down shall be collected directly in CMB.	Plant drains from SG and TG areas shall be led to their dedicated sumps. The waste water from these sumps shall be pumped to Lamella Clarifier / tube settler (ETP Area) for removal of suspended solids and oil. Sludge from the same is treated in a thickener and oil separated is disposed off in drums. The clear water shall be led to the CMB after treatment process. Oily wastes from fuel oil farm area shall be treated in an oil water separator located in the same area and clear water from the same shall be pumped to CMB of Effluent treatment plant. Being a super critical project no boiler blow down is there and is not envisaged in the scope of ETP	Bidder is clarified that floor drains, other oily drains shall be led to an oil water separator only in ETP area.
47	IIIA	C2	2.25.10	Sheet 42 of 80	Crud effluent condition	As per earlier executed projects it is observed that Under normal condition crud in effluent shall be 5 ppb.customer is requested to please accept the same.	As per earlier executed projects it is observed that Under normal condition crud in effluent shall be 5 ppb.customer is requested to please accept the same.
48	IIIA	C2	2.25.10	Sheet 42 of 80	Copper Load at the inlet = 10 ppb	For supercritical Oxygen Treatment based plants Copper free metallurgy is selected. In view of this Copper load as indicated in the influent analysis shall not be applicable	BHEL confirmed that Copper free metallurgy is being adopted in Super critical plants. Therefore copper load is not applicable for CPU.
49	IIIA	C2	2.25.10	Sheet 42 of 80	Oxygen in effluent parameters	CPU system not remove O2 and hence is not applicable.	CPU system not remove O2 and hence is not applicable.
50	IIIA	C2	2.25.12	Sheet 42 of 80	Conductivity <0.1 micro mhos/cm at 25 deg C	The conductivity shall be <0.2 microS/cm	BHEL confirmed that 0.2 microS/cm is sufficient for boiler and turbine during startup / shut down.
51	IIIA	C2	2.25.12	Sheet 43 of 80	The effluent crud should not exceed 0.2 ppb at the outlet of pre filter.	Pre filter shall be provided with 99.98 % crud removal during start up condition.	Pre filter shall be provided with 99.98 % crud removal during start up condition.



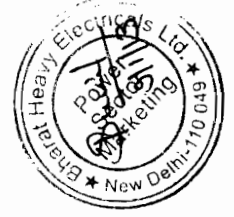
2 x 660 MW Suratgarh TPS

Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
59	V	Table 1	clause 20		Both PLC systems of DM Plant and raw water system shall be interconnected at network level to have a bi-directional communication to facilitate the data exchange. Please clarify whether such a provision is possible or we should take it in deviations.	As both the packages DM plant and Raw water system are different and may have PLC of different make, the communication between them at this stage cannot be ensured and also since there are no process interlocks between the two systems the same is also not desirable. Customer to please confirm the same
60	III A	C1	12.2.14.0	20 & 21 of 34	General	In absence of detailed system write-up and flow scheme for Fuel Oil Unloading & Storage System in tender documents, BHEL offer shall be as per attached system write up and Flow diagrams to be read in conjunction with clarification deviation as mentioend below.
61	Not Used.					
62	Not Used.					
63	III A III A III A III B III B	Datasheet A14 C3 D27 D7 D14	Clause 1.12 Clause 3.3.2 Clause 8.6 Clause 3.2 Clause 3.0	sheet 6 of 9 sheet 2 of 15 sheet 7 of 15 sheet 2 of 22 sheet 8 of 10		Specification of pipes are given under various sections like A14, C3, D27, D7, D14 having slightly different requirements. Material specification has been considered as per Vol III B, section D14, sheet 8 of 10 and pipe thickness has been considered as per Vol III B, section D-7, clause no. 3.2.
64	III B	D14	1.3.2	1 of 10	For HFO unloading consider a	Retention & heating time is not relevant to system design as the same depends upon the heater parameters of railway wagon which is fixed, temperature at which HFO is received in the wagon, and no. of workers / operators available in the unloading area for connection and their skill. Unloading time is governed by the unloading capacity of pumps specified by the customer and pumps of specified capacities are being offered by us. However, Pumping time shall be considered as 3 hours as per the specification.
65	Not Used.					



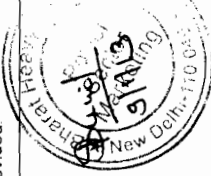
2 x 660 MW Suratgarh TPS

Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
52	IIIA	C2	2.25.14	Sheet 43 of 80	Service run	Prefilter shall be designed only for start-up condition of 50 hours of operation and not for normal or condenser tube leakage condition. For this one number (2X50%) prefilter per unit of non backwashable type shall be provided.
53	IIIA	C2	2.25.18	Sheet 45 of 80	Total wet volume coefficient if 1.1.	The resin shall be of CPU grade of UPS type.
54	IIIA	DATASHEET A17 - CPU	1	Sheet 1 of 7	Design pressure shut off head + 20 % of preceeding pump.	Design pressure shall be shut off head of condensate extraction pump + 5% margin or 45 kg/cm2 whichever is higher.
55	IIIA	DATASHEET A17 - CPU	1.1	Sheet 2 of 7	Material of construction (shell & dished ends)	Material of Pressure vessels (other than service vessel) shall be as per SA 516 Gr 70 or IS 2062 or IS 2002 as applicable.
56	IIIB	D10	1.3 ii)	Sheet 1 of 7	DM Plant CPU Regeneration building	Customer to please note that there was discrepancy in the tender specification regarding shed of building for DM Plant and CPU Regeneration. We have considered a common shed for DM Plant and CPU Regeneration Building.
57	V	Table 1			Packages – CPU and electro chlorination plant shall be PLC based with only monitoring of critical parameters from CCR as well as LCR	Please refer remarks under point 8 above.
58	V	Table 1			Fuel oil unloading and storage and Effluent treatment shall be PLC	Please refer remarks under point 9 for Fuel oil system above. Further, regarding ETP PLC based system will be provided.



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Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
66	III B	D14	2	3 of 10	PLC based	DCS based control system is envisaged for HFO unloading & Sofrage system in line with pre-bid clarification as agreed by customer.
67	III B	D14	3, 4	4 of 10	Design Pressure - 10 % margin on worst operating condition	These tanks are atmospheric tanks and are designed for water filled head. Hence no other margin is required on worst operating condition. The tank shall be designed as per IS 803.
68	III B	D14	3	4 of 10	Tank corrosion allowance not specified	Corrosion allowance of 3.0 mm has been considered for bottom shell course and 1.5 mm on other courses and tank bottom plate. No corrosion allowance has been considered for roof plate. However, minimum thickness of roof plate shall be 6.0 mm.
69	III B	D14	3	7 of 10	Type of Sump Pumps- Vertical, Non clog, centrifugal	Depending upon availability for the required duty parameters for sump pumps in water pit of OWS, the type of pump may be vertical single screw type also.
70	III B	D14	3	9 of 10	Oil Water Separator capacity - By Bidder	Oil water separator capacity shall be to cater to the flow of sump pump discharge in Fuel Oil Pump House, spillage & wash water in HFO Unloading Area/ LDO unloading Area and spillage and wash water in Tank dyke area. The same shall be sized as per API 421 and will have a single chamber.
71	Not Used					
72	Not Used					
73	III	D 4.3, Datasheet-A, DM water storage tank	6	1 of 1	3 layers of floating PP balls.	NaOH breather has been provided to shield the DM water from atmosphere and are working properly in all previously executed projects. Floating PP balls are not required for the tanks and shall not be provided.



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Deviation on Tender Documents

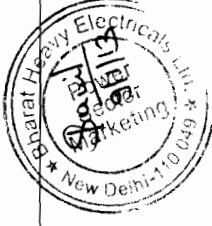
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
74	III II	D 4.3, Datasheet-A, DM water storage tank 13	5 13.3.1.7.3.1	1 OF 1 10 of 14	Internal painting and external painting Tanks (Internal Surfaces) as specified in relevant sections of specification	Different painting requirement indicated under different clause of the specification. Further, under painting schedule of tank, total DFT of paint is coming as 770 microns which is not advisable as it may result in self peeling of paint from the tank surface due to its self weight. Painting for DM water and Condensate storage tanks shall be followed as: Internal (Surface Preparation blast clean to SA2.5)) Primer 1 coat of epoxy resin based zinc phosphate high build primer (2 pack), DFT 50-70microns. Finish 2 coats of solvent free epoxy paint. DFT 150 microns each, total internal DFT (350 - 370 microns) External (Surface Preparation Hand power/power toolcleaning / wire brushing to ST2, primer 2 coats of red oxide zinc chromate primer (IS2074) of 25-35 microns DFT each. Finish 2 coats of synthetic enamel (IS2932) paint of 20-25 microns DFT each, total DFT 90-120 microns) Underneath (Surface preparation Blast clean to SA2.5, Primer 1 coat of high built coal tar epoxy suitably pigmented, DFT 80-100microns. Finish not applicable, total DFT 80-100 microns). Final colour of tank shall be sea green shade no. 217.	Different painting requirement indicated under different clause of the specification. Further, under painting schedule of tank, total DFT of paint is coming as 770 microns which is not advisable as it may result in self peeling of paint from the tank surface due to its self weight. Painting for DM water and Condensate storage tanks shall be followed as: Internal (Surface Preparation blast clean to SA2.5)) Primer 1 coat of epoxy resin based zinc phosphate high build primer (2 pack), DFT 50-70microns. Finish 2 coats of solvent free epoxy paint. DFT 150 microns each, total internal DFT (350 - 370 microns) External (Surface Preparation Hand power/power toolcleaning / wire brushing to ST2, primer 2 coats of red oxide zinc chromate primer (IS2074) of 25-35 microns DFT each. Finish 2 coats of synthetic enamel (IS2932) paint of 20-25 microns DFT each, total DFT 90-120 microns) Underneath (Surface preparation Blast clean to SA2.5, Primer 1 coat of high built coal tar epoxy suitably pigmented, DFT 80-100microns. Finish not applicable, total DFT 80-100 microns). Final colour of tank shall be sea green shade no. 217.
75	VOLUME-III/A	THERMAL INSULATION FOR HOT SURFACES, SECTION-D33	CLAUSE NO.-4.4.2	SHEET 06 OF 14	WIRE NETTING: 20SWG GS & 20SWG SS WITH 20MM HEXAGONAL OPENING	AS PER THE STANDARD PRACTICE OF BHEL FOR OTHER 660MW PROJECTS AND NOT READILY AVAILABILITY OF 20SWG WIRE NETTING IN MARKET; WE ARE OFFERING 24 SWG WITH 13MM APERTURE WIRE NETTING OF GS & SS MATERIAL ON ONE SIDE AS PER REQUIREMENT. MOREOVER WIRE NETTING OF 13MM APERTURE AND 24 SWG ON ONE SIDE IS ADEQUATE FOR SUPPORTING THE MATTRESSES.	AS PER THE STANDARD PRACTICE OF BHEL FOR OTHER 660MW PROJECTS AND NOT READILY AVAILABILITY OF 20SWG WIRE NETTING IN MARKET; WE ARE OFFERING 24 SWG WITH 13MM APERTURE WIRE NETTING OF GS & SS MATERIAL ON ONE SIDE AS PER REQUIREMENT. MOREOVER WIRE NETTING OF 13MM APERTURE AND 24 SWG ON ONE SIDE IS ADEQUATE FOR SUPPORTING THE MATTRESSES.



2 x 660 MW Suratgarh TPS

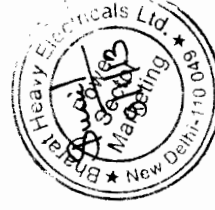
Deviation on Tender Documents

Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
76	VOLUME-VI	CONDENSER COOLING WATER SYSTEM, SECTION:- D4.5 & D4.6	CLAUSE NO.- 21.11 & CLAUSE NO.- 12.4 RESPECTIVELY	SHEET 33 OF 57 & SHEET 16 OF 17 RESPECTIVELY	AT LOCATION OF BENDS RCC ANCHOR BLOCKS SHALL BE DESIGNED AND PROVIDED. THRUST BLOCK SHALL BE PROVIDED FOR CONDUITS AT THE OUTSIDE OF CW PUMP HOUSE AND AT TG BUILDING CW PIT CONDUITS.	SINCE THE CW PIPES ARE THE WELDED STEEL PIPES SO NO ANCHOR BLOCK IS REQUIRED AT EVERY BEND. HOWEVER WE WILL PROVIDE THRUST BLOCK FOR CW PIPES AT THE OUTSIDE OF CW PUMP HOUSE AND AT TG BUILDING CW PIT OUTSIDE FOR CW PIPES. NOTE: ONLY 2500NB & ABOVE PIPE SIZE ARE CONSIDERED AS LARGE DIA PIPES.	Further BHEL clarified that Anchor Blocks shall be provided if required as per detailed stress analysis of pipeline.
77	Not Used						
78	IV	D10	1.1	1 OF 8	g) 48V DC Lead Acid Plante type batteries with associated battery chargers, 48 V DC Distribution Boards (DCDBs) & associated accessories shall be provided for River water system DC loads.	In River Water Intake area for Suratgarh TPS, For breaker operation, 220 V DC is required, therefore, 220 V DC system (Lead Acid Plante battery, chargers & distribution board) envisaged instead of 48V DC system.	In River Water Intake area for Suratgarh TPS, For breaker operation, 220 V DC is required, therefore, 220 V DC system (Lead Acid Plante battery, chargers & distribution board) envisaged instead of 48V DC system.
79	IV	D3	1.14	2 OF 4	The breaker shall have 2 x 100% hydraulic pumps	As per manufacturer practice, for GCB with the option of Hydraulic operation, 1 x 100% arrangement + manual changing facility of hydraulic pumps shall be provided. Additionally, one no. pump can be provided as spare only (However, motorised operation will also be considered in line with customer acceptance for the same in pre-bid replies).	As per manufacturer practice, for GCB with the option of Hydraulic operation, 1 x 100% arrangement + manual changing facility of hydraulic pumps shall be provided. Additionally, one no. pump can be provided as spare only (However, motorised operation will also be considered in line with customer acceptance for the same in pre-bid replies).
80	IV/ V	VOL-IV-D16, VOL-V D5.3, D5.4	1.4, 29.15; 1.47.2	1 OF 9, 50 OF 55, 17 OF 42		As per Vol-IV, Part-B, Section D16 & also in Vol V, Section D5.3, clause 29.15, conductor cross sectional area for instrumentation cables (individual & overall shielded/ overall shielded) is specified as 0.5 sq. mm. and the same has been considered. (As per Vol-V, Section D5.4, clause 1.47.2, referred also in amendment at S No. 90, conductor cross section is indicated as 0.8 sq. mm. which is in contradiction to above).	The conductor cross-section area for instrumentation cables shall be 0.5sq. mm in line with Vol-IV specification requirements.



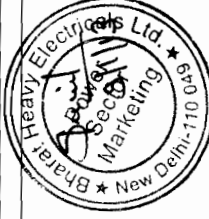
2 x 660 MW Suratgarh TPS

Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
81	IV	D3, D6	D3, D6 (4)	D6 (1 OF 16)	Section D3 pertaining to GCB does not indicate sizing criteria for continuous current rating, and the same is to be indicated by bidder. Section D6, clause 4 pertaining to IPB indicates the continuous current rating of IPB considering maximum output of generator at specified minimum voltage under VWO conditions (along with additional 10% margin)	Please note that no specific requirement is given in customer specification regarding selection of continuous current rating of GCB. Therefore, rating of GCB (23595 A i.e 24 kA model) is selected/ considered corresponding to the maximum generator output, which is technically suitable, technically recommended, and in line with engineering practice followed for all other projects. If GCB continuous rating is made to match with IPB rating (for IPB continuous rating, 10% margin is asked as per customer specification), the next higher model as per GCB manufacturer is of 28 kA, which will result in additional cost implication.
82	Amendment 11.08.12	Vol-III B - D4	sl no. 22, clause no. 2.2.1	2 of 23	Boat specification: iii. Fuel type - Diesel	Fuel type shall be petrol. Diesel type comes in boats of very higher capacity engine (above 150hp). Also they are of in board type. Kindly note that use of motor boat in Raw water reservoir is not a daily job. Hence customer is requested to accept the same.
						Clarifications (As per meeting dt. 23/12/12 & 09/01/13) Bidder confirmed to furnish the GCB continuous rating (maximum generator output at min voltage under VWO condition) as per specification, Sec D3. Fuel type shall be petrol. Diesel type comes in boats of very higher capacity engine (above 150hp). Also they are of in board type. Kindly note that use of motor boat in Raw water reservoir is not a daily job. Hence customer is requested to accept the same.



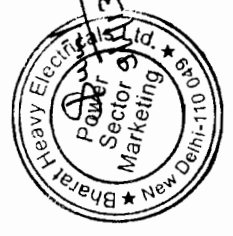
2 x 660 MW Suratgarh TPS

Deviation on Tender Documents						
Sl. No.	Volume, Part	Datasheet/ Section No.	Cl. No.	Page No.	Tender Specification requirement	Deviation
83	Vol-VI	Section : D 4.2	Clause-1.2	Sheet 1 of 9	Site grading.....	Extent of Leveling & Grading and Finished Ground Levels shall be as per submitted drawing no. PE-DG-J50-603-001 Rev T00 titled "Area grading plan for BHEL scope". However it should meet the functional requirement of the proposed units.
	Vol-VI	Section : D 4.2	Clause-1.2	Clarification	The final levels will be finalized during detailed engineering stage...	
84	Vol-VI	Section : D 4.2	Clause-1.14	Sheet 2 of 9	Railway track in service bay ..	Rail track for train movement as per referred clause is excluded from BHEL's scope as construction of Rail Track from existing Railway siding to Maintenance bay of Power House building of Unit 7th & 8th Unit is excluded from bidder's scope vide amendment.
85	Vol-VI	Section : D 4.2	Clause-19.0	Sheet 8 of 9	Scope also include proof checking ... by an independent agency preferably by SERC, Chennai ...	Scope also include proof checking ... by an independent agency preferably by SERC, Chennai/ IITs....
86	Vol-VI	Section : D 4.5	Clause-2.4.5	Sheet 6 of 57	Diversion drains drains shall be lined brick/stone masonry or PCC Slabs	Diversion drain if provided shall be lined with brick/stone masonry or PCC slab.
87		Sl. No. 105	Amendment	--	Add- The drains ...	One lift is already available/being offered as per specs in boiler (referred as Boiler elevator). The bunker building is connected with walkways in Feeder floor, tripper floor and also bunker building roof. With this, personnel can approach both the bunker bays at sides. Hence separate additional lift is not required in Mill/bunker bay and Hence is not considered in BHEL offer because of side mill arrangement.
	Vol IV	Section:D1	Clause 2.13.5	8 OF 10	One(1) passenger cum goods lift of capacity 1360kg & speed of 0.75m/sec shall be provided in the bunker bay for each unit (i.e total 2 nos)	
88	Not Used.					



Annex- 1 EBT

Sl. No.	Vol./ Part	Section	Clause No.	Page No.	Tender Specification Requirement	Comment / Clarification	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	IV-B	Section: D21	Cl. 3.2, Sl. No. 20	30 of 31	Transformer incipient fault detector.	Since the detailed specification for Transformer incipient fault detector is not available in the customer specification, we understand that there is a requirement of mobile DGA analyzing instrument for analyzing the oil parameters at site. Hence the same have been considered in our offer. This is for clarification only.	Since the detailed specification for Transformer incipient fault detector is not available in the customer specification, we understand that there is a requirement of mobile DGA analyzing instrument for analyzing the oil parameters at site. Hence the same have been considered in our offer. This is for clarification only.
2.	IV-B	Section: D21	Cl. 2.61 Cl. 3.2, Sl. No. 4	26 of 31 29 of 31	Transformer Turn Ratio Tester Portable Transformer turn ratio meter	Items "Transformer Turn Ratio Tester" & "Portable Transformer turn ratio meter" are same and hence only 1 no of "Transformer Turn Ratio Tester" is considered in our offer. This is for clarification only.	Items "Transformer Turn Ratio Tester" & "Portable Transformer turn ratio meter" are same and hence only 1 no of "Transformer Turn Ratio Tester" is considered in our offer. This is for clarification only.



Sl. No.	Volume/ Part No.	SECTI ON	CLAU SE NO.	Page No.	SPECIFICATION	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
CHP							
1.	Vol. III	Sec D8	3.1.77		In overflow sump, there will be two (2) numbers of transfer Pumps for transferring this water to effluent treatment plant (ETP)	We have offered 2 Nos.(1W+1S) overflow transfer pump of capacity 200 m3/hr.	We have offered 2 Nos.(1W+1S) overflow transfer pump of capacity 200 m3/hr.
2.	Not Used.						
3.	Vol. VI,	Sec D4.2	1.28		Sick wagon shed with associated building as per RDSO Norms	We have offered one sick wagon shed suitable for accommodating one sick wagon (Box N25). The dimension of sick wagon shed is offered as 13.8 M X 6.7 M X 8M in absence of any details.	Dimension of Sick wagon shed shall be suitable for accommodating only one no. of wagon (It should be suitable for any type of wagons covered in RDSO G33 R1 guideline.).
4.	Coal flow diagram				Coal testing laboratory with sampling system	We have offered only coal testing laboratory with equipment mentioned in the specification in the wagon tippler area. We have not offered any Coal sampling system in wagon tippler area.	Coal samples from the wagons shall be collected manually and same shall be homogeneously mixed manually and further sent to the coal testing lab in the WT area.



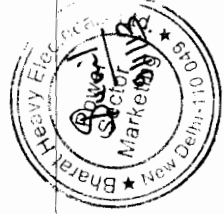
Sl. No.	Volume/ Part No.	SECTI ON	CLAUSE NO.	Page No.	SPECIFICATION	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
5.	Vol.III,	Sec D8	3.1.64		One (1) No. Passenger cum goods elevator shall be provided in crusher Houses.	We have offered one (1) No. Passenger cum goods elevator of 1000 T capacity at PCH 1&2, SCH 1&2 in absence of the capacity mentioned in the specification.	BHEL confirmed the capacity of the elevator as 1000 kg at mentioned locations.
6.	Plot plan				Building sizes	We have not considered building dimensions as mentioned in the plot plan. We have offered buildings in coal handling plant as per actual technical requirement.	Building dimensions indicated in the plot plan are the indicative dimensions and bidder can finalise the dimensions as per actual technical requirement with clearances as specified.
7.	Vol.III,	Sec D8	3.2		Bunker ventilation system	We have offered one no. bunker ventilation system for all bunkers in each bunker bay. For one unit, one bunker bay is having 4 bunkers and other bunker bay is having 3 bunkers.	We have offered one no. bunker ventilation system for all bunkers in each bunker bay. For one unit, one bunker bay is having 4 bunkers and other bunker bay is having 3 bunkers. However both systems shall be of same capacity from



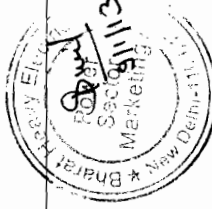
Sl. No.	Volume/ Part No.	SECTI ON	CLAUSE NO.	Page No.	SPECIFICATION	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						bunkers.	standardization point of view. BHEL confirmed for the sizing of bunker ventilation system of each bunker bay for 4 bunkers.
8.	Vol.III	Sec D8	3.0		Primary crusher	We understand that only one vendor is available in the market for this capacity of primary crusher and also their provenness for this higher capacity (2000/3000 TPH) is to be ascertained.	BHEL confirmed as per specification. However same shall be reviewed during detail engineering.
9.	Vol.III,	Sec D8	1.0		Sump pump	We have offered 1W+1S sump pump of 50 m3/hr capacity at location shown in the coal flow diagram.	We have offered 1W+1S sump pump of 50 m3/hr capacity at location shown in the coal flow diagram.
10.	Not Used						
	AHP						
11.	Plot Plan TCE.574 9A-100-		Plot Plan		2 Nos. AHP compressor house shown in the plot plan.	Conveying air compressor for the stage, IA compressor and fluidizing blower /heaters shall	Conveying air compressor for the stage, IA compressor and fluidizing blower /heaters shall be



Sl. No.	Volume/ Part No.	SECTION	CLAUSE NO.	Page No.	SPECIFICATION	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	GA-1000-P4.					be accommodated in single compressor house for both the units inside the plant and same is shown in our plot plan.	accommodated in single compressor house for both the units inside the plant and same is shown in our plot plan.
12.	Vol. III- part B /,	Sec D9 datasheet A14	5.1.2	Page 2 of 5	Piping from fly ash silo to slurry sump	Piping from intermediate surge hopper to Slurry sump is applicable and same is offered and there is no slurry pipe from FA silo to ash slurry sump.	Piping from intermediate surge hopper to Slurry sump is applicable and same is offered and there is no slurry pipe from FA silo to ash slurry sump.
13.	Plot Plan TCE.574 9A-100- GA-1000- P4.		Plot Plan		Ash water pump house, ISH, Clarifier, Ash slurry pump house	We have relocated Ash water pump house, Clarifier, ISH, Ash slurry pump house as per the AHP system requirement, maintenance suitability and same is shown in the plot plan.	We have relocated Ash water pump house, Clarifier, ISH, Ash slurry pump house as per the AHP system requirement, maintenance suitability and same is shown in the plot plan.
14.	Plot plan TCE.574 9A-100- GA-1000- P4.		Plot Plan		Building sizes	We have not considered building dimensions as mentioned in the plot plan. We have offered buildings in Ash handling plant as per actual technical requirement.	Building dimensions indicated in the plot plan are the indicative dimensions and bidder can finalise the dimensions as per actual technical requirement with clearances as specified.



Sl. No.	Volume/ Part No.	SECTION	CLAUSE NO.	Page No.	SPECIFICATION	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
15.	Vol. III- part B	/ Sec D9	2.2	Page 3 of 14	Manual evacuation facility.....	We have not offered manual evacuation facility from ESP hoppers for loading into trucks. Only pneumatic pressure conveying system is considered for FA evacuation from ESP hoppers.	Facility for manual evacuation in case of emergency is required for discharging ash on to the floor for first four fields from ESP hoppers.
16.	Vol. III- part B	/ Sec D9	2.2	Page 3 of 14	Suitable wetting head/ Jet pump system required FA slurry evacuation.	Jet pump system below ISH is considered for FA slurry disposal to the ash slurry sump.	Jet pump system below ISH is considered for FA slurry disposal to the ash slurry sump.
17.	BA flow diagram TCE.574 9A-570- FD-1014- P2.				Clarified Ash water recovery pumps	Since ash water tank and clarifier are located nearby as per our plot plan so separate clarified ash water recovery pumps are not required and same is not offered also.	BHEL confirmed that Clarified Ash water recovery pumps shall be considered as per enquiry specification as the ash water tank is above ground level. However BHEL informed that clarified ash water pump is not required as per layout and so requirement of clarified ash water pump shall be further reviewed during detail engineering.
18.	Vol. III- part B /	Sec D9 ,dash eet A18,	1.0	Page 1 of 2	Sump pump	We have offered 1W+1S sump pump of 20 m3/hr capacity at ISH, FA silo and	BHEL confirmed the sump pump capacity as per enquiry specification and tender AHS



Sl. No.	Volume/ Part No.	SECTI ON	CLAUSE NO.	Page No.	SPECIFICATION	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						AHP compressor house area. As per BA flow diagram there is no drain sump pump in BA hopper area and same is also not offered.	flow diagrams. Drain water from BA area shall be brought to BA overflow sump.



BHEL Piping Centre - QA Deviations

S.N	Vo- lume	Section	Clause No.	Page No	Tender Technical Specifications	BHEL Clarification / Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	Volume II –	C12	12.0 12.0.2	Page 1 of 17	Quality assurance requirements Bidder shall submit.....Quality plans with such additional requirements....and obtain these quality plans reviewed/approved by the Owner /Consultant	BHEL is an ISO 9001 certified company. All our procedures will be as per ISO 9001 & our Quality Manual For major items, quality plans will be submitted for customer approval. For all other items, BHEL standard quality plans and procedure will be followed Quality Plans (in BHEL format) will be submitted after award of contract	BHEL is an ISO 9001 certified company. All our procedures will be as per ISO 9001 & our Quality Manual For major items, quality plans will be submitted for customer approval. For all other items, BHEL standard quality plans and procedure will be followed Quality Plans (in BHEL format) will be submitted after award of contract



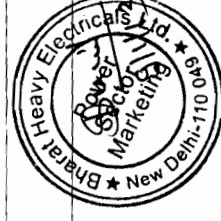
S.N	Volume	Section	Clause No.	Page No	Tender Technical Specifications	BHEL Clarification / Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
2.	Volume II	E4	1.0 1.10 1.12	2&3 of 7	Shop Inspection and Test Procedures All principal mill reports, vendor inspection/tests reports, test certificates.... When the tests and documentation have been completed, the consultant shall issue acceptance note/shipping release note....	Test certificates are co-related only for IBR items. Co-relation of test certificate not envisaged for NON-IBR items; However, material specification is ensured. IBR lines are inspected by IBR authorities and Non IBR lines are inspected by BHEL/BHEL authorized representatives. Hence Owner's inspection and shipping clearance note is not envisaged.	Test certificates are co-related only for IBR items. Co-relation of test certificate not envisaged for NON-IBR items; However, material specification is ensured. IBR lines are inspected by IBR authorities and Non IBR lines are inspected by BHEL/BHEL authorized representatives. Hence Owner's inspection and shipping clearance note is not envisaged.



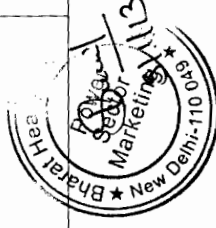
SL.	VOLUME	SECTION	CLAUSE No.	CUSTOMER REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	IP BUSDUCT					
1.	Not Used					
2.	Volume-IV, Part-B Section: D6		Clause No.:25.0,		As our busduct is of continuously welded type, hence, a local rain hood shall be provided at rubber bellow location. This is in line with clause no. 12.0 page 2 of 16.	As our busduct is of continuously welded type, hence, a local rain hood shall be provided at rubber bellow location. This is in line with clause no. 12.0 page 2 of 16.
3.	Not Used					
4.	Volume-IV, Part-B Section: D6		Clause No.:1.6, Datasheet-A,		Temperature rise limits for enclosure and conductor shall be in line with IS-8084 as below- a) 55°C above ambient for silver plated joints. b) 40°C above ambient for plain bolted joints. c) 30°C above ambient for enclosure.	Temperature rise limits for enclosure and conductor shall be in line with IS-8084 as below- a) 55°C above ambient for silver plated joints. b) 40°C above ambient for plain bolted joints. c) 30°C above ambient for enclosure. However enclosure temperature rise



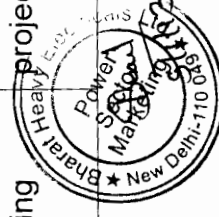
SL.	VOLUME	SECTION	CLAUSE No.	CUSTOMER REQUIREMENT	DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
						shall be 30°C over ambient temperature 50°C (Total of 80°C)
5.	Volume-IV, Part-B Section: D6,		1.12 of Data sheet		Enclosure material for Tap-off section shall be Al alloy grade-31000 which has 3 times higher mechanical strength which shall be required to withstand higher level short circuit forces. Since the current density is very less main design consideration is strength.	Enclosure material for Tap-off section shall be Al alloy grade-31000 which has 3 times higher mechanical strength which shall be required to withstand higher level short circuit forces. Since the current density is very less main design consideration is strength.
	SP BUSDUCT					
6.	Volume-IV, Part-B Section: D6-1,		Clause No.: 4.1 1.12(Data sheet-A),		Temperature rise limits for enclosure shall be in line with IS-8084, i.e. 30°C above ambient	Temperature rise limits for enclosure and conductor shall be in line with IS-8084 i.e. 30°C above ambient However enclosure temperature rise shall be 30°C over ambient temperature 50°C (Total of 80°C)
7.	Not used					



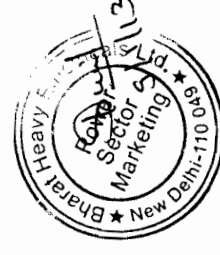
SN	REFERENCE TENDER SPECIFICATION				SPECIFICATION REQUIREMENT	CLARIFICATION/ DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL	SEC	CLAUSE	PAGE			
1.	Volume- IIIA,	Sec C2	Clause 2.31.14	Sheet 76 of 81	<u>Drive Turbine</u> The BFP shall be driven through disconnect flexible coupling or any other proven flexible coupling. The disconnect coupling shall be automatically disconnect the driven equipment from the drive turbine so as to permit independent operation of the drive turbine on turning gear.	BHEL proposes flexible coupling between BFP drive Turbine and BFP. Dry flexible membrane couplings are simplified in design and lot of accessories required for Dis-connect couplings (like hydraulic pumping unit, hydraulic actuators etc.) are not applicable. Dis-engagement is by simple dismantling of spacer bolts. Reference list is enclosed.	BHEL confirmed that the design of coupling shall be of proven design.
2.	Not Used						
3.	Volume- IIIA	Sec C2	Clause 2.31.12 g)	Sheet 76 of 81	Low vacuum unloader	Vacuum unloading device is not recommended and hence not provided.	Vacuum unloading device is not recommended and hence not provided.



SN	REFERENCE TENDER SPECIFICATION				SPECIFICATION REQUIREMENT	CLARIFICATION/ DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL	SEC	CLAUSE	PAGE			
	BFP & CEP						
4.	VOL -IIIA,	SECTIO N C2-	SHEET 40 OF 80	CLAUSE 2.24 SPECIFIC DESIGN REQUIRE MENTS- CEP & ACCESSO RIES	The impeller shall be cast in one piece finished all over and carefully balanced both statically and dynamically. The assembled rotor shall also be dynamically balanced.	Individual Impellers are balanced. Dynamic Balancing of CEP Rotor is not feasible in view of long length and multiple shafts design.	Individual Impellers are balanced. Dynamic Balancing of CEP Rotor is not feasible in view of long length and multiple shafts design.
5.	VOL -IIIA,	SECTIO N C2-	CL 1.22.1	Data sheet A4- CEP Sheet 3 of 4	NPSH TEST : Witnessed	NPSH test is a type test and it will be conducted on one of the pumps.	NPSH test is a type test and it will be conducted on one of the pumps.
6.	VOL -IIIA,	SECTIO N C2-	Clause 1.16 (Also at CI 2.30.3 and 2.30.6 of	Data Sheet A7- BFP Sheet 2 of 6	TYPE OF BFP RECIRCULATION CONTROL VALVE : Separate modulating	On-Off type BFP RC Valve is offered as per BHEL Standard Practice for all projects.	On-Off type BFP RC Valve is offered as per BHEL Standard Practice for all projects. However Bidder to take care of



SN	REFERENCE TENDER SPECIFICATION			SPECIFICATION REQUIREMENT	CLARIFICATION/ DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL	SEC	CLAUSE			
			Section C2-Sheet 68 of 80)	type/automatic modulating type recirculation valve(ARC)		control of the feed water supply to boiler.
7.	VOL -IIIA,	SECTION N C2- Data Sheet A7-BFP	Clause 1.18	Sheet 3 of 6 BFP VIBRATION LEVEL : VDI 2056 group G degree 'Good'	As per ISO 10816-1 Cl-II Zone B	As per ISO 10816-1 Cl-II Zone B. Further BHEL clarified that vibration level shall confirm to ISO 10816-1, CL- II Zone A/B.



SN	REFERENCE TENDER SPECIFICATION				SPECIFICATION REQUIREMENT	CLARIFICATION/ DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL	SEC	CLAUSE	PAGE			
8.	Vol. III	Data Sheet A CWP	Note-1 Sl No.4	Sheet 3 of 3,	CW Pump Shop performance tests are to be conducted on all pumps	a) Shop performance test will be carried out on one of the offered CW pumps. Since all the pumps are identical, it is not required to repeat this test for all pumps. This is the standard practice followed at BHEL for all projects. b) Due to capacity limitations in our test pit, CW Pump Shop performance test will be limited to the demonstration of flow up to design point flow.	a) Deviation withdrawn. b) BHEL further clarified that the testing will be done as per available testing facility.
9.	Vol. III	D5.3	14.9 (d)		Heat Exchanger	All Feed Water heaters (LP Heaters, HP Heaters) and Deaerators will be provided with Float type magnetic Level Switches as per our standard practice.	All Feed Water heaters (LP Heaters, HP Heaters) and Deaerators will be provided with Float type magnetic Level Switches as per

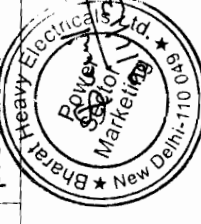


SN	REFERENCE TENDER SPECIFICATION				SPECIFICATION REQUIREMENT	CLARIFICATION/ DEVIATION	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
	VOL	SEC	CLAUSE	PAGE			
10.	Vol. III	Data Sheet A5	1.13.3		Heat Exchanger Tubes : LP Heaters - Stainless steel to SA 249 grade TP 304 welded or equivalent	Material of construction of tubes for LP Heaters shall be Welded stainless steel to SA688 TP304.	our standard practice. Material of construction of tubes for LP Heaters shall be Welded stainless steel to SA688 TP304. Further Material of construction acceptable for Feed Water Heaters.



Annexure-1 J ISM

Sl. No.	Volume, Part	Section No.	Cl. No.	Page No.	Tender Specification requirement	Clarification / Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	IV	D13	1.6	1 of 7	Locked rotor current of the HT motors, except mill motors, rated 1500KW and below shall be limited to 600 % (inclusive of 20 % tol) of the full load current and motor rated above 1500KW shall be limited to 450 % inclusive of tolerance. & Amendment.	BHEL will meet starting current limitation provided pull out torque shall be less than 205 %. This is as per IS standard.	Bidder confirmed meeting the specification requirement of provision of pull out torque of at least 205% of full load torque except for motors rated above 1500kW.
2.	IV	D13	Data sheet. Sl. No. 38	4 of 6	Quantity & type of temperature detectors for all HT motors...a) Minimum 6 duplex RTD for winding hot spot and b) minimum two thermocouple per bearing.	Stator winding shall be provided with 12 no., Pt 100, Simplex RTDs shall be provided.	Stator winding shall be provided with 12 no., Pt 100, Simplex RTDs shall be provided.



Annexure-1 K PCRI

Sl. No.	Volume, Part	Section No.	Cl. No.	Page No.	Tender Specification requirement	Clarification / Deviation	Clarifications (As per meeting dt. 23/12/12 & 09/01/13)
1.	Vol. III,	Sec D5,	Cl. no. 11.0 and 13.0	SHEET 1 OF 2 & SHEET 2 OF 2	11.0 The CONTRACTOR shall establish ground water, surface water and ambient air quality monitoring stations in a radius of 10 km from the plant premises to keep watch on the ambient air and water quality. The number and location of the monitoring stations shall be decided with Concern R.O.	For ambient air quality monitoring PCRI will supply 4 Continuous Ambient Air Quality Monitoring System (AAQMS), 04 Respirable dust samplers (RDS) and 1 mobile van mounted with AAQMS. The mobile van will be used for ambient air quality monitoring & collection of water samples in a radius of 10 km from the plant premises to keep watch on the ambient air & water quality. The above is envisaged in our offer.	As per specification both PM2.5 and PM10 to be measured in AAQMS. 4 no.s Continuous Ambient Air Quality Monitoring System (AAQMS). 10 nos. RDS (capable to carry out monitoring of both PM 2.5 and PM10) required including mobile van AAQMS.

