

**BANGLADESH-INDIA FRIENDSHIP POWER CORPORATION (PVT) LTD
(BIFPCL)**

**2 X 660MW MAITREE SUPER THERMAL POWER PROJECT
AT RAMPAL, BANGLADESH**

VOLUME – II B

**TECHNICAL SPECIFICATION
FOR
OXYGEN DOSING SYSTEM**

SPECIFICATION NO.: PE-TS-421-154-A002



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

TECHNICAL SPECIFICATION FOR OXYGEN DOSING SYSTEM

REV. NO. 00

DATE : 21.11.2017

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PROJECT**

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**TECHNICAL SPECIFICATION FOR CHEMICAL
DOSING SYSTEM**

REV. NO. 00

DATE : 21.11.2017

PROJECT INFORMATION

(FOR PROJECT INFORMATION BIDDER TO REFER ANNEXURE VIII)



TITLE :
**2 X 660MW MAITREE SUPER THERMAL POWER
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SPECIFICATION NO. PE-TS-421-154-A002

SECTION I

**TECHNICAL SPECIFICATION FOR CHEMICAL
DOSING SYSTEM**

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SECTION I

SPECIFIC TECHNICAL REQUIREMENTS

SUB-SECTION IA: SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)

SUB-SECTION IC: SPECIFIC TECHNICAL REQUIREMENTS (CONTROL & INSTRUMENTATION)



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SUB SECTION IA

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SUB-SECTION IA

SPECIFIC TECHNICAL REQUIREMENTS - MECHANICAL

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1.0 SCOPE:

This specification is intended to cover design (i.e. preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, fill of lubricants & consumables, mandatory spares along with spares for erection, startup and commissioning as required, forwarding, proper packing, shipment and delivery at site, preparation and submission of drawing /documents & equipment / system guarantee etc. as specified hereinafter for 2X660 MW, MAITREE SUPER THERMAL POWER PLANT.

Broad scope of work of this package includes all equipment and accessories. Please also refer C&I section for C&I scope. The Oxygen dosing system as specified in Technical Specification shall consist of the followings:

- Entire Oxygen dosing system mounted on skid as per P&IDs and Data Sheet-A.
- Instrumentation (minimum) as per the enclosed P&ID.
- Start-up & commissioning spares as required, mandatory spares as specified.
- Injector assemblies (8 nos.), tees (20 nos.), elbows (20 nos.), loose tubing (480 meter), compression fittings (90 nos.) for loose tubing.
- Foundation nuts & bolts to fix each skid on the floor, as required.

2.0 SCOPE OF SERVICES

The bidder's scope also includes following services for scope under this specification:-

- ✓ Design and engineering.
- ✓ Fabrication of the skid mounted oxygen dosing system.
- ✓ Painting as per approved painting requirement to be finalized during detailed engineering. However the same shall be prepared in line with the painting requirement enclosed in ANNEXURE IV of technical specification.
- ✓ Inspection and testing of the skid as per the approved quality assurance plan.
- ✓ Supply of the skid mounted oxygen dosing system up to the power plant site along with all accessories as defined in the technical specification.
- ✓ Supervision of E&C of Oxygen dosing skids including Ten (10) man days and two (2) nos. site visit, accommodation, food, local conveyance, air ticket (economy class)

3.0 CIVIL SCOPE

Nil.

4.0 TERMINAL POINTS (ALSO REFER P & I DIAGRAM ENCLOSED)

- All field instruments (pressure and flow transmitters), solenoid valves and MFC shall be terminated at JB by the oxygen dosing vendor for further connection to DCS by BHEL/ Customer.
- All vent connections shall be connected via vent header and terminated at one point of the skid for further connection to atmosphere by BHEL.
- Dosing termination point shall be after MFC and terminated at one point by the oxygen dosing supplier for further interconnection till dosing locations by BHEL/ Customer.
- 24 V-DC connection to SV-3, SV-4 and SV-5 shall be directly connected by BHEL/ Customer.

5.0 OXYGEN DOSING SYSTEM: (2 SKIDS PER UNIT; TOTAL= 4 SKIDS)

(Refer Drawing. No. PE-DG-421-154-A001)

One skid of Oxygen Dosing System consists of the following:-

- ✓ Eight number oxygen cylinders, dosing at downstream of Deaerator/ CPU outlet.
- ✓ Two number of Pressure Regulator as per section IIA and Data Sheet – A.
- ✓ Two number MFC as per section IIA and Data Sheet – A.
- ✓ Associated Piping, valves, fitting as indicated in the P&ID of oxygen dosing system and Data Sheet-A enclosed and as required to make the system complete.
- ✓ Control & instrumentation as per P&ID of Oxygen Dosing System, Data sheet-A, Section IB, and IIB.

5.0 QUALITY PLAN AND SUB VENDOR APPROVAL

- The quality assurance plan is enclosed as **ANNEXURE-I**. However requirement of detailed QP, inspection checklist, certificate of conformance etc. for each equipment and sub-vendor shall be finalized during detailed engineering stage; decision of BHEL/Customer shall be binding on vendor in this regard. Any changes/additional tests insisted upon by owner during approval of QAP's shall be accepted by bidder without any commercial and delivery implication to

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BHEL/Customer. Bidder shall submit the quality plans in BHEL format during detailed engineering stage. Bidder to note further that during detailed engineering all the QAP's/check lists etc. shall be submitted to Customer /BHEL for approval. All inspection & testing etc. shall be carried out accordingly.

- The sub vendor list enclosed **ANNEXURE-II** is indicative only and is subject to approval / acceptance by Customer. Bidder to propose his sub vendor list with back up documents (experience list, end user certificate as applicable) etc. The same shall subject to BHEL and Customer approval during detailed engineering stage without any technical, commercial & delivery implication to BHEL.

6.0 DRAWINGS/DOCUMENTATION REQUIREMENT ALONG WITH BID

Bidder to furnish the following documents/information **(For C&I please refer the respective section of the specification).**

- Deviation if any in the enclosed Schedule of deviation with cost of withdrawal only with mention of specification clause for which deviation is being asked. (Stamped & Signed)
- Compliance cum confirmation schedule.(Stamped & Signed)
- Schedule of Declaration. (Stamped & Signed)
- Un Price Schedule duly filled in. (Stamped & Signed).

Bidder to note that if bidder has taken any deviation from the technical specification requirements, the same shall be clearly mentioned in the bid in the BHEL prescribed format of Schedule of Deviations attached as Section - III of this technical specification.

In case of no deviation, Bidder to furnish signed and stamped copy of "Schedule of Deviations with cost of withdrawal" stating **"No Deviation"**. No other technical document is required along with bidder's offer. Any other document submitted by bidder shall not be evaluated by BHEL and shall be considered as withdrawn. Bidder to note that any un-declared deviation mentioned in bidder offer other than specified in the scheduled of Deviations shall be considered as null and void.

7.0 DRAWING/DOCUMENTS REQUIREMENT (PI refer C&I portion also):-

For the drawings/ documents submission schedule, please refer **Annexure-VI**.

For the Drawings/Documents Submission Procedure, please refer **Annexure-III**. The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and Customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

8.0 SPARES

All the spares for the equipment under the contract provided by the vendor will strictly conform to the specifications and documents and will be identical to the corresponding main equipment/components supplied under the contract. The quality plan and the inspection requirement finalized for the main equipment will also be applicable to the corresponding spares.

8.1 MANDATORY SPARES

- The list of mandatory spares is indicated in Annexure V.
- The bidder shall indicate the prices in the 'Schedule of mandatory Spares' whether or not he considers it necessary for the BHEL & Customer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.
- The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.
- All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the unit. However, spares shall not be dispatched before dispatch of corresponding main equipment.



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- Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.
- The Bidder shall note that if there is any change/ variation in equipment / system during detail engineering which causes any change/ variation in the essential spares quantity, the same shall be supplied without any commercial implications. The price indicated for the mandatory spares shall be considered for the purpose of evaluation.
- Any spare which bidder declares as "Not Applicable" for his system, if found applicable shall be supplied by the bidder without any cost implication to BHEL/Customer.

8.2 START-UP AND COMMISSIONING SPARES

Start-up and Commissioning spares are those which would be required during equipment or system testing, start up and commissioning. All spares used until the plant is finally handed over by the bidder to the Customer come under this category. All start-up and commissioning spares as required shall be provided by the bidder without any additional cost to the BHEL and Customer. However bidder to provide additional spares as per their system requirement without any commercial and delivery implication to BHEL/Customer during detailed engineering List of spares shall be furnished by BIDDER along with the offer.

Bidder shall be responsible for the ready and timely availability for all the start-up and commissioning spares as required during various stages of testing, cleaning and commissioning up to handing over of each unit of the total plant.

An adequate stock of start-up spares shall be available at the site such that the start-up and commissioning of the equipment/systems, Performance guarantee test and handing over the equipment/ systems to the Customer will be carried out without hindrance and delay. All start-up spares which remain unused after the taking over of the plant shall remain the property of the Customer.

8.3 MAINTENANCE TOOLS AND TACKLES

- One set of all special tools shall be furnished and shipped with each piece of equipment for dismantling, maintenance, adjustment, and calibration of the equipment. The tools shall be shipped in separate heavily constructed wooden boxes provided with hinged covers and padlock hasps.
- The Contractor shall supply under this contract all maintenance tools for each piece of equipment / system and it shall be boxed separately and the boxes shall be appropriately marked for shipment and identification of contents.
- A weather-proof itemized list of the contents shall also be attached to the outside of each container.
- The maintenance tools shall include all special handling rigs, bars, slings, cable and all specialised equipment for control system maintenance such as extender boards, scopes, and all software and hardware.
- Further, Bidder shall also include a full set of regular maintenance tools and tackles required. Bidder shall also include all maintenance tools and tackles in their scope. Total price of all the maintenance tools and tackles shall be included in the quoted lump sum price.

9.0 THE VENDOR WARRANTIES:

1. That all spares supplied will be new and in accordance with the contract document and will be free from defects in design, material and workmanship and shall further guarantee as under:
 - a. In case of any failure in the original component/equipment due to faulty designs, materials and workmanship, the corresponding spare parts if any, supplied will be replaced without any extra cost to the BHEL and Customer unless a joint examination and analysis by BHEL and/or Customer of such spare parts prove that the defect found in the original part that failed can safely be assured not to be present in spare parts.
 - b. The long term availability of spares to the BHEL and the Customer for the full life of the equipment covered under the contract and that before going out of production of spare parts of the equipment covered under the contract, vendor and his sub-vendors shall give the BHEL and the Customer at least 24 (Twenty Four) months advance notice so that the latter may order his bulk requirements of spares, if he so desires. The same provision will also be applicable to the sub-vendors. Further, in case of discontinuance of manufacture of any spares by the vendors or his sub-vendors the vendors and his sub vendors, will provide the BHEL and the Customer, 2 (two) years in advance, with full manufacturing drawings, material specifications and technical information required by the



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BHEL and the Customer for the purpose of manufacture of such items and also the right to manufacture such spares for their own requirements.

- c. Further in case of discontinuance of supply of spares by the vendors or his sub-vendors, the vendor will provide the BHEL and the customer with full information for replacement of such spares with other equivalent makes, if so required by the BHEL and the customer.
 - d. Notwithstanding the above, the vendor shall be responsible for supply of spares for the lifetime of the package at reasonable prices. The prices of all future requirements of spares shall be derived from the corresponding ex-works price at which the orders for such spares have been placed by the BHEL and the customer as a part of the mandatory or long term or any other kind of spares. The base indices for calculating ex-works price shall be commissioning of last equipment under main contract.
2. The vendor will indicate the delivery period of the spares, which the BHEL and the Customer may procure in accordance with this clause.
 3. In case of emergency requirements of spares, the vendor would make every effort to expedite the manufacture and delivery of such spares on the basis of mutually agreed time schedule.
 4. In case the vendor fails to supply the mandatory or long term or any other kind of spares on the terms stipulated above, the BHEL and the customer shall be entitled to purchase the same from the alternate sources at the risk and the cost of the vendor and recover from the vendor, the excess amount paid by the BHEL and the customer over the rates as per the contract. In the event of such risk purchase by the BHEL or the customer, the purchases will be as per the works and procurement policy of the BHEL and the customer prevalent at the time of such purchases and BHEL & the customer at his option may include a representative from the vendor in finalizing the purchases.
 5. It is expressly understood that the final settlement between the parties in terms of relevant clauses of the tender document shall not relieve the vendor of any of his obligations under the provision of long term.

10.0 ADDITIONAL REQUIREMENT

- a) Bidder to adhere Format of operation and maintenance manual requirement as per Annexure VII during detailed engineering.
- b) Bidder to adhere General technical requirement as per Annexure VIII during detailed engineering.
- c) While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under section-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser / Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial / delivery implication. Availability of spares and such provisions shall continue to be enforced till the expiry of 30 (thirty) years period reckoned from the scheduled date of completion of trial operation of the last equipment unless otherwise discharged expressly in writing by the BHEL or the Customer.
- d) Initial charge of all lubricants & grease.
- e) All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box.
- f) Finish paints for touch-up painting of equipment after erection at site in sealed container.
- g) All the first fill and one Year's topping requirements or 10 % of first fill quantity, whichever is more of consumable such as greases, oil, lubricants, servo fluids/control fluids, gases and etc. which will be required to put the equipment covered under the scope of specifications, into successful commissioning / initial operation and to establish completion of facilities shall be furnished by the bidder. Suitable standard lubricants as available in Bangladesh are desired. Efforts should be made to limit the variety of lubricants to minimum.
- h) Document approval by Customer/ BHEL under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval.
- i) Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to Customer and BHEL for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- j) Relevant requirements as per GTR, GCC, ECC & SCC. Any statutory requirement / clearance required for the packages from government / local body shall be in bidder's scope.
- k) In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.

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- l) Latest version of all codes and standards to be followed.
- m) For detailed dispatch instructions, Bidder to refer special condition of contract (SCC) of the project.
- n) All the equipment and items shall be properly packed as per requirements stipulated in sea worthy packing specification enclosed as Annexure-IX.
- o) Any item/ equipment manufactured in China shall not be acceptable for this project.
- p) All cables within the skid shall be in scope of Oxygen Dosing Vendor.

11.0 PACKING:

For sea worthy packing details, refer ANNEXURE IX.

12.0 DESIGN REQUIREMENTS

Bidder to note that design requirement of the chemical dosing skids shall be as below: -

- All the terminal points shall be easily accessible and towards one side of skid.
- All valves shall be easily accessible for the operator.
- All equipment shall have SS name plate clearly indicating the equipment name.
- Tube fittings of the system shall be done using elbows and tees. Tube bending is not acceptable.
- All JBs shall be mounted in their respective dosing skids only.
- MFC shall also be mounted in an enclosure. DOP of enclosure shall be IP-65 minimum. Other technical requirements of this enclosure shall be in line with JB details indicated elsewhere in the specification.
- All cylinders supplied should conform to international "Gas Cylinder Rules" and Bangladesh CCE license for the same shall be arranged by the bidder.
- All items supplied for the oxygen dosing systems shall be suitable for oxygen service. Bidder shall provide the certificates indicating items are oxygen cleaned or suitable for oxygen service.
- MOC of individual item/ equipment mentioned in the technical specification is only indicative. However, Bidder shall follow/ comply and design the oxygen dosing system in line with the following below mentioned ASTM standards and standards mentioned in the Data sheet.
 - o ASTM G63: Guide for evaluating non-metallic materials for oxygen service.
 - o ASTM G93: Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments.
 - o ASTM G 94: std. guide for evaluating Metals for oxygen service.
 - o ASTM F1792-97 (2010): Standard Specification for Special Requirements for Valves Used in Gaseous Oxygen Service.
 - o ASTM G88: Standard Guide for Designing Systems for Oxygen Service.
- Any change envisaged to meet the above standards and system/ service requirements during detailed engineering shall be agreed/ complied by the bidder without any price/ delivery implication to BHEL/ Customer.

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ANNEXURES

ANNEXURE I: QUALITY PLAN.
 ANNEXURE II: SUB VENDORS LIST.
 ANNEXURE III: DRAWING DOCUMENTS DISTRIBUTION PROCEDURE.
 ANNEXURE IV: PAINTING SPECIFICATION.
 ANNEXURE V: MANDATORY SPARES LIST.
 ANNEXURE VI: DRAWING/DOCUMENTS SUBMISSION SCHEDULE.
 ANNEXURE VII: FORMAT FOR OPERATION AND MAINTENANCE.
 ANNEXURE VIII: GENERAL TECHNICAL REQUIREMENTS.
 ANNEXURE IX: SEA WORTHY PACKING.



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ANNEXURE I: QUALITY PLAN.

		MANUFACTURER'S NAME & ADDRESS :		MANUFACTURING QUALITY PLAN				PROJECT PACKAGE		: OXYGEN DOSING SYSTEM			
				ITEM: OXYGEN DOSING SYSTEM SUB - SYSTEM : DEAERATOR & CEP DISCHARGE DOSING		PSI QP. NO : REV. : DATE : PAGE :		CONTRACT NO. MAIN SUPPLIER BHEL QP. NO NTPC QP. NO		: BHEL/PEM/NOIDA			
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY**			REMARKS	
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
1.0	<u>WELDER'S QUALIFICATION</u>												
1.1	WELDING PROCEDURE SPECIFICATION (WPS)	CORRECTNESS	MA	SCRUTINY	100%	ASME IX	ASME IX	QW 482	P	V	V		
1.2	WELDER PERFORMANCE & PROCEDURE QUALIFICATION RECORD	WELD SOUNDNESS & WELDING PERFORMANCE	MA	PHYSICAL TEST	100%	ASME IX	ASME IX	QW 483 & QW 484	P	V	V		
2	EMPTY OXYGEN CYLINDER	MTC, HYDRO TEST & RELEVANT TESTS AS PER IS 7285	MA	IS 7285	100%	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MFRS CERTIFICATE	P	V	V		
3	VALVES (BODY & BONNET)	MATERIAL	MA	--	100%	APPROVED DATASHEET	AS PER MODEL DECODIFICATION MENTIONED IN MFRS CATALOGUE	MANUFACTURERS COC	P	V	V		
4	INSTRUMENTS												
4.A	PRESSURE GAUGE	MOC FOR WETTED PARTS, CALIBRATION & BOURDON OVER PRESSURE PROTECTION & TYPE	MA	MEASUREMENT	1/TYPE	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MFRS CERTIFICATE	P	V	V		
4.B	PRESSURE TRANSMITTER	CALIBRATION, OVER LOAD PROTECTION & TYPE TEST CERTIFICATE	MA	MEASUREMENT	100%	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MANUFACTURERS COC	P	V	V		
5	SOLENOID VALVES	MATERIAL	MA	VISUAL	100%	APPROVED DATASHEET	AS PER MODEL DECODIFICATION MENTIONED IN MFRS CATALOGUE	MANUFACTURERS COC	P	V	V		
6	CYLINDER PRESSURE REGULATOR	MATERIAL	MA	VISUAL	100%	APPROVED DATASHEET	AS PER MANUFACTURERS CATALOGUE	MANUFACTURERS COC	P	V	V		
7	TERMINATION BOX	COUNTUNITY,IR-HV-IR & DEGREE OF PROTECTION	MA	ELECTRICAL	100%	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MFRS COC & INSPECTION REPORT	P	V	V		
8	TUBING	CHEMICAL & PHYSICAL	MA	CHEMICAL & PHYSICAL TEST	100%	APPROVED DRAWING DATASHEET	APPROVED DRAWING DATASHEET	LAB REPORT	P	V	V		
9	MASS FLOW CONTROLLER	CALIBRATION REPORT	MA	ELECTRICAL	100%	APPROVED DRAWING & DATASHEET	APPROVED DRAWING & DATASHEET	CALIBRATION REPORT	P	V	V		
10	FITTING	MATERIAL	MA	VISUAL	100%	APPROVED DRAWING	AS PER MODEL DECODIFICATION MENTIONED IN MFRS CATALOGUE	MANUFACTURERS COC	P	V	V		
11	FINAL ASSAMBLY	DIMENSION, ORIENTATION & COMPLETENESS.	MA	MEASUREMENT	100%	APPROVED DRAWING	APPROVED DRAWING	INSPECTION	P	W	V		
	FAT	LEAKAGE		N2 FILL FOR 2HR	100%	APPROVED DRAWING / FACTORY ACCEPTANCE TEST	NO LEAKAGE	INSPECTION REPORT	P	W	V		
12	POWDER COATING STAMPING	DFT MEASUREMENT	MI	VISUAL	100%	APPROVED PAINTING SCHEME			P	W	V		
13	PMI Test for SS	GRADE CONFIRMATION	MA	CHEM.TEST	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/ DWG	INSPECTION REPORT	P	W	V		

NOTES: ALL INSTRUMENTS SHALL BE OXYGEN CLEANED AND SUITABLE FOR OXYGEN SERVICE. MANUFACTURERS COC CERTIFYING THE SAME REGARDING OXYGEN CLEANED SHALL BE SUBMITTED FOR REVIEW DURING FINAL INSPECTION.

		LEGEND : * RECORDS IDENTIFIED WITH "TICKS" SHALL BE ESSENTIALLY INCLUDED BY CONTACTION IN QA DOCUMENTATION. ** M : MANUFACTURER/SUB-CONTRACTOR C : BHEL, N: CUSTOMER				DOC NO.		REV :		CAT :	
MANUFACTURER/ SUB SUPPLIER		MAIN SUPPLIER									
SIGNATURE		INDICATE "P" PERFORM, "W" WITNESS, AND "V" VERIFICATION AS APPROPRIATE, "CHP" SHALL BE IDENTIFIED IN COLUMN "N".		FOR CUSTOMER USE		REVIEWED BY		APPROVED BY		APPROVAL SEAL	

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TEST PROCEDURE FOR OXYGEN DOSING SYSTEM

- A Factory Acceptance Testing will be conducted at vendor's Factory. This will be for verification of the functional performance of critical equipment/instruments and hardware design when run at design pressure, temperature and flow.
- FAT will be carried out using **only the inert gas** such as **Nitrogen**. Following will be the FAT protocol.
- Checking the completeness of the system. This will include visual inspection of equipment and instruments as per the P & ID s & GA along with skid after assembling on skid.
- Soap joint leak test of tubing/fittings/valves using nitrogen at 1.25 times of maximum operating pressure.
- **(ANSI B31.8)**, for 2 hours. The allowable pressure drop would be up to 0.5 bar over 2 hours.
- Functional testing of calibrated components (equipment/ instruments) using nitrogen. The test controller will be connected to Mass flow controller. The set point will be given from test controller & this will be monitored.
- Testing of Assembly of skid, instruments, termination box will be done by BHEL as per approved Quality Assurance Plan.
- Inert test run using nitrogen to demonstrate flow.

Final Assembly & Factory Acceptance Test will be witnessed by BHEL & CUSTOMER.



TITLE :
**2 X 660MW MAITREE SUPER THERMAL POWER
PROJECT**

SPECIFICATION NO. PE-TS-421-154-A002

SECTION I

**TECHNICAL SPECIFICATION FOR OXYGEN
DOSING SYSTEM**

SUB SECTION IA

REV. NO. 00

DATE : 21.11.2017

ANNEXURE II: SUB VENDORS LIST.



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

SECTION I

TECHNICAL SPECIFICATION FOR OXYGEN DOSING SYSTEM

SUB SECTION IA

REV. NO. 00

DATE : 21.11.2017

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
1.	FILLING OF OXYGEN CYLINDER	FILLING OF EMPTY CYLINDERS MAY BE DONE FROM ANY CCE LICENSED OXYGEN GAS FILLER	AS APPLICABLE	
2.	EMPTY OXYGEN CYLINDERS	BPCL	ALLAHABAD	
		EVEREST KANTO	BOMBAY	
		MARUTI KOATSU CYLINDER LTD	HALOL, GUJARAT	
3.	CHECK VALVE/BALL VALVE/	HAMLET	USA	
		SWAGELOK	USA	
		PARKER	USA	
4.	VALVE MANIFOLD	HAMLET	USA	
		EXCEL HYDRO	MUMBAI	
		SCHNEIDER	GERMANY	
		HY LOK	KOREA	
		DK TECH	KOREA	
		ANDERSON GREENWOOD	USA	
		ASLACH	MUMBAI	
		HP VALVE AND FITTING	CHENNAI	
		HYD AIR	LONAVLA	
		FLUID CONTROL	MUMBAI	
		MICRO PRECISION	FARIDABAD	
		PARKER	USA	
		SWAGELOK	USA	
		BALDOTA	MUMBAI	
5.	PRESSURE REDUCING VALVE	TESCOM	USA	
		SWAGELOK	USA	
6.	TUBING	SWAGELOK	USA	
		HAMLET	USA	
		PARKER	USA	
		SANDVIK	USA	
		VIKAS INDUSTRIAL PRODUCTS	NOIDA	
7.	NEEDLE VALVE & PRESSURE SAFETY VALVE	SWAGELOK	USA	
		HAMLET	USA	
		PARKER	USA	
8.	SOLENOID VALVE	ROTEX	BARODA	
		AVCON	MUMBAI	
		ASCO	CHENNAI	
		SMC	NOIDA	
		NUCON	HYDERABAD	
9.	3 WAY VALVE	HI TECH	AHMEDABAD	
		ADVANCE VALVES PVT.LTD	NOIDA	
		BDK	HUBLI	
		FOURESS ENGG.INDIA LTD.	MUMBAI	
		FLUIDLINEVALVES COMPANY PRIVATE LTD.,	MUMBAI	
		INSTRUMENTATION LTD.	PALAKAD	
		KIRLOSKAR BROTHERS LTD.	PUNE	
		VENUS PUMP & ENGG. WORKS	KOLKATA	
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI	
		STAFFORD CONTROLS LIMITED	PUNE	
10.	PAINT	MICON VALVES (INDIA) PVT.LTD	MUMBAI	
		ASIAN PAINTS (I) LTD.		
		BERGER PAINTS INDIA LTD		



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

SECTION I

TECHNICAL SPECIFICATION FOR OXYGEN DOSING SYSTEM

SUB SECTION IA

REV. NO. 00

DATE : 21.11.2017

		GOODLASS NEROLAC		
		JENSON & NICHOLSON (I) LTD		
		CDC CARBOLINE (I) LTD.		
		SHALIMAR PAINTS LTD.		
		ADDISON PAINTS LTD		
		GRAND POLYCOAT		
		BOMBAY PAINTS		
		HEMPLE PAINTS (SINGAPORE)		
		JOTUN PAINTS		
		SAIL		
11.	STRUCTURE STEEL	TISCO		
		JINDAL		
		BHUSWAL		
12	MASS FLOW CONTROLLER	BROOK'S (EMERSON)		



Project : MAITREE STPP (2 x 660 MW)
Package : EPC Pkg (440/220kV Switchyard
Package, GT, ST, UT, Auxiliary Transformer, IPBD
and SPBD)
Supplier : BHEL
Contract No.:

Annexure - VI
LIST OF ITEMS REQUIRING QUALITY PLAN

DOC NO :
REV.NO : 0
3 OF 7
DATE : 13.12.2015
PAGE :

AND SUB-SUPPLIER APPROVAL

S.N.	Item Description	QP/ Insp. Cat		QP Sub. Schedule	QP Approval Schedule	Proposed sub-supplier	Place	Sub- supplier approval status / cat	Sub- supplier Details submission schedule	Remark
13	ALUMINIUM TUBE	III	130			HINDALCO INDALCO JINDAL ALUMINIUM TUBE ALOM EXTRUSIONS BALCO SUDAL	RENUKUT ALUPURAM BANGALORE KOLKATA KORBA NASIK	A A A A A A		
15	CABLE TRAY, BENDS, COUPLER PLATES	III	*							Refer Cabling List
16	ACSR CONDUCTOR	III	140			HINDUSTAN VIDYUT PRODUCTS GUPTA POWER DIAMOND POWER HIREN ALUMINIUM JSK INDUSTRIES HIRA CABLES SHARAVATHY CONDUCTORS	FARIDABAD BHUWANESHW AR VADODARA SILVASSA SILVASSA HIRAKUD BANGALORE	A BR A A A A A		
17	GS EARTHWIRE / LIGHTING WIRE	III	*			MAIN CONTRACTOR APPROVED SOURCES				
18	CABLE GLANDS	III	*							Refer Cabling List
19	1.1KV GRADE POWER AND CONTROL CABLES (SUBJECT TO PROVENNESS REQUIREMENTS)	III	150							Refer Cabling List
20	CABLE LUGS	III	*							Refer Cabling List
21	LIGHTING FIXTURES & LUMINARIES	III	*							Refer Station Lighting list
22	LIGHTING POLE	III	*			BIS approved Vendors as per IS-2713*				*Vendor should have valid BIS licence
23	INDUSTRIAL RECEPTACLES	III	*							Refer Cabling List
24	LEAKAGE CURRENT ANALYSER	III	*			ISA PGK ELECTRONICS DOBLE TRANSINOR SCOPE T&M	ITALY CHENNAI USA NORWAY PUNE	NOTED NOTED NOTED NOTED NOTED		





PROJECT : MAITREE STPP (2 x 660 MW)
PACKAGE : EPC-STG
CONTRACTOR : BHEL BHOPAL
CONT NO. :

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL

SUB SYSTEM: RE JOINTS, BFV, TANKS

Ref No.

Revision No. 00

Date : 14/12/2015

SR NO.	ITEM	QP/IN S-PN.C AT*	QP NO.	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS/C AT	SS DETAIL SUB-SCHEDULE	SS APPL SCHEDULE	REMARKS
		***				STEEL INNOVATION	BHOPAL	DR			
		***				INDO-ASIATIC ENGRS	DELHI	DR			
10.	MICS. TANKS	II				BHEL	BHOPAL	A			
11.	FLASH TANKS FABRICATION	II				ELECTRO AUTO INDUSTRIES	BHOPAL	A			
		II				MODERN ALLIED	BHOPAL	A			
		***				SHRI KUSHAL FABRICATORS	BHOPAL	A			
		***				MEHTA INDUSTRIES	BHOPAL	A			
		***				BOBA BROTHERS	BHOPAL	A			
		***				B.K. ENTERPRISE	BHOPAL	A			
		***				STEEL INNOVATION	BHOPAL	DR			
		***				INDO-ASIATIC ENGRS	DELHI	DR			
12.	FLASH TANKS	***				BHEL	BHOPAL	A			
13.	ACTUATORS FOR BFV					REFER C&I LIST ENCLOSED TO THE LOA/NOA					
14.	CASTINGS FOR BF VALVE	II				UP STEEL	MUZAFFAR NAGAR	A			
		II				L&T	KANSBAHL	A			
		II				BHEL	BHOPAL	A			
		II				SIMPLEX	BHILAI	A			
		II				VAISHNAV STEEL	MUZ. NAGAR	DR			
		II				SAURABH METALS	MANDIDEEP	A			
		II				STAR WIRE (I) PVT. LTD.	BALLABHGAR H	A			



PROJECT : MAITREE STPP (2 x 660 MW) PACKAGE : EPC-STG CONTRACTOR : BHEL BHOPAL CONT NO. :		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: RE JOINTS, BFV, TANKS							Ref No.		
									Revision No. 00		
									Date : 14/12/2015		
SR NO.	ITEM	QP/IN S-PN.C AT*	QP NO.	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS/CAT	SS DETAIL SUB-SCHEDULE	SS APPL SCHEDULE	REMARKS
		II				BOLLINENI CASTINGS	HYDERABAD	DR			
		II				STEELCAST	BHAVNAGAR	A			
15.	BF VALVE BODY & DOOR FABRICATION	***				SIGMA HEAVY ENGG INDUSTRIES	BHOPAL	A			
		***				SHRI KUSHAL FABRICATORS	BHOPAL	A			
		***				MODERN ALLIED	BHOPAL	A			
		***				MEHTA INDUSTRIES	BHOPAL	A			
		***				DUNHILL PRODUCT	BHOPAL	A			
		***				BHOPAL ENGG	BHOPAL	A			
16.	BUTTER FLY VALVES	I				BHEL	BHOPAL	A			
17.	TEMPERATURE GAUGES	III				REFER C&I LIST ENCLOSED TO THE LOA/NOA					

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PROJECT : MAITREE STPP (2 x 660 MW)
PACKAGE : EPC-STG
CONTRACTOR : BHEL BHOPAL
CONT NO. :

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL

SUB SYSTEM: RE JOINTS, BFV, TANKS

Ref No.

Revision No. 00

Date : 14/12/2015

SR NO.	ITEM	QP/INS PN.CA T*	QP NO.	QP SUB- MISSION SCHEDU- LE	QP APPL SCHEDU LE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS/C AT	SS DETAIL SUB- SCHEDULE	SS APPL SCHEDULE	REMARKS
21	FORGINGS AND BARS	II				KISAAN STEEL	GHAZIABAD	A			
		II				FORGE MONCHIERI	ITALY	A			
		***				CFFP	HARDWAR	A			
		***				STAR WIRE	BALLABHGARH	A			
		***				GHAZIABAD FORGINGS	GHAZIABAD	A			
		***				GHAZIABAD ISPAT	GHAZIABAD	A			
		***				HINDON FORGE	GHAZIABAD	A			
		***				BAY FORGE	CHENNAI	A			
		***				YOUNG CHANG METAL CO. LTD	KOREA	A			
		***				MYSCO CO. LTD.	KOREA	A			
		***				PSM	KOREA	A			
		***				VIKRANT STEEL	KOLKATTA	A			
		***				SAIL-ASP	DURGAPUR	A			
		***				GOLDEN IRON & STEEL WORKS	N. DELHI	DR			
		***				TAE WOONG CO. LTD.	KOREA	A			
22	STANLESS STEEL PLATES FOR PRESSURE PARTS	II				USINOR INDU STEEL	FRANCE	A			
		***				JINDAL STRIPS	HISSAR	A			
		***				NISSHOIWA COPR	JAPAN	A			
		***				SAIL	SALEM	A			
		***				BOEHLER	AUSTRILA	A			

*** Inspection and testing requirements are covered under respective main equipments doc.

Note 1 For Items not listed above, BHEL approved vendors shall be applicable.

"N" Vendor is noted for this project

Prateek



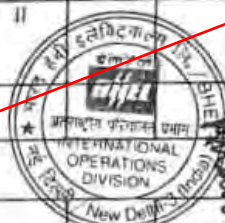
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	Project : Maitree STPP Package : 2 x 660 MW EPC -TG & AUX Contractor : BHEL, Hyderabad Contract No.:		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator					Ref No.: Revision No.: 00			
								Date: 12-12-2015			
	SN	ITEM	QP/INS-PN CAT *	QP No.	QP SUB-MISSIO N SCHED ULE	QP APPL SCHE DULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S / CAT	SS DETAIL SUB-SCHEDU LE	SC APPL SCHEDU LE

		II				LIMITED., M/s ASIAN INDUSTRIAL VALVES	INDIA	A			
		II				M/s BHARAT HEAVY ELECTRICALS LTD.,	INDIA	A			
		II				M/s DRESSER INDUSTRIES INC.,	USA	A			
		II				M/s ANDERSON, GREENWOOD & CO.,	USA	A			
58	LP HEATER	I				BHEL	HYDERBAD	A			SUB-QR ITEM
59	HP HEATER	I				BHEL	HYDERBAD	DR			SUB-QR ITEM
						SPX	USA	A			SUB-QR ITEM
						BHI	SOUTH KOREA	A			SUB-QR ITEM
						TEI	USA	A			SUB-QR ITEM
						SHANGHAI	CHINA	DR			SUB-QR ITEM
						HOLTEC	USA	A			SUB-QR ITEM
60	DRAIN COOLER	I				BHEL	HYDERBAD	A			
61	VALVES GATE, GLOBE, CHECK ½ TO 10" (UPTO 2500 CL)	II				TOA VALVES	JAPAN	A			
		II				DEUTSCHE BABCOCK	GERMANY	A			
		II				DRESSER	USA	A			
		II				BHEL	TRICHY	A			
62	VALVES (GATE, GLOBE, NRV) ½ TO 10"	II				AUDCO	CHENNAI	A			
		II				BHEL	TRICHY	A			

		PROJECT : Maitree STPP (2 x 660 MW)				LIST OF ITEMS REQUIRING QP			REF. NO :		
		PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR : BHEL - PEM				VENDOR AS APPROVED BY			DATE : 15/12/2015		
		CONTRACT NO :									
No	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
1	M.E. BELLOWS					FLEXATHERM EXPANLOW PVT. LTD.	INDIA	DR			SUBJECT TO CARRYING OUT TYPE TEST
	M.E. BELLOWS					Qinhuangdao North Metal Hose Co. Ltd.,	CHINA	DR			SUBJECT TO CARRYING OUT TYPE TEST
	M.E. BELLOWS					Teddington Engineered Solutions	UK	DR			
	M.E. BELLOWS					LONESTAR INDUSTRIES	CHENNAI	A			SUBJECT TO CARRYING OUT TYPE TEST
	M.E. BELLOWS					MB METALLIC BELLOWS PVT. LTD.	CHENNAI	A			SUBJECT TO CARRYING OUT TYPE TEST
	M.E. BELLOWS					FLEXICAN BELLOWS AND HOSES PVT. LTD.	VADODARA	A			SUBJECT TO CARRYING OUT TYPE TEST
	M.E. BELLOWS					METALLIC BELLOWS INDIA PVT. LTD.	CHENNAI	A			SUBJECT TO CARRYING OUT TYPE TEST
	M.E. BELLOWS					B. D. Engineers	FARIDABAD	DR			SUBJECT TO CARRYING OUT TYPE TEST
2	BALL VALVES					BELGAUM AQUA VALVES PVT. LTD.	BELGAUM	DR			
	BALL VALVES					A.V. VALVES LTD	AGRA	DR			
	BALL VALVES					MICROFINISH VALVES PVT LTD.	HUBLI	A			
	BALL VALVES					ATAM VALVES PVT. LTD.	INDIA	DR			
	BALL VALVES					WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	INDIA	DR			
	BALL VALVES					AUDCO(L & T)	COIMBOTORE	A			

BALL VALVES			BDK	HUBLI	A	upto 400 NBX 150#
BALL VALVES			PEC	MUMBAI	A	upto 400 NBX 150#
BALL VALVES			FLOWCHEM	AHMEDABAD	A	upto 350 NBX 150#
BALL VALVES			AKAY INDUSTRIES	MUMBAI	A	upto 50 NBX 150#
BALL VALVES			VALTECH INDUSTRIES	MUMBAI	DR	
BALL VALVES			GM ENGINEERING PVT. LTD.	RAJKOT	DR	
BALL VALVES			LEADER VALVES LTD.	JALLANDHAR	A	upto 50 Nb
BALL VALVES			INTERVALVE POONAWALLA LTD.	INDIA	DR	
BALL VALVES			UNIFLOW	INDIA	DR	
BALL VALVES			DEMBLA VALVES LTD.	INDIA	DR	
BALL VALVES			Hawa Valves (India) Pvt. Ltd.	INDIA	DR	
BALL VALVES			NILON VALVES PRIVATE LIMITED	INDIA	DR	
BALL VALVES			VAAS AUTOMATION PVT. LTD.	INDIA	DR	
3 AIR RELEASE VALVES	III		A.V. VALVES LTD	AGRA	A	
AIR RELEASE VALVES			G.M. DALUI AND SONS PVT.LTD.	HAWRA	A	
AIR RELEASE VALVES			LEADER VALVES LTD.	JALANDER	A	
AIR RELEASE VALVES			R and D MULTIPLES (METAL CAST) PVT LTD	MUMBAI	A	
AIR RELEASE VALVES			UPADHAYA VALVES MANUFACTURERS PRIVATE LIMITED,	KOLKATTA	A	
4 BUTTERFLY VALVES (STEAM SERVICE)	I		INSTRUMENTATION LTD.	PALGHAT	A	
BUTTERFLY VALVES (STEAM SERVICE)			FOURESS ENGG. INDIA LTD.	BANGALORE	A	
BUTTERFLY VALVES (STEAM SERVICE)			AUTALEM, S.L.	SPAIN	DR	
BUTTERFLY VALVES (STEAM SERVICE)			SHENJIANG VALVES CO. LTD.	CHINA	DR	
BUTTERFLY VALVES (STEAM SERVICE)			NENGFA WEIYE TIELING VALVE JOINT STOCK CO. LTD.	CHINA	DR	
5 THERMAL INSULATION - R-MATTRESSES/P-SECN	II		LLOYD INSULATIONS (INDIA) LTD.	DAMAN, DURGAPUR, JAMSHEDPUR	A	
THERMAL INSULATION - R-MATTRESSES/P-SECN			GOENKA ROCKWOOL (INDIA) PVT.LTD,	RAIPUR	A	
THERMAL INSULATION - R-MATTRESSES/P-SECN			ROCKWOOL (INDIA) PVT. LTD.	MEDAK	A	
THERMAL INSULATION - R-MATTRESSES/P-SECN			Polybond Insulation Private Limited,	INDIA	DR	





PROJECT : Maitree STPP (2 x 660 MW)
 PACKAGE : EPC
 Sub Package: Desalination & FGDWWTP
 CONTRACTOR : M/S BHEL
 CONT. NO.

LIST OF ITEMS REQUIRING QP
 APPROVAL & ACCEPTABLE
 VENDOR AS PROPOSED BY
 M/S BHEL

REF NO :
 REVISION NO. 00

DATE : 13th December 2015

8	RUBBER EXPANSION JELLOWS	II	CLYDE UNION LTD	GLASGOW - G44 4EX	A	
		II	BACHMANN INDUS(I) LTD	CHENNAI	N	
		II	KELD ELLENTOFT INDIA PVT. LTD.	CHENNAI	N	
		II	CORI ENGINEERS PVT LTD.	CHENNAI	N	
		II	EAGLE BURGMANN KE PVT.LTD	CHENNAI	N	
		II	HAT RUBBERS	CHENNAI	N	
		II	HITECH JOINTS & LININGS P LTD	CHENNAI	N	
		II	HITECH ENGINEERING	CHENNAI	N	
		II	SHREE RUBBER WORKS,	NAVI MUMBAI	N	
		II	STEAMLINE INDUSTRIES LIMITED	MUMBAI	N	
8	GRP PIPES & PIPE FITTINGS	II	MODERN ENGINEERING PLASTICS PV	SALEM	N	
		II	SHRIRAM SEPL COMPOSITES P LTD	MARSHALL'S ROAD,EGMORE,C	N	
		II	BALAJI FIBER REINFORCE PVT LTD	VADODARA	N	
		II	EPP COMPOSITES PRIVATE LIMITED	RAJKOT	N	
		II	REINHOLD POLY GLASS	HOSUR	N	
9	HP PIPING (SS PIPING AND ROD)	II	CHEMICAL PROCESS PIPING PVT LIMITED	MUMBAI	N	
		II	STANDARD METAL TRADING CO.,	CHENNAI	N	
		II	TUBE PRODUCTS INCORPORATE	BARODA	N	
		II	PADMINI STEELS	MUMBAI	N	

BIFPCL

ENGINEERING DIV / QAI

CONTRACTOR

12/13/2015



PROJECT : Maitree STPP (2 x 60₀ MW)
 PACKAGE : EPC
 Sub Package: Desalination & FGDWWTP
 CONTRACTOR : M/S BHEL
 CONT. NO.

LIST OF ITEMS REQUIRING QP
 APPROVAL & ACCEPTABLE
 VENDOR AS PROPOSED BY
 M/S BHEL

REF NO :
 REVISION NO. 00

DATE : 13th December 2015



10 STEEL TANK

II	CHOKSI TUBE,	MUMBAI	N
II	D.K. CORPORATION,	MUMBAI	N
II	BALWANT STEEL	CHENNAI	N
II	ROSHAN IND CORPORATION	MUMBAI	N
II	TECHNOFAB ENGINEERING LIMITED		N
II	UNITECH MACHINES LTD(INFRASTRUCTURE DIVISION)	GURGAON	N
II	SAKTHI HI-TECH CONSTRUCTIONS PVT LTD	KANCHEEPURAM DISTRICT	N
II	GMW PRIVATE LIMITED	VADODARA	N
II	THERMO PADS (P) LTD	HYDERADAD	N
II	THERMOSYSTEMS PVT. LIMITED.,	HYDERADAD	N
II	TECHNO ELECTRIC & ENGINEERING CO LTD.,	KOLKATA	N
II	BRIDGE AND ROOF CO.(INDIA) LTD.,	CHENNAI	N
II	DIAMOND FABRICATIONS (I) PVT. LTD.,	PUNE	N
II	ION EXCHANGE (I) LTD.,	MUMBAI	N
II	ION EXCHANGE (INDIA) LIMITED,	CHENNAI	N
II	GEO MILLER & COMPANY LIMITED	NEW DELHI	N
II	PARAMOUNT LTD	VADODARA	N
II	THERMAX LIMITED,	PUNE	N
II	VA TECH WABAGH LTD		N
II	BRIPLEX WATER ENGINEERING LIMITED	NEW DELHI	N

11 FGD WASTE WATER TREATMENT PLANT

BIFPCL

4 of 6

ENGINEERING DIV / QAI

CONTRACTOR

12/13/2015

24

BIFPCL	PROJECT : MAITREE (2X660 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL PACKAGE SUB-SYSTEM: BHEL TRICHY, EDN						REF. NO.:		
	PACKAGE : EPC								REV. NO.: 00		
	CONTRACTOR : BHEL										
	CONTRACT NO. :								DATE: 12 TH DECEMBER 2015		
SL. NO.	ITEM	QP/ INSP. CAT.	QP. NO.	QP. SUBMISSION SCHEDULE	QP APPL. SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL/ STATUS/ CAT	SS DETAIL SUB SCHEDULE	SC APPL. SCHEDULE	REMARKS

* - Inspection category will be decided during vendor evaluation.

NOTE - 1 : For the items not appearing in the preaward list, BHEL's approved Vendor list will be used.

NOTE - 2 : For items covered in Annexure-I to B0, Part-B, Section-V, Amendment No 5 of technical specification, BHEL has to furnish the details to establish qualifying / provenness requirement to BIFPCL for review at the time of detailed engineering irrespective of the approval category "A" or "DR" mentioned in the vendor list.



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BIFPCL		PROJECT: Maitree (2x660MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL				Ref No:				
		Package: EPC						Revision No: 00				
		CONTRACTOR: BHEL		QP NO. 9560-102-2		SUB SYSTEM: Steam Generator/RAW MATERIAL S				Date: 13.12.15		
		CONT NO:										
SR NO	ITEM	QP /INS -PN CAT	QP NO.	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS	
1	SEAMLESS TUBES	S				TUBOS REUNIDOS	SPAIN	A			CS, T-11, T-22, T-23, T-91	
		S				Vallorc & Mannesmann	Germany	A			T-92, T-91, T-23, T-22, T-11, CS	
		S				Vallorc & Mannesmann	France	A			T-92, T-91, T-23, T-22, T-11, CS	
		S				TENNARIS GLOBAL (NKK TUBES)	JAPAN	A			T-91, T-22, T-11, CS	
		S				HENGYANG VALIN STEEL TUBE CO	CHINA	A			CS, T-11, T-22 (Note-5 WITH TPI)	
		S				TENNARIS GLOBAL (DALMIN ITALY)	ITALY	A			T-22, T-11, CS	
		S				JIANGSU CHENGDE STEEL TUBE SHARE	CHINA	A			CS & AS UPTO T-22 (Note-5 WITH TPI)	
		S				JFE (KAWASAKI)	JAPAN	A			T-92, T-91, T-22, T-11, CS	
		S				TENNARIS GLOBAL (SILCO, ROMANIA)	ROMANIA	A			CS, T-11, T-22, T-23, T-91	
		S				CHANGZHOU CHANGBAO PRECISION	CHINA	A			CS	
		S				PRODUCTUS TUBLARES	SPAIN	A			T-91, T-22, T-11, CS	
		S				SUMITOMO METALS	JAPAN	A			T-92, T-91, T-23, T-22, T-11, CS	
		S				BENTLER	Germany	A			T-92, T-91, T-22, T-11, CS, SS	
		S				IBF	ITALY	A			T-91, T-22, T-11, CS	



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SR NO	ITEM	QP /INS- PN CAT	QP NO. 9560-102-2	QP SUB- MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHEDULE	SC APPL SCHEDULE	REMARKS
1	SEAMLESS TUBES	\$				WAYMAN GORDAN	USA	A			T-91, T-22, T-11, CS
		\$				BHEL SSTP	TRICHY	A			T22, T11, CS
		\$				JINDAL SAW LTD	NASHIK	A*			CS, T-11, T-22 Sub to Conditions
		\$				REMI	INDIA	A*			CS, T-11, T-22 Sub to Conditions
		\$				ISMT	Ahmednagar/ Baranati	A*			CS, T-11, T-22 Sub to Conditions
		\$				MSL	RAIGAD	A*			CS Sub to Conditions
		\$				BAOSHAN IRON & STEEL CO LTD	CHINA	A*			CS, T-11, T-22 (Note- 5 WITH TPI)
		\$				HMT	GUJRAT	DR			CS
		\$				CHANGZHOU CHANGBAO PRECISION	CHINA	DR			ALLOY UPTOT-22
2	SEAMLESS TUBES (RIFLED)	\$				SALZGITTER MANESSAMANN PRECISION	FRANCE	A			CS
		\$				CHANGZHOU CHANGBAO PRECISION	CHINA	DR			
		\$				BAOSHAN STEEL	CHINA	DR			
		\$				TENNARIS GLOBAL (DALMINE)	ITALY	DR			
		\$				SUMITOMO	JAPAN	DR			
		\$				TUBOS REUNIDOS	SPAIN	DR			
3	SEAMLESS TUBES (SS)	\$				KOBE	JAPAN	A			SS 304, SS 347H
		\$				POSCO SPL STEEL CO	KOREA	A			SS 304, 347H, SUPER 304
		\$				TUBACEX	SPAIN	A			



SR NO	ITEM	QP /INS- PN CAT	QP NO. 9560-102-2	QP SUB-MISSION SCHEDULE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHED ULE	SC APPL SCHED ULE	REMARKS
3	SEAMLESS TUBES (SS)	S				SMST	ITALY	A			SS 304, 347H, SUPER 304
	SEAMLESS TUBES (SS) UPTO DIA < 76.1 MM	S				SUMITOMO METAL IND LTD	JAPAN	A			SS 304, SS 347H, SUPER 304
	SEAMLESS TUBES (SS) UPTO OD 159.0MM & WT- 12.5MM	S				HUADI STEEL GROUP	CHINA	A			SS 304, 304H, 347H (Note-5 WITH TPI)
		S				ZHEJIANG JIULI HI TECH	CHINA	A			SS 304, 304H, 347H (Note-5 WITH TPI)
4	SEAMLESS PIPES	S				TUBACEX	SPAIN	A			SS PIPES
		S				SUMITOMO METALS	JAPAN	A			P-92, P-91, P-22, P-11, CS
		S				Vallorec & Mannesmann	France	A			P-92, P-91, P-22, P-11, CS
		S				HENGYANG VALIN STEEL TUBE CO	CHINA	A			CS
		S				BHEL SSTP	TRICHY	A			CS
		S				Yangzhou Chengde Steel Pipe Co Ltd	CHINA	A			CS
		S				TUBOS REUNIDOS	SPAIN	A			P-91, P-22, P-11, CS
		S				VALCONVY TRUB CHOMUTOV	CZECH REP	A			CS, P11, P22
		S				ARCELOR MITTAL	ROMANIA	A			CS
		S				WAYMAN GORDAN	USA	A			P-91, P-22, P-11, CS
		S				TENNARIS GLOBAL (NKK TUBES)	JAPAN	A			P-91, P-22, P-11, CS
		S				IBF SPA	ITALY	A			P-92, P-91, P-22, P-11, CS
		S				JFE (KAWASAKI)	JAPAN	A			P-92, P-91, P-22, P-11, CS

SR NO	ITEM	QP /INS- PN CAT	QP NO. 9560-102-2	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
4	SEAMLESS PIPES	\$				PRODUCTUS TUBLARES	SPAIN	A			P-91, P-22, P-11, CS
		\$				Vallorec & Mannesmann	Germany	A			P-92, P-91, P-22, P-11, CS
		\$				TENNARIS GLOBAL (Dalmine)	Italy	A			P-91, P-22, P-11, CS
		\$				JINDAL SAW LTD	NASHIK	A*			CS, P-11, P-22, Sub to Conditions
		\$				ISMT	Ahmednagar/ Baramati	A*			CS, P-11, P-22, Sub to Conditions
		\$				Yangzhou Chengde Steel Pipe Co Ltd	CHINA	A*			P-11, P-22 (Sub to Conditions)
		\$				MSL	RAIGAD	A*			CS Sub to Conditions
		\$				REMI	BHARUCH	A*			CS, P-11, P-22, Sub to Conditions
		\$				RATNAMANI	MUMBAI	DR			CS
		\$				ZIZIANG GROSS	CHINA	DR			CS
	SEAMLESS PIPES (DIA UPTO 159 MM)	\$				TENNARIS GLOBAL (SILCO TUBES)	ROMANIA	A			P-91, P-22, P-11, CS
	SEAMLESS PIPES (UPTO 160 MM)	\$				BENTLER	Germany	A			P-92, P-91, P-22, P-11, CS
	SEAMLESS PIPES (UPTO 219.0 MM)	\$				JIANGSU CHENGDE STEEL TUBE SHARE	CHINA	A			CS & AS UPTO P-22 (Note-5 WITH TPI)
	SEAMLESS PIPES (UPTO 88.9 MM)	\$				BAOSHAN IRON & STEEL CO LTD	CHINA	A*			CS
	SEAMLESS PIPES (UPTO OD 914 X WT 102 MM)	\$				RINGMIL	ITALY	A			FORGED CS PIPE
5	PLATES & ROLLED SECTION (UPTO GRADE 91)	\$				INDUS STEEL BELGIUM	BELGIUM	A			CS BASIS, AS UPTO Gr-91



SR NO	ITEM	QP /INS- PN CAT	QP NO. 9560-102-2	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
7	PLATES & ROLLED SECTION (CS)	\$				ARCELOR MITTAL GALATI	ROMANIA	A			CS PLATES UPTO 80 MM
		\$				JSW STEEL LTD	INDIA	A			STRUCTURAL STEEL
		\$				RINL	INDIA	A			STRUCTURAL STEEL
		\$				ESSAR STEEL LTD	INDIA	A			STRUCTURAL STEEL
		\$				TISCO	INDIA	A			STRUCTURAL STEEL
		\$				LIYODS STEEL INDS LTD (UTTAM VALUE STEEL)	INDIA	A			STRUCTURAL STEEL
		\$				ISPAT INDUSTRIES LTD	INDIA	A			STRUCTURAL STEEL
		\$				JSPL	INDIA	A			STRUCTURAL STEEL
		\$				SAIL	INDIA	A			STRUCTURAL STEEL
		\$				AZOVSTAL	UKRAINE	DR			
8	PLATES (SS)	\$				OUTOKUMPU	SWEDEN	A			SS PLATES UPTO 20 MM THK
		\$				INDUSTEEL BELGIUM	BELGIUM	A			GR-304, 309, 310, 316
		\$				ISL STAINLESS	JAIPUR	A			LINER SS 304
		\$				INDUSTEEL LOIRE	FRANCE	A			GR-304, 309, 310, 316
		\$				SAIL	BHILAI / SALEM	A			GR-304, 309, 310, 316
		\$				COLUMBUS STAINLESS STEEL (ACRINOX)	SOUTH AFRICA	A			GR-304, 309, 310, 316
		\$				NIPPON STEEL CORP	JAPAN	DR			

SR NO	ITEM	QP /INS- -PN CAT	QP NO. 9560-102-2	QP SUB- MISSION SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHED ULE	SC APPL SCHED ULE	REMARKS
8	PLATES (SS)	\$			THYSEEN KRUPP	GERMANY	DR			
		\$			SUMITOMO	JAPAN	DR			
		\$			ACRONI SLOVENIS	JAPAN	DR			
		\$			DKC	KOREA	DR			



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SR NO	ITEM	QP /INS -PN CAT	QP NO. 9560-102-2	QP SUB-MISSION SCHEDULE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHED ULE	SC APPL SCHED ULE	REMARKS
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1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY BIFPCL)

A - For those items proposed vendor is acceptable to BIFPCL. To be indicated with letter "A" in the list alongwith the condition of approval, if any.

DR - For those items "Detailed Required" for BIFPCL review. To be identified with letter "DR" in the list.

DR* - For those item "Detail Required by BIFPCL for record updation only

NOTED : For these items vendors are approved by Main Supplier and accepted by BIFPCL without specific vendor approval from BIFPCL. To be identified with "NOTED"

2.0 QP INSPECTION CATEGORY :

CAT - I : For those items the Quality Plans are approved by BIFPCL and final acceptance will be on physical inspection witness by BIFPCL

CAT - II : For those items the Quality Plans are approved by BIFPCL. However no physical inspection shall be done by BIFPCL. The final acceptance by BIFPCL shall be on the basis of review of documents.

CAT - III : For those items Main supplier approves Quality Plans. The final acceptance by BIFPCL shall be on the basis of Certificate of Conformance by main supplier.

* Inspection category will be decided during vendor evaluation.

NOTE - 1 : For the items not appearing in this preaward list, BHEL 's approved Vendor list will be used.

NOTE - 2 : For items covered in Annexure-I to B0, Part-B, Section-V, Amendment No 5 of technical specification, BHEL has to furnish the details to establish qualifying / provenness requirement to BIFPCL for review at the time of detailed engineering irrespective of the approval category "A" or "DR" mentioned in the vendor list.



PROJECT : Maitree STPP (2 x 60 MW)
PACKAGE : EPC
Sub Package: Steam Generator (BHEL-Trichy)-
Additional
CONTRACTOR : M/S BHEL
CONT. NO.

LIST OF ITEMS REQUIRED & QP
APPROVAL & ACCEPTABLE
VENDOR AS PROPOSED BY
M/S BHEL

REF NO :
REVISION NO. 00
DATE : 13th December 2015

S.No	ITEM	QP / Insp Cat.	QP No.	Proposed Sub-Supplier	Place	Sup' approval status / cat	Remarks
1.	SEAMLESS PIPES			JIANGSU CHENGDE STEEL TUBE	CHINA	DR	FOR CS GRADE
2.	SEAMLESS PIPES			YANGZHOU CHENGDE STEEL TUBE CO LTD	CHINA	DR	FOR CS GRADE
3.	SEAMLESS PIPES			HENGYANG	CHINA	DR	FOR P12,P22 & P91 GRADE
4.	SEAMLESS PIPES			ZIZIANG GROSS	CHINA	DR	FOR CS,AS & P91 GRADE
5.	SEAMLESS TUBES			JANGSU WUJIN STAINLESS STEEL PIPE	CHINA	DR	FOR SS304,304H,347H GRADE
6.	Gratings & Platforms			PINAX STEEL INDUSTRIES PVT.LTD	India	DR	
7.	Gratings & Platforms			VINFAB ENGINEERS INDIA PVT LTD	India	DR	
8.	Gratings & Platforms			ANKIT ELECTROGRATING	India	DR	
9.	Light Bonded Mineral Wool			POLYBOND INSULATION PVT.LTD	India	DR	
10.	Castable Refractory			ABS REFRACTORIES PVT.LTD	India	DR	
11.	Castable Refractory			INDUSTRIAL ASSOCIATES	India	DR	
12.	Castable Refractory			CASTWEL INDUSTRIES	India	DR	
13.	Pourable Insulation			ABS REFRACTORIES PVT.LTD	India	DR	
14.	Pourable Insulation			INDUSTRIAL ASSOCIATES	India	DR	
15.	Pourable Insulation			CASTWEL INDUSTRIES	India	DR	
16.	HEA Ignitor			FIVES COMBUSTION SYSTEMS PVT. LTD	India	DR	
17.	Control Valve for Start up system			KOSO INDIA PRIVATE LIMITED	India	DR	
18.	Control Valve for Start up system			CONTROL COMPONENT INDIA PVT LTD	India	DR	
19.	Control Valve for Soot blower pressure reducing, SH/RH			CONTROL COMPONENT INDIA PVT LTD	India	DR	

SR NO	ITEM	QP /INS -PN CAT	QP NO. 9560-102-2	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
31	HANGER & SUPPORTS - (Other than CLH & VLH)	I				BHEL	TRICHY	A			
32	SNUBBERS	III				PIPE SUPPORTS	U K	N			
		III				CARPENTER PATTERSON	U K	N			
		III				SANWA TAKI	JAPAN	N			
		III				LIEBGA	GERMANY	N			
		III				ITT GRINELL	GERMANY	N			
33	CONVENTIONAL VALVES (Gate, Globe & check) BHEL RANGE	I				BHEL	TRICHY	A			
34	OTHER VALVES (2/3 WAY VALVES) BHEL RANGE	I				BHEL	TRICHY	A			
35	CONVENTIONAL VALVES (Gate, Globe & check) OTHER THAN BHEL	I				VELAN	H4TIX8 Montreal Canada	A			Gate/Check v/v upto 22"CI 2500
		I				LEADER VALVES	JALANDHAR	A			CCS Globe v/x 24"CI 600, Globe v/v 24"CI 300, Check v/v 24"CI 600
		I				CRESCENT VALVES	MUMBAI	A			UPTO NB 300 CI 600
		I				VELAN VALVE CORP	USA	A			Gate v/v 2-24"CI 900-4500, Cast Steel Gate v/v 18-48"CI 150-600
		I				VELAN	UK	A			1) Globe v/v 1/4"-2"CI 4500, 2) Bonnetless Globe v/v 1/2-2.5"CI 150-600
						VELAN	Quebec Canada	A			Gate/Globe/Check v/v upto 3"CI 2680



SR NO	ITEM	QP /INS- PN CAT	QP NO. 9560-102-2	QP SUB-MISSION SCHEDULE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHED ULE	SC APPL SCHED ULE	REMARKS
35	CONVENTIONAL VALVES (Gate, Globe & check) OTHER THAN BHEL	I				L&T VALVES	COIMBATOR E	A			1) CAST 2500 CL; Gate(CS&AS) upto 20" & Check(CS&AS) upto 16", 2) Forged 4500 CI (CS&AS) Gate upto 1" & Globe/Check upto 2"
		I				BDK	HUBLI	A			UPTO NB 300 & CL600, FORGED UPTO NB 50 CL 800
		I				FOURESS ENGG. INDIA LTD.	MUMBAI	A			UPTO NB 200 CL 600; NB 250-600 CL 300
		I				NITON VALVES	AURANGAB AD	A			WCB/WCC (Gate valve upto 36 "CI 600)
		I				SAMSHIN	SOUTH KOREA	A			2500 CI Gate/Globe/Check upto 24" ; CI 3500 Gate upto 18" & Globe upto 6"; 4500 CI Gate upto 6" & Globe/Check/Angle upto 2"
		I				VELAN	H4T1G2 Montreal Canada	A			Gate/Globe/Check upto 24 "CI 4500
		I				VELAN	PORTUGAL	A			Cast Steel Gate/Globe/Check 2-12"CI 150-600
		I				ROCKWELL	USA	A*			
		I				CRIS	FRANCE	A*			
		I				OKANO VALVES	JAPAN	A*			
		I				RAIMONDI	ITALY	A*			
		I				HP VALVES	NETHERLANDS	A*			Trim Valves

Protect

SR NO	ITEM	QP /INS- -PN CAT *	QP NO. 9560-102-2	QP SUB- MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHEDULE	SC APPL SCHEDULE	REMARKS
35	CONVENTIONAL VALVES (Gate, Globe & check) OTHER THAN BHEL	1				FLOW SERVE	USA	A*			
		1				DRESSER MASONNEILAN	USA	A*			
		1				OKANO VALVES	JAPAN	A*			
		1				TOA	JAPAN	A*			
		1				CRIS	FRANCE	A*			
		1				TYCO SEMPELL	GERMANY	A*			
		1				MIL CONTROLS	KERALA	A*			
		1				FOURESS INDIA	INDIA	A*			
		1				DEUTSCHE BABCOCK	GERMANY	A*			
		1				KSB	COIMBTOR E	A*			
		1				SPX PROCESS EQUIPMENTS / COPEL VULCAN	USA	A*			
		1				TOA/MEIWA	JAPAN	A*			
		1				RAIMONDI	ITALY	A*			
		1				BABCOCK BORSING	ESPANA	A*			
		1				DEWARNC	UK	A*			
36	SAFETY VALVE (SPRING TYPE)	1				DRESSER	USA	A			
		1				SEMPPELL AG	GERMANY	A			
	SAFETY VALVES (SPRING TYPE)	1				TYCO (PENTAIR VALVES & CONTROLS)	USA	A			
		1				FLIKUI	JAPAN	A			
		1				RIENEKE GMBH	GERMANY	A			HYD TYPE
		1				BOPP & REUTHER	GERMANY	A			HYD TYPE

SR NO	ITEM	QP /INS- PN CAT	QP NO. 9560-102-2	QP SUB- MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHEDULE	SC APPL SCHEDULE	REMARKS
36	SAFETY VALVES (SPRING TYPE)	I				VALVE TECHNOLOGIES	USA	A*			
		I				MEIWA	JAPAN	A*			
		I				BHEL	TRICHY	A*			
37	ERV	I				VALVE TECHNOLOGIES	USA	A	BHEL, INDIA IS ALSO ACCEPTABLE		
		I				FUKUI	JAPAN	A			
		I				SEMPELL AG	GERMANY	A			
		I				DRESSER	USA	A			
		I				MEIWA CORP	JAPAN	A*			
		I				RIEKE GMBH	GERMANY	A*			
38	PLUG VALVE	II				FLOWERVE INDIA CONTROLS	KANCHIPU RAM	A			UPTO 150 NB CL 300, UPTO 400 NB CL 150
		II				3Z CORP	KOREA	A*			
		II				BDK	HUBLI	A*			
		II				ZED VALVES CO. PVT. LTD.	AHMEDAB AD	DR			
39	SILENCERS	III				BBM ACCOSTIC	PUNE	N			
		III				INDIRA INDUSTRIES	RANIPET	N			
		III				BURGESS MANNING	USA	N			
		III				CCI FLUID KINETICS	USA	N			
		III				CCI	HOSUR	N			
		III				PR ACOUSTIC	TRICHY	N			
40	MAIN & AUX COLUMNS, CEILING GIRDERS, BUILT UP BEAMS	I				BHEL	TRICHY	A			

SR NO	ITEM	QP /INS- -PN CAT	QP NO. 9561-101	QP SUB- MISSION SCHEDULE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS /CAT	SS DETAIL SUB- SCHED ULE	SC APPL SCHED ULE	REMARKS
15	SCREW PUMP FOR LOS	III				ALEKTON	CHENNAI	A			
		III				KRAL	AUSTRIA	A			
		III				TUSHACO (DELTA),	DAMAN	A*			
		III				DELTA PD PUMPS PVT. LTD.	MUMBAI	DR			
		III				UT PUMPS	FARIDABA D	DR			
16	EMITTING ELECTRODE FOR ESP	II				SIVA SPRINGS	MADURAI	A			
		II				VENKATESWARA STEEL & SPRINGS (INDIA) PVT LTD	COIMBATO RE	A			
		II				NAGAPPASPRINGS	RANIPET	A			
		II				KWALITY COILS	MADURAI	A			
		II				BEST COILS	RANIPET	A*			
17	COLLECTING ELECTRODE FOR ESP	II				BHEL	RANIPET	A			
18	COLUMNS OF ESP SUPPORTING STRUCTURES	I				BHEL & NTPC APPD SUBCONTRACTORS WITH BHEL MATERIAL	RANIPET	A			
19	ROOF BEAMS	I				BHEL & NTPC APPD SUBCONTRACTORS WITH BHEL MATERIAL	RANIPET	A			
20	COLLECTING/ EMITTING ELECTRODE SUSPENSION ASSY	II				BHEL & NTPC APPD SUBCONTRACTORS WITH BHEL MATERIAL	RANIPET	A			
21	ELECTRICALLY OPERATED HOIST FOR ESP-3 TON CAPACITY	III				BHEL & NTPC APPD SUBCONTRACTORS WITH BHEL MATERIAL	RANIPET	A			



SR	ITEM	QP /INS- -PN CAT	QP NO. 9561-101	QP SUB- MISSION SCHEDU -LE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS /CAT	SS DETAIL SUB- SCHED ULE	SC APPL SCHED ULE	REMARKS
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1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY BIFPCL)

A - For those items proposed vendor is acceptable to BIFPCL. To be indicated with letter "A" in the list along with the condition of approval, if any.

DR - For those items "Detailed Required" for BIFPCL review. To be identified with letter "DR" in the list.

DR* - For those item "Detail Required by BIFPCL for record updation only

NOTED : For these items vendors are approved by Main Supplier and accepted by BIFPCL without specific vendor approval from BIFPCL. To be identified with "NOTED"

2.0 QP INSPECTION CATEGORY :

CAT - I : For those items the Quality Plans are approved by BIFPCL and final acceptance will be on physical inspection witness by BIFPCL

CAT - II : For those items the Quality Plans are approved by BIFPCL. However no physical inspection shall be done by BIFPCL. The final acceptance by BIFPCL shall be on the basis of review of documents.

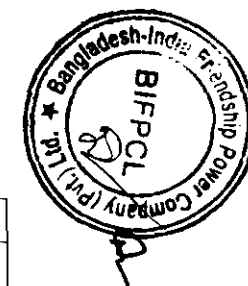
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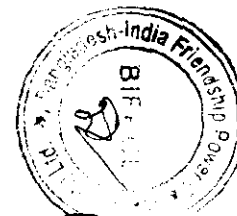
NOTE - 1 : For the items not appearing in this preaward list, BHEL's approved Vendor list will be used.

NOTE - 2 : For items covered in Annexure-I to B0, Part-B, Section-V, Amendment No 5 of technical specification, BHEL has to furnish the details to establish qualifying / provenness requirement to BIFPCL for review at the time of detailed engineering irrespective of the approval category "A" or "DR" mentioned in the vendor list.

	PROJECT: MAITREE, 2X660 MW PACKAGE: TG PACKAGE CONTRACTOR: BHEL HARIDWAR CONTRACT NO.:		LIST OF ITEM SREQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL SUB SYSTEM: C & I				REFNO.:00 REV NO.:00 Date:14.12.2015	
	SI No.	Item	LIST OF IT EMS	Vendor/Manufacturer Name	Place	SC A PP L_S	Remarks	



2.	Thermocouples	*		SiemensLimited	Gurgaon	DR	
3.	Fibre optic Gen End Winding VibrationMonitoring System	II		Vibro System INC	Canada	A	Refer Note 1
3.	Fibre optic Gen End Winding VibrationMonitoring System	II		MC-Monitoring SA	Switzerland	A	Refer Note 2
3.	Fibre optic Gen End Winding VibrationMonitoring System	*		SiemensLimited	Gurgaon	DR	
4.	Level Switch (Float/Displacer Type)	III		Chemtrols Samil	Mumbai	A	
4.	Level Switch (Float/Displacer Type)	III		Pune Techtrols	Pune	A	
4.	Level Switch (Float/Displacer Type)	III		Levcon Instruments	Kolkata	A	
4.	Level Switch (Float/Displacer Type)	III		SBEM	Pune	A	
4.	Level Switch (Float/Displacer Type)	III		SiemensLimited	Gurgaon	A	
4.	Level Switch (Float/Displacer Type)	III		DKInstruments	Kolkata	A	
4.	Level Switch (Float/Displacer Type)	III		V Automat&Instruments	NewDelhi	A	
4.	Level Switch (Float/Displacer Type)	III		Magnetrol Instruments	Belgium	A	
4.	Level Switch (Float/Displacer Type)	III		Endress& Hauser Instruments	Switzerland / Aurangabad	A	
4.	Level Switch (Float/Displacer Type)	*		Pratolina Instruments	Mumbai	DR	
5.	Pressure/Differential Pressure Gauge	III		Manometer India	Mumbai	A	
5.	Pressure/Differential Pressure Gauge	III		H Guru Instruments(South India)	Bangalore	A	

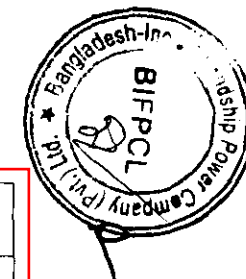


	PROJECT: MAITREE, 2X660 MW PACKAGE: TG PACKAGE CONTRACTOR: BHEL HARIDWAR CONTRACT NO.:		LIST OF ITEM SREQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL SUB SYSTEM: C & I				REFNO.:00 REV NO.:00 Date:14.12.2015	
	SI No.	Item	LIST OF IT EMS	Vendor/Manufacturer Name	Place	SC_A PP L_S	Remarks	

5.	Pressure/Differential Pressure Gauge	III		H Guru Instruments	Muzaffarpur Risra	A	
5.	Pressure/Differential Pressure Gauge	III		FISCHER MESS & REGELTECHNIK	Germany	A	
5.	Pressure/Differential Pressure Gauge	III		Baumer Technologies	Vapi	A	
5.	Pressure/Differential Pressure Gauge	III		GluckIndia	Mumbai	A	
5.	Pressure/Differential Pressure Gauge	III		A N Instruments	Narendrapur	A	
5.	Pressure/Differential Pressure Gauge	III		Ashcroft	Gandhinagar	A	
5.	Pressure/Differential Pressure Gauge	III		Wika Instruments	Pune	A	
5.	Pressure/Differential Pressure Gauge	III		NSRT	Kolkata	A	
5.	Pressure/Differential Pressure Gauge	III		PTCI	Kolkata	A	
5.	Pressure/Differential Pressure Gauge	*		Siemens Limited	Gurgaon	DR	
5.	Pressure/Differential Pressure Gauge	III		Walchand nagar Industries	Attikolla, Dharwad	A	
5.	Pressure/Differential Pressure Gauge	*		New Scientific Repairs & Tradi	KOLKATA	DR	

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	PROJECT: MAITREE, 2X660 MW PACKAGE: TG PACKAGE CONTRACTOR: BHEL HARIDWAR CONTRACT NO.:		LIST OF ITEM SREQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL SUB SYSTEM: C & I				REFNO.:00
							REV NO.:00
							Date:14.12.2015
SI No.	Item	LIST OF IT EMS		Vendor/Manufacturer Name	Place	SC A PP L_S	Remarks

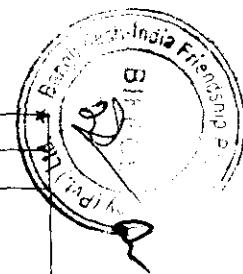


5.	Pressure/Differential Pressure Gauge	*		Forbes Marshall (Hyd) Pvt Ltd	IDA Nacharam, Medak	DR	
6.	Pressure/DP/Flow Transmitters	II		ABB Limited	Bangalore	A	2600 T series
6.	Pressure/DP/Flow Transmitters	II		Emerson Process Management	Pawane	A	
6.	Pressure/DP/Flow Transmitters	III		Fuji Electric System	Japan /China	A	
6.	Pressure / D P / Flow Transmitters	II		Laxsons Automation	Daman	A	M/s Smar Brazil Make
6.	Pressure/DP/Flow Transmitters	III		ABB Utility Automation	Germany	A	2600 T series
6.	Pressure/DP/Flow Transmitters	III		Yokogawa India	Bangalore	A	Make M/s Yokogawa, Japan
6.	Pressure/DP/Flow Transmitters	III		Siemens Limited	Thane	A	
6.	Pressure/DP/Flow Transmitters	*		Chino corporation India	Ghaziabad	DR	
7.	Instrumentation Cables	II		Paramount Communication	Khuskhera	A	For PVC, FRLS
7.	Instrumentation Cables	II		KEI industries	Bhiwadi	A	For PVC, FRLS
7.	Instrumentation Cables	II		Delton Cables	Faridabad	A	For PVC, FRLS
7.	Instrumentation Cables	II		Cords Cables	Bhiwadi	A	For PVC, FRLS
7.	Instrumentation Cables	II		Elkay Telelinks	New Delhi	A	For PVC, FRLS
7.	Instrumentation Cables	II		Universal Cables	Satna	A	For PVC, FRLS

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III



	PROJECT: MAITREE, 2X660 MW PACKAGE: TG PACKAGE CONTRACTOR: BHEL HARIDWAR CONTRACT NO.:	LIST OF ITEM SREQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL SUB SYSTEM: C & I				REFNO.:00	
						REV NO.:00	
						Date:14.12.2015	
SI No.	Item	LIST OF IT EMS		Vendor/Manufacturer Name	Place	SC_A PP L_S	Remarks

7.	Instrumentation Cables	II		NICCO Corporation	Kolkata	A	For PVC, FRLS
7.	Instrumentation Cables	II		Thermo Cables Ltd.	Hyderabad	A	For PVC, FRLS
7.	Instrumentation Cables	*		Advance Cable Technologies	Bangalore	DR	
7.	Instrumentation Cables	*		Manoj Cables Limited	Delhi	DR	
7.	Instrumentation Cables	*		Pagoda Cables Pvt. Ltd.	Delhi	DR	
8.	Gas Analyser Cabinet	I		ABB Limited	Bangalore	A	H2 Analyser imported from ABB, Germany
8.	Gas Analyser Cabinet	I		Adage Automation	Mumbai	A	Hydrogen Gas Analyser (Calomat 6) will be Imported from Siemens Germany
8.	Gas Analyser Cabinet	I		Yokogawa India	Bangalore	A	Analyser will be imported from M/S Yokogawa Electric Corporation (YEC), Japan (Micro Processor based, Working on Gas Density Principle).
8.	Gas Analyser Cabinet	I		Siemens Limited	India	A	H2 Analyser imported from Siemens, Germany
9.	Conductivity Analyser (Conduction Measuring Equipment)	*		Forbes Marshall	Pune	DR	
9.	Conductivity Analyser (Conduction Measuring Equipment)	III		ABB India Limited	Bangalore/Dehradun	A	Make:ABB,USA/UK

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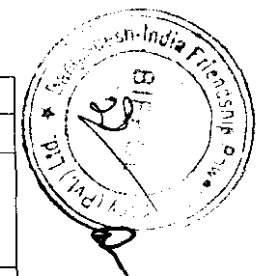
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PROJECT: MAITREE, 2X660 MW
PACKAGE: TG PACKAGE
CONTRACTOR: BHEL
HARIDWAR
CONTRACT NO.:

**LIST OF ITEM SREQUIRING QUALITY PLAN AND
SUB CONTRACTOR APPROVAL SUB SYSTEM: C & I**

REFNO.:00
REV NO.:00
Date:14.12.2015



SI No.	Item	LIST OF ITEMS	Vendor/Manufacturer Name	Place	SC A PP L_S	Remarks
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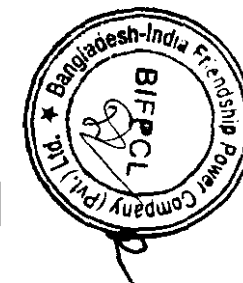
11.	Pressure / DP Switch	*	BOLL & KIRCH	Germany	DR	
11.	Pressure / DP Switch	*	IMI Norgren Herion	India	DR	
11.	Pressure / DP Switch	*	Trafag Controls India Private	Gurgaon	DR	
12.	Capacitance type Level Transmitters/Switches	III	Magnetrol Instruments	Belgium	A	Application Capacitance Level Switches-Generator & Turbine Capacitance type Level Transmitters-Generator (Primary Water Tank)
12.	Capacitance type Level Transmitters/Switches	III	Endress+Hauser Instruments	Switzerland / Aurangabad	A	
12.	Capacitance type Level Transmitters/Switches	II	NIVO Controls	Indore	A	
12.	Capacitance type Level Transmitters/Switches	II	SBEM Pvt. Ltd.,	Pune	A	
12.	Capacitance type Level Transmitters/Switches	*	DK Instruments	Kolkata	DR	
13.	Guided Wave Radar Level Transmitters	III	Magnetrol Instruments	Belgium	A	Application-Main Oil Tank & Control Fluid Tank
13.	Guided Wave Radar Level Transmitters	III	Endress+Hauser Instruments	Switzerland / Aurangabad	A	Application- Main Oil Tank & Control Fluid Tank
14.	Position Transmitters	III	Siemens Limited	Gurgaon	A	Make-M/s Siemens, Germany
14.	Position Transmitters	III	ABB Limited	Bangalore/ Dehradun	A	Make-M/s ABB Germany
14.	Position Transmitters	III	Electronics Corporation	Hyderabad	DR	
14.	Position Transmitters	*	BI Enterprises	Mumbai	DR	

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	PROJECT: MAITREE, 2X660 MW PACKAGE: TG PACKAGE CONTRACTOR: BHEL HARIDWAR CONTRACT NO.:		LIST OF ITEM SREQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL SUB SYSTEM: C & I				REFNO.:00	
							REV NO.:00	
							Date:14.12.2015	
SI No.	Item	LIST OF ITEMS		Vendor/Manufacturer Name	Place	SC A PP L_S	Remarks	
14.	Position Transmitters	*		Curtiss Wright Corporation	USA	DR		



LEGENDS :

DR-Detailed Required.

CAT- I:For those items the Quality Plans are approved by BIFPCL and final acceptance will be on physical inspection witness by BIFPCL.

CAT- II : For those items the Quality Plans are approved by BIFPCL. However no physical inspection shall be done by BIFPCL. The final acceptance by BIFPCL shall be on the basis of review of documents.

CAT- III : For those items Main supplier approves Quality Plans. The final acceptance by BIFPCL shall be on the basis of Certificate of Conformance by main supplier.

*- Inspection category will be decided during vendor evaluation.

Note 1: Wired Panel along with standard bought out items like Blank panel / enclosure, accessories like Ethernet switch, Power Supply, Terminal, MCB are accepted from indigenous suppliers acceptable to BIFPCL and tied up in QP.

Note 2:For items covered in Annexure-I to BO, Part-B, Section-V, Amendment No 5 of technical specification, BHEL has to furnish the details to establish qualifying / provenness requirement to BIFPCL for review at the time of detailed engineering irrespective of the approval category "A" or "DR" mentioned in the vendor list.

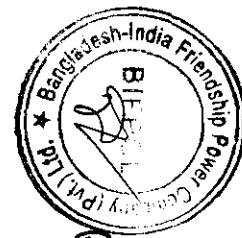
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		PROJECT : Maitree STPP (2 x 660 MW)					LIST OF ITEMS REQUIRING QP			REF. NO :	
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN					VENDOR AS APPROVED BY			DATE : 12/12/2015	
		CONTRACT NO :									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		*				Greenback Energy Solutions Inc.	USA	DR			
		*				BHELSONIC	Trichy	DR			
13	Coal bunker Level monitor	%				%					% - Type, vendor and inspection category will be decided during detail Engineering.
14	Tube thickness Meter	III				Main Supplier approved sources		NOTE D			
15	POSITIVE DISPLACEMENT FLOW METER/ TRANSMITTER	II				BROOKS	USA	A			
		II				BOPP & ROUTHIER	GERMANY	A			
		II				OVAL	JAPAN	A			
		I				Tosniwal Corporation	Chennai	A			Up to 4 inch only
16	Coriolis Type Mass Flow meter	III				Krohne	Germany	NOTE			Subject to type acceptance from BIFPCL Engineering.
		III				E & H	Aurangabad	NOTE			
		III				Siemens	Germany	NOTE			
		III				Yokogawa	Bangalore	NOTE			
		III				Emerson	Pawane	NOTE			
17	Control Valve for Start Up System	II				CCI	USA/Switzerland/Korea	A			
		II				Tyco Sampell	Germany	A			
		*				EMERSON (Fisher)	USA/France/Japan	DR			Reference list and performance feedback are to be submitted.
		*				Dressor Masoneilan	France	DR			
		*				KOSO	Japan	DR			
		*				HORA	Germany	DR			
		*				CCI	Sricity	DR			



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		PROJECT : Maitree STPP (2 x 660 MW)					LIST OF ITEMS REQUIRING QP			REF. NO :	
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN					VENDOR AS APPROVED BY			DATE : 12/12/2015	
		CONTRACT NO :									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval I SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
23	Temperature Transmitter	III				EMERSON	U.S.A/Pawane / Singapore	A			
		III				Yokogawa	Japan	A			Final testing at M/S YIL, Bangalore is also acceptable
		III				Moore	USA	A			
		III				M System	JAPAN	A			
		III				ABB	GERMANY/Faridabad	A			
		III				ENDRESS & HOUSER	Aurangabad	A			
		*				Khrone		DR			M/s BHEL will forward only two proposals after details review of BIFPCL Technical specification requirements.
		*				Tokyo Keiso	Japan	DR			
		*				INOR	Sweden	DR			
		*				P & F	India	DR			
		*				Siemens		DR			
		*				Yamatake	JAPAN	DR			
		*				Yamari	JAPAN	DR			
		*				Foxboro		DR			
25	Electronic transmitters (pressure, DP)	III				EMERSON (Rosemount)	USA/ Pawane	A			
		III				FUJI ELECTRIC	China	A			
		III				YOKOGAWA	JAPAN	A			Testing and Calibration at M/s YIL, Bangalore is also acceptable.
		I				ABB	FARIDABAD	A			Model - 2600 T
		III				ABB	GERMANY / Italy	A			Model - 2600 T
		III				Siemens	France / India	A			
		III				Honeywell	Pune	A			
		*				ENDRESS & HOUSER	Aurangabad/ Germany	DR			
26	Thermocouples, RTD & Thermowell	III				HERAUS SENSOR	GERMANY	A			
	Refer Note - 2	III				WISE Control	Korea	A			
		II				Tempens	Udaipur	A			
		II				Pyroelectric	Goa	A			

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		PROJECT : Maitree STPP (2 x 660 MW)					LIST OF ITEMS REQUIRING QP			REF. NO :	
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN					VENDOR AS APPROVED BY			DATE : 12/12/2015	
		CONTRACT NO :									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		*				HBL Power Systems	India	DR			M/s BHEL will forward only two proposals after details review of BIFPCL Technical specification requirements.
		*				Dubas	India	DR			
		*				Chloride Power Systems (caldyne)	India	DR			
		*				Universal Instrument manufacturing co P Ltd	India	DR			
		*				Hind Rectifier Ltd	India	DR			
38	Battery Health Monitoring System	III				Emerson	Mumbai	A			
		III				Eltek SGS Pvt Ltd	Gurgaon	A			
		*				B Tech Inc	USA	DR			
		*				Hitachi Hi Rel	Gandhinagar	DR			
		*				Hopeckee	Germany	DR			
39	Battery(Ni-cd)	I				AMCO SAFT	Bangalore	A			
		II				SAFT	France/Sweede	A			
		I				HBL POWER	Hyderabad	A			
		*				Hopeckee	Germany	DR			
40	Battery (Lead Acid Tubular / Plante)	I				Exide	Kolkata	A			
		I				HBL POWER	Hyderabad	DR			Only for tubular
		I				Hopeckee	Germany	DR			
41	Impulse pipe & tubes	II				Maharashtra Seamless	Raigarh	A			Carbon steel only
		II				Sumitomo/kawasaki/Nippon	Japan	A			
		II				TPS TECHNITUBE	Germany	A			
		II				Veluric & manessmann	Germany	A			
		II				BHEL	Trichy	A			
		II				Trouvay and Cauvin	France	A			Makes shall be as per approved list (Sr. No. 41)
		II				ISMT	Ahamadnagar	A			Carbon steel only.
		II				Sandvik		A			For SS only.
		*				Jindal saw	India	DR			
		*				Ratanamani Metal and	Ahamadabad	DR			
		*				Shubhalaxmi Metal and	Mumbai	DR			
45	Local Instrument Enclosure/Rack	I				Pyrotech	Udaipur	A			
		I				Instrumentation Limited	Kota	A			

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		PROJECT : Maitree STPP (2 x 660 MW)					LIST OF ITEMS REQUIRING QP			REF. NO :	
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN					VENDOR AS APPROVED BY			DATE : 12/12/2015	
		CONTRACT NO :									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		I				Sajas electrical	Trichurapalli	A			
		I				Prammen	Puddukottai	A			
		I				Chemin	Pondicherry	A			
		*				Forbes Marshall	Pune	DR			
		*				Procon	Chennai	DR			
46	Instrument Cables	II				Paramount	Khushkhera	A			PVC,FRLS type,RQP
		II				Polycab	Daman	A			PVC,FRLS type,RQP
		II				Delton	Faridabad	A			PVC,FRLS type,RQP
		II				KEI	Bhiwadi	A			PVC,FRLS type
		II				Elkey Telelinks	Faridabad	A			PVC,FRLS type
		II				CORDS	Bhiwadi	A			PVC,FRLS type,RQP
		II				CORDS	Kaharani	A			PVC,FRLS type,RQP
		II				Nicco	Kolkata	A			PVC,FRLS type
		II				TEW & C	USA	A			
		II				Habia cables	Sweedan	A			
		II				Kerpen cables	Germany	A			
		II				Lapp cables	Germany	A			
		II				Thermo electra Bv	Netherland	A			
		II				Universal Cable	Satna	A			PVC,FRLS type
		II				Thermocables	Hyderabad	A			
		II				Finolex Cable	Pune	DR *			
		II				Incab	Pune	DR *			
		*				Lapp cables	India	DR			BHEL will forward only two proposals after details review of BIFPCL Technical specification requirements
		*				Lioni cable	Pune	DR			
		*				Gupta Cable	Orisa	DR			
		*				CMI	Faridabad	DR			
47	Electrical actuator	III				Auma	Germany	A			
		III				Limitorge	USA	A			
		III				Rotorg	UK	A			
		II				Limitorque	Faridabad	A			
		II				Rotork	Chennai/ Bangalore	A			
		III				Nippon gear	Japan	A			
		II				Auma	Bangalore	A			
		III				Harold Beck	USA	A			
		III				Drehmo	Germany	A			

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		PROJECT : Maitree STPP (2 x 660 MW)				LIST OF ITEMS REQUIRING QP			REF. NO :		
		PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN				VENDOR AS APPROVED BY			DATE : 12/12/2015		
		CONTRACT NO :									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
51	Pneumatic Actuator (Power Cylinder e.g. FOR	*				Uniflex Cables	India	DR			
		II				Dong Woo Valve Control Co. LTD	Korea	A			
		II				Shin Hwa Engineering Co. LTD	Korea	A			
		I				Instrumentation Limited	Palghat	A			
		I				Kelton		A			
		I				SMC Pneumatics	Noida	A			Up to 12 inch only
		I				Rotex	Mumbai	A			Conditional
		*				Festo	Bangalore	DR			
53	Transducer	II				AE	Mumbai	A			
		II				Southern Transducer	Chennai	A			
		II				Elster	Mumbai	A			
		III				Camille Bauer	Germany	A			
		III				Metrawat	Germany	A			
		II				Rishab	Nasik	A			
		*				Pyrotech	Udaipur	DR			
59	Coupling / Interposing relays	III				PARAMOUNT	BANGALORE	A			* To be covered in DDCMIS QP
		III				OMRON		A			
		III				OEN		A			
		III				Jyoti	Baroda	A			
		III				ELSTA	SWITZERLAN	A			
		*				Schneider	Germany	DR			
		*				Siemens	Germany	DR			
		*				Phoenix	Germany	DR			
60	Solenoid valve	III				Rotex	Vadodara	A			
		III				Avcon	Mumabi	A			
		III				Herion	Germany	A			
		III				IMI NORGEN	GERMANY	A			
		III				Jafferson	Argentina	A			
		III				Asco	Chennai/USA	A			
		III				Festo	Bangalore	A			
		III				SMC	Noida	A			
		III				Parker	Brand Name	A			
		*				Schneider	Germany				



		PROJECT : Maitree STPP (2 x 660 MW)				LIST OF ITEMS REQUIRING QP			REF. NO :		
		PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN				VENDOR AS APPROVED BY			DATE : 12/12/2015		
		CONTRACT NO :									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
68	PLC System (If applicable)	I				GE Intellegent platforms	Bangalore	A			
		I				ABB	Bangalore	A			
		I				Schneider	Nasik	A			
		I				Rockwell	Sahibabad	A			
		I				Siemens	Nasik	A			
69	SMART POSITIONER	#				ABB		N			# - To be covered in Control Valve QP.
		#				masolenien		N			
		#				Siemens		N			
		#				Smar		N			
		#				Yokogawa		N			
		#				EMERSON (Fisher Rosemount)		N			
		#				MESTO		N			
70	ROTAMETER	III				IEPL	HYDRABAD	A			
		III				TRAC	HYDRABAD	A			
		III				PLACKA	CHENNAI	A			
		III				EUREKA	PUNE	A			
		III				SCIENTIFIC DEVICES	MUMBAI	A			UP TO 300 NB
		III				FLOW STAR	FARIDABAD	A			
		III				TOKOYO KEISO	JAPAN	A			
		*				Flowtech Instrument		DR			
		*				Samil Chemtrol	MUMBAI	DR			
		*				Gauges Bourdon	Parvel	DR			
71	SINGLE AND MULTI POINT TEMPERATURE RECORDER (Micorprocessor based)	III				YOKOGAWA INDIA	BANGALORE	A			Make Yokogawa, Japan
		III				CHINO CORPORATION	JAPAN	A			
		III				EUROTHERM	UK	A			
		III				EUROTHERM	INDIA	DR			
		III				YOKOGAWA	JAPAN	A			
		III				ABB	UK / GERMANY	A			
		III				FUJI	JAPAN	A			

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SUB-VENDOR LIST FOR C&I
2X660 MW MAITREE STPP- BANGLADESH

Sl No	Package Code	Package Name	Supplier Name	Tech Limit
1	145-04000-A	CONTROL VALVE	FORBES MARSHALL ARCA PVT.LTD.	No technical limit exists except for feed control valve. For feed control valves, approved up to sub-critical power plants of 600 MW rating.
2	145-04000-A	CONTROL VALVE	INSTRUMENTATION LTD.	
3	145-04000-A	CONTROL VALVE	Koso India Private Limited,	
4	145-04000-A	CONTROL VALVE	BOMABA SPECIAL VALVE SOLUTIONS PVT LTD	
5	145-04000-A	CONTROL VALVE	KSB MIL CONTROLS LTD.	
6	145-04000-A	CONTROL VALVE	SUZHOU DELAN ENERGY SCIENCE & TECHNOLOGY CO., LTD.	
7	145-04000-A	CONTROL VALVE	WALDEMAR PRUSS ARMATURENFABRIK GMBH	
8	145-04000-A	CONTROL VALVE	Mascot Valves Pvt. Ltd.	
9	145-04000-A	CONTROL VALVE	R.K.CONTROL INSTRUMENTS PVT. LTD.	For subcritical power plant up to 150MW
10	145-04000-A	CONTROL VALVE	Valitalia S.P.A. ,	
11	145-04000-A	CONTROL VALVE	PARCOL S.p.A	
12	145-04000-A	CONTROL VALVE	EMERSON PROCESS MANAGEMENT CHENNAI LIMITED	
13	145-04000-A	CONTROL VALVE	DRESSER VALVE INDIA PVT. LTD	
14	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	DRESSER INDUSTRIES INC.	
15	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Barksdale GmbH, Germany	
16	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SWITZER PROCESS INSTRUMENTS PVT. LTD.	
17	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	PRECISION MASS PRODUCTS PVT. LTD.	
18	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS INDUSTRIES LIMITED	
19	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	GENERAL INSTRUMENTS CONSORTIUM	
20	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SOR INC.	
21	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS (INDIA) LIMITED	
22	145-06000-A	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Kaustubha Udyog,	
23	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INDUSTRIES	
24	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	BOSE PANDA INSTRUMENTS PVT.LTD.	
25	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	
26	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	PRECISION MASS PRODUCTS PVT. LTD.	
27	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Baumer Technologies India Pvt. Ltd.	
28	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	
29	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	FORBES MARSHALL (HYD) LTD.	

30	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	
31	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	
32	145-08000-A	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Nesstech Instruments Private Limited	
33	145-10000-A	TEMPERATURE GAUGE	FORBES MARSHALL (HYD) LTD.	
34	145-10000-A	TEMPERATURE GAUGE	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	
35	145-10000-A	TEMPERATURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	
36	145-10000-A	TEMPERATURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	
37	145-10000-A	TEMPERATURE GAUGE	H.GURU INDUSTRIES	
38	145-10000-A	TEMPERATURE GAUGE	GOA THERMOSTATIC INSTRUMENTS PVT.LTD.	
39	145-10000-A	TEMPERATURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	
40	145-10000-A	TEMPERATURE GAUGE	Baumer Technologies India Pvt. Ltd.	
41	145-10000-A	TEMPERATURE GAUGE	PRECISION MASS PRODUCTS PVT. LTD.	
42	145-11000-A	LEVEL GAUGE	BLISS ANAND PVT. LTD.	
43	145-11000-A	LEVEL GAUGE	TOSHNIWAL BROTHERS PVT.LTD.	MAKE:NIVO CONTROLS
44	145-11000-A	LEVEL GAUGE	SIGMA INSTRUMENTS CO.	
45	145-12000-A	FLOW ELEMENT	MICRO PRECISION PRODUCTS PVT. LTD.	
46	145-12000-A	FLOW ELEMENT	TM TECNOMATIC SPA	
47	145-12000-A	FLOW ELEMENT	STAR-MECH CONTROLS (I) PVT.LTD.	
48	145-12000-A	FLOW ELEMENT	INSTRUMENTATION LTD.	
49	145-13000-A	TEMP. ELEMENT	DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	
50	145-13000-A	TEMP. ELEMENT	Thermal Instrument India Pvt. Ltd.	
51	145-13000-A	TEMP. ELEMENT	Tempsens Instrument (I) Pvt Ltd	
52	145-13000-A	TEMP. ELEMENT	PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD.	
53	145-13000-A	TEMP. ELEMENT	TECHNO INSTRUMENTS	
54	145-13000-A	TEMP. ELEMENT	Baumer Technologies India Pvt. Ltd.	
55	145-13000-A	TEMP. ELEMENT	TM TECNOMATIC SPA	
56	145-13000-A	TEMP. ELEMENT	TOSHNIWAL INDUSTRIES PVT. LTD.,	
57	145-13000-A	TEMP. ELEMENT	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	
58	145-13000-A	TEMP. ELEMENT	GAUGE BOURDON INDIA PVT. LTD.	
59	145-13000-A	TEMP. ELEMENT	Nesstech Instruments Private Limited	

60	145-13000-A	TEMP. ELEMENT	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	
61	145-14000-A	TRANSMITTERS	ABB LIMITED	PRESSURE TRANSMITTER, DP TRANSMITTER and TEMP TRANSMITTER
62	145-14000-A	TRANSMITTERS	Pune Techtrol Pvt. Ltd.	Only for capacitance Type Level Transmitter
63	145-14000-A	TRANSMITTERS	V. AUTOMAT & INSTRUMENTS (P) LTD.	a)DISPLACEMENT TYPE TRANSMITTERS. b)PRESSURE AND DP TRANSMITTERS
64	145-14000-A	TRANSMITTERS	Moore Industries International Inc.	
65	145-14000-A	TRANSMITTERS	PANAM ENGINEERS	For Pressure and Diff. Pressure transmitter
66	145-14000-A	TRANSMITTERS	TOSHNIWAL INDUSTRIES PVT. LTD.,	
67	145-14000-A	TRANSMITTERS	Endress + Hauser (India) Pvt. Ltd.,	
68	145-14000-A	TRANSMITTERS	YOKOGAWA INDIA LIMITED,	
69	145-14000-A	TRANSMITTERS	SBEM PVT. LTD.	FOR CAPACITANCE TYPE.
70	145-14000-A	TRANSMITTERS	SIEMENS LIMITED	
71	145-14000-A	TRANSMITTERS	EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	
72	145-14000-A	TRANSMITTERS	SMART INSTRUMENTS LTD, BRAZIL	LD-301 & T-301 TRANSMITTER FROM M/S SMART EQUIPMENTS BRAZIL.
73	145-14000-A	TRANSMITTERS	NIVO CONTROLS PVT. LTD.	For Capacitance type only
74	145-14000-A	TRANSMITTERS	Honeywell Automation India Limited	
75	145-25000-A	JUNCTION BOX	Shrenik & Company,	
76	145-25000-A	JUNCTION BOX	SUCHITRA INDUSTRIES	
77	145-25000-A	JUNCTION BOX	FLEXPRO ELECTRICALS PVT. LTD.	Metal type junction box only
78	145-25000-A	JUNCTION BOX	K.S.INSTRUMENTS PVT.LTD.	
79	145-25000-A	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS	
80	145-32000-A	INSTRUMENTS TUBE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	
81	145-32000-A	INSTRUMENTS TUBE FITTINGS	Fluid Controls Pvt. Ltd.	
82	145-32000-A	INSTRUMENTS TUBE FITTINGS	AURA INCORPORATED	
83	145-32000-A	INSTRUMENTS TUBE FITTINGS	PRECISION ENGINEERING INDUSTRIES	
84	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	SIGMA INSTRUMENTS CO.	
85	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	Sapcon Instrument Pvt Ltd.	
86	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	V. AUTOMAT & INSTRUMENTS (P) LTD.	
87	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	

88	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	Flow Star Engineering Pvt. Ltd.,	
89	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	NIVO CONTROLS PVT. LTD.	For Capacitance type level switch.
90	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	Baumer Technologies India Pvt. Ltd.	
91	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	Pune Techtrol Pvt. Ltd.	
92	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	BLISS ANAND PVT. LTD.	
93	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	SOR INC.	
94	145-35000-A	LEVEL SWITCH-CAPACITANCE TYPE	LEVCON INSTRUMENTS PVT. LTD.	
95	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	SOR INC.	
96	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	LEVCON INSTRUMENTS PVT. LTD.	
97	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	V. AUTOMAT & INSTRUMENTS (P) LTD.	
98	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	HI-TECH SYSTEMS & SERVICES LTD.	Vendor shall source import contents of Level Switch (Conductivity Type) from Levelstate Systems Ltd., United Kingdom.
99	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	RAMAN INSTRUMENTS PVT.LTD.	Vendor shall source import contents of Level Switch (Conductivity Type) from Mobrey Measurement, an operating unit of Morbey Ltd., Slough, Berkshire, United Kingdom.
100	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	Sapcon Instrument Pvt Ltd.	
101	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	SIGMA INSTRUMENTS CO.	
102	145-36000-A	LEVEL SWITCH-CONDUCTIVITY TYPE	BLISS ANAND PVT. LTD.	
103	145-37000-A	LEVEL SWITCH-FLOAT TYPE	SIGMA INSTRUMENTS CO.	
104	145-37000-A	LEVEL SWITCH-FLOAT TYPE	Pune Techtrol Pvt. Ltd.	
105	145-37000-A	LEVEL SWITCH-FLOAT TYPE	D.K. INSTRUMENTS PVT.LTD.	
106	145-37000-A	LEVEL SWITCH-FLOAT TYPE	V. AUTOMAT & INSTRUMENTS (P) LTD.	
107	145-37000-A	LEVEL SWITCH-FLOAT TYPE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	
108	145-37000-A	LEVEL SWITCH-FLOAT TYPE	LEVCON INSTRUMENTS PVT. LTD.	
109	145-37000-A	LEVEL SWITCH-FLOAT TYPE	GENERAL INSTRUMENTS CONSORTIUM	
110	145-37000-A	LEVEL SWITCH-FLOAT TYPE	Baumer Technologies India Pvt. Ltd.	
111	145-37000-A	LEVEL SWITCH-FLOAT TYPE	SBEM PVT. LTD.	
112	145-37000-A	LEVEL SWITCH-FLOAT TYPE	SOR INC.	
113	145-37000-A	LEVEL SWITCH-FLOAT TYPE	BLISS ANAND PVT. LTD.	
114	145-38000-A	INSTRUMENTS PIPE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	
115	145-38000-A	INSTRUMENTS PIPE FITTINGS	Fluid Controls Pvt. Ltd.	
116	145-38000-A	INSTRUMENTS PIPE FITTINGS	PRECISION ENGINEERING INDUSTRIES	
117	145-38000-A	INSTRUMENTS PIPE FITTINGS	AURA INCORPORATED	
118	145-42000-A	ULTRASONIC FLOW METERS	CHEMTROLS INDUSTRIES PVT. LTD.	For Flexim Fluxus non-invasive ultrasonic flowmeter only;
119	145-42000-A	ULTRASONIC FLOW METERS	Rockwin Flowmeter India Pvt. Ltd.	
120	145-42000-A	ULTRASONIC FLOW METERS	FLASH FORGE PVT LTD	

121	145-42000-A	ULTRASONIC FLOW METERS	NIVUS GMBH	
122	145-43000-A	FLOW ELEMENT - ORIFICE	MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	
123	145-43000-A	FLOW ELEMENT - ORIFICE	STAR-MECH CONTROLS (I) PVT.LTD.	
124	145-43000-A	FLOW ELEMENT - ORIFICE	TANSA EQUIPMENTS PVT. LTD.	
125	145-43000-A	FLOW ELEMENT - ORIFICE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	
126	145-43000-A	FLOW ELEMENT - ORIFICE	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	
127	145-43000-A	FLOW ELEMENT - ORIFICE	MICRO PRECISION PRODUCTS PVT. LTD.	
128	145-43000-A	FLOW ELEMENT - ORIFICE	INSTRUMENTATION LTD.	
129	145-43000-A	FLOW ELEMENT - ORIFICE	HYDROPNEUMATICS PVT. LTD.	
130	145-43000-A	FLOW ELEMENT - ORIFICE	Flow Star Engineering Pvt. Ltd.,	
131	145-43000-A	FLOW ELEMENT - ORIFICE	CHEMTROLS INDUSTRIES PVT. LTD.	
132	145-43000-A	FLOW ELEMENT - ORIFICE	INSTRUMENTATION ENGINEERS PVT LTD	
133	145-44000-A	FLOW ELEMENT - NOZZLE	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	except P91 material pipes;
134	145-44000-A	FLOW ELEMENT - NOZZLE	MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	
135	145-44000-A	FLOW ELEMENT - NOZZLE	HYDROPNEUMATICS PVT. LTD.	
136	145-44000-A	FLOW ELEMENT - NOZZLE	STAR-MECH CONTROLS (I) PVT.LTD.	
137	145-44000-A	FLOW ELEMENT - NOZZLE	INSTRUMENTATION LTD.	
138	145-44000-A	FLOW ELEMENT - NOZZLE	MICRO PRECISION PRODUCTS PVT. LTD.	
139	145-45000-A	INSTRUMENT FITTINGS	Perfect Instrumentation Control (India) Pvt. Ltd.	
140	145-45000-A	INSTRUMENT FITTINGS	Arya Crafts & Engineering Pvt. Ltd.	
141	145-45000-A	INSTRUMENT FITTINGS	Comfit & Valve Pvt. Ltd.	
142	145-45000-A	INSTRUMENT FITTINGS	HP VALVES & FITTINGS INDIA PVT. LTD.	
143	145-45000-A	INSTRUMENT FITTINGS	AURA INCORPORATED	
144	145-45000-A	INSTRUMENT FITTINGS	PRECISION ENGINEERING INDUSTRIES	
145	145-45000-A	INSTRUMENT FITTINGS	FLUIDFIT ENGINEERS PVT. LTD.	
146	145-45000-A	INSTRUMENT FITTINGS	VIKAS INDUSTRIAL PRODUCTS	
147	145-45000-A	INSTRUMENT FITTINGS	Fluid Controls Pvt. Ltd.	
148	145-45000-A	INSTRUMENT FITTINGS	PANAM ENGINEERS	
149	145-47000-A	ELECTROMAGNETIC FLOW METER	Electronet Equipments Pvt Ltd.	
150	145-47000-A	ELECTROMAGNETIC FLOW METER	Adept Fluidyne Pvt. Ltd.	
151	145-47000-A	ELECTROMAGNETIC FLOW METER	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	
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	<u>NOTES:</u> i) The above sub-vendor list is tentative & for reference only. However Sub-Vendor List is subject to BHEL/ end user approval without any commercial/ delivery implication. ii) New Sub-Vendor if proposed by Vendor during contract stage shall be subject to BHEL/ end user approval without any commercial/ delivery implication.			

	TITLE : 2 X 660MW MAITREE SUPER THERMAL POWER PROJECT	SPECIFICATION NO. PE-TS-421-154-A002	
		SECTION I	
	TECHNICAL SPECIFICATION FOR OXYGEN DOSING SYSTEM	SUB SECTION IA	
		REV. NO. 00	DATE : 21.11.2017

NOTE:

1. The sub vendor list above is indicative only and is subject to BHEL and customer approval. Sub-vendor list will be finalized with L1 bidder before placement of LOI/LOA without any commercial and delivery implication.
2. The inspection category will be intimated after award of contract by BHEL/customer. However the same will be adhered by the bidder without any commercial and delivery implication to BHEL/ customer.
3. Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.



TITLE :
**2 X 660MW MAITREE SUPER THERMAL POWER
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ANNEXURE III: DRAWING DOCUMENTS DISTRIBUTION PROCEDURE.



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

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Documents:	PEM
Documents for approval	8
Documents for information	8
Schedules, diagrams, lists, tables, calculation, specifications and other documents	8
Final as-built drawings:	
CD-ROMs of final as-built drawings	10
Final as-built drawings (hard copy)	14
Final O&M manuals	18
CD-ROMs of Final O&M Manuals	10
Detailed project time schedules	5

- Bidder shall submit soft copy/hard copy/CD ROMs of all the finally approved drawings and O&M Manuals as required by Customer/Customer consultant/BHEL-site/BHEL-PEM. The exact number of hard copies/CD ROMs of these documents to be submitted shall be notified to the bidder at the time of detailed engineering and bidder shall submit the same without any commercial/delivery implications to BHEL/Customer.
- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.
- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copies whichever is later.
- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying these requirements shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.
- Bidder has to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.
- Bidder to submit instrument schedule, cable schedule and valve schedule (as applicable) in MS- Excel format during detailed engineering.
- Bidder to also furnish the auto cad copy/ MS-word (as applicable) of the following documents after award of contract. However any other auto cad copy/ MS-Excel/ MS-word of any other document as per the insistence of BHEL/ customer will also be submitted by the bidder without any delivery/ commercial implication to BHEL/ Customer.
 - P&IDs.
 - GA & Foundation Drawing
 - Local Control Panel/ Junction Box Wiring Diagram



TITLE :
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ANNEXURE IV: PAINTING SPECIFICATION



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

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SUB SECTION IA

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DATE : 21.11.2017

Sl. No.	Surface location	Surface preparation	Coating systems	No. of coats	Generic type	(DFT) per coat μm	Total DFT μm
1.	Structural steel works, piping, vessels, tanks	SA 2.5	Primer	1	Zinc-Epoxy	80	160
			Finish	1	Epoxy High Solid	80	
2.	Pumps, motors, other equipment	SA 2.5	Primer	1	Zinc-Epoxy	80	180
			Finish	2	Epoxy High Solid	50	
3.	Motors	RAL 4008 (Signal Violet)					
4.	Structural steel, steel skids for equipment.	Window Grey RAL 7040					
5.	Panels, cubicles, junction boxes	Light Grey RAL 7035					
Medium		Base	RAL	Lettering		RAL	
Oxygen		Signal Blue	5005	Signal White		9003	

Note: In addition to painting requirements indicated above, bidder to refer the painting requirements specified in Annexure-VIII.



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ANNEXURE V : MANDATORY SPARES LIST

S.No	Description	Quantity
1.0	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10% or 1 no. of each type and model, whichever is more
2.0	Local Indicators like temperature gauges, pressure gauges, differential pressure gauges, flow gauges, flow meters etc.,	5% or 1 no. of each make, model and type whichever is more (to be divided to various ranges in proportion to main of all make, model, type population)
3.0	Low Pressure Piping	
a	Valves	5% of the total population of each type, size and class OR minimum 1 no. of each type, size & class. Note:-Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.
b	Spare gaskets for valves	3 sets for each type, material, size & class per unit
c	Gland packing for valves	05 sets for each type, material, size & class per unit
4.0	Process Connection Piping (For Impulse Piping/Tubing, Sampling Piping/Tubing And Air Supply Piping.	
a.	Valves of all types	10%
b.	2 way, 3 way, 5 way valve manifolds	10% of each type, class, size and model
c.	Fittings	10%

Notes:-

- Mandatory spares quantity shall be supplied on the basis of total installed population of the items in oxygen dosing system for the station and the fraction shall be rounded off to the next higher whole number.
- The Mandatory spares for the equipment under the contract provided by the vendor will strictly conform to the specifications and documents and will be identical to the corresponding main equipment/components supplied under the contract.
- The quality plan and the inspection requirement finalized for the main equipment will also be applicable to the corresponding mandatory spares.
- In case, mandatory spares are not applicable as per equipment / item selected, bidder has to provide equivalent mandatory spare as per for selected equipment / item in line with list of mandatory spares.



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ANNEXURE VI: DRAWING/DOCUMENTS SUBMISSION SCHEDULE



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

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DATE : 21.11.2017

DRAWING/DOCUMENTS SUBMISSION SCHEDULE

After award of LOI, following minimum drawing/documents shall be submitted by the bidder for BHEL and Customer approval. However any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

For the Drawings/Documents Distribution procedure, please refer Annexure-III. The submission of soft copy or hard copy of the drawing/document whichever is later will be considered as final date of submission of the drawing/document. The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

- Drawing/documents submission schedule: First submission of basic drawings/ documents – (P&ID, GA & Foundation details & QAP for CHEMICAL DOSING SYSTEM) shall be within 3 weeks from the date of LOI.
- Every revised submission incorporating comments – within 7 days.
- BHEL shall provide observation / approval within 3 weeks from the date of document submission.
- Bidder further confirmed that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. . Engineering meeting shall be held fort nightly, for which the bidder shall depute his concerned engineer along with project manager to BHEL PEM office or at customer office. The meeting can also be held at site.

List and schedule of drawings/documents to be submitted after award of contract:-

S.No.	Drawing/Document No.	Drawing/Document Title	No. of weeks for drawing/document submission after placing LOI/PO
1.	PE-V2-423-154A-A001	P&I DIAGRAM FOR OXYGEN DOSING SYSTEM	3
2.	PE-V2-423-154A-A002	TECHNICAL DATA SHEET--OXYGEN DOSING SYSTEM	4
3.	PE-V2-423-154A-A003	GA DRAWING & FOUNDATION DETAILS	4
4.	PE-V2-423-154A-A004	JUNCTION BOX TERMINATION DWGS. FOR OXYGEN DOSING SYSTEM	5
5.	PE-V2-423-154A-A006	QAP FOR CHEMICAL DOSING SYSTEM	4
6.	PE-V2-423-154A-A007	O&M MANUAL FOR CHEMICAL DOSING SYSTEM WITH CATALOGUE	16

NOTES:-

- Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion. However, in case changes are necessitated due to any constraints at customer end, delay in review/ approval of such revised drawing will be to customer's account.

	TITLE : 2 X 660MW MAITREE SUPER THERMAL POWER PROJECT	SPECIFICATION NO. PE-TS-421-154-A002	
		SECTION I	
	TECHNICAL SPECIFICATION FOR OXYGEN DOSING SYSTEM	SUB SECTION IA	
		REV. NO. 00	DATE : 21.11.2017

(a) Bidder to note that drawings/documents submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drawings/documents approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's internal proxy setting should not block DMS application's link
(<http://124.124.36.198/wrenchwebaccess/login.aspx>)
- DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.
- For quick access bidder may refer the link <http://bhelpem.com/DMSManuals/DMSManuals.html>



TITLE :
**2 X 660MW MAITREE SUPER THERMAL POWER
PROJECT**

SPECIFICATION NO. PE-TS-421-154-A002

SECTION I

**TECHNICAL SPECIFICATION FOR OXYGEN
DOSING SYSTEM**

SUB SECTION IA

REV. NO. 00

DATE : 21.11.2017

ANNEXURE VII: FORMAT FOR OPERATION AND MAINTENANCE



TITLE :
2 X 660MW MAITREE SUPER THERMAL POWER PROJECT

SPECIFICATION NO. PE-TS-421-154-A002

SECTION I

TECHNICAL SPECIFICATION FOR OXYGEN DOSING SYSTEM

SUB SECTION IA

REV. NO. 00

DATE : 21.11.2017

Bidder to submit operation and Maintenance manual with minimum information as listed in below check list during contract stage.

Check List for Operation & Maintenance Manual

- 1.1.1.1 Project name :
1.1.1.2 Project number :
1.1.1.3 Package Name :
1.1.1.4 PO reference :
1.1.1.5 Document number :
1.1.1.6 Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	<u>Cover page</u>				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	<u>Index</u>				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	<u>Description of Plant/System</u>				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				
4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				



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4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	<u>Operation Guidelines for plant personal/user/operator</u>				
5.1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5.2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5.3	Do's & Don't of the equipments.				
5.4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5.5	Parameters to be monitored with normal values and limiting values				
5.6	Trouble shooting with causes and remedial measures				
5.7	Routine operational checks, recommended logs & records				
5.8	Changeover schedule if more than one auxiliary for the same purpose is given				
5.9	Painting requirement and schedule				
5.10	Inspection, repair, Testing and calibration procedures				
6.0	<u>Maintenance guidelines for plant personal</u>				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				



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6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	Statutory and other specific requirements considerations.				
8.0	List of reference documents				
9.0	Binding as per requirement				



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PROJECT**

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DOSING SYSTEM**

SUB SECTION IA

REV. NO. 00

DATE : 21.11.2017

ANNEXURE VIII: GENERAL TECHNICAL REQUIREMENTS

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General Technical Specification

Sg

as / B



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B0. General Specification

Preamble

The Technical Specification is amended in accordance with following Technical Clarifications to Bidding Documents ("Clarification Batches"), which are already published on the BIFPCL's Website:

- Clarification No. 1 (Clarification #01);
- Clarification No. 3 (Clarification #03);
- Clarification No. 5 (Clarification #05);
- Clarification No. 7 (Clarification #07); and
- Clarification No. 8 (Clarification #08).

Only technical clarifications with regard to content and consequently causing alterations of Scope of Services and Supplies, Technical Requirements, Data Sheets and/or Annexes are incorporated.

General clarifications such as "Subject to BIFPCL's approval during Basic/Detailed Engineering" or "Details to be discussed during Engineering" are not incorporated as it is self-evident that Contractor's design and engineering shall subject to Employer's approval.

Already published Amendments (reference is made to Amendments No. 1 and No. 2) are not again incorporated/included in the amended Technical Specification. This applies for instance for:

- B3, B4 including Data Sheets (replacement of the original documents, refer to Amendment No. 1);
- B12.8 PV Plant and B12.9 Waste Management including Data Sheets (additional documents, refer to Amendment No. 2);
- Annex C, G-05 Health and Safety Manual (additional document, refer to Amendment No. 2); and
- Annex C, M-03 Design Limestone List (replacement of the original document, refer to Amendment No. 1).

In addition some parts of the Technical Specification are modified without reference to a published Clarification or Amendment. This applies for instance for:

- Annexes M-06, M-07, M-08 and M-10, which are revised according to Amendment of B3 and B4 and which shall replace the respective original Annexes.
- Annexes M-04 and M-12, which are revised according to the latest available river water sampling and analysis.



B0.1 Subject of Specification

The Joint Venture of Bangladesh-India Friendship Power Corporation (pvt) Ltd (BIFPCL) intends to construct a 2x 660 MWe, gross coal fired power plant (the Plant, the Maitree-STPP Project or the Project) in the district of Khulna for which BIFPCL firms as Employer, utilizing high availability, high efficiency steam cycle technology.

The Contractor shall cover all works for the engineering, procurement, construction and commissioning of the whole plant on a turnkey basis.

Two power units with steam generator, steam turbine generator and ancillary systems shall be proposed in a technology that enables the Contractor to guarantee a high net efficiency while achieving a high reliability (certain restrictions regarding the technology and the design parameters apply, as detailed herein). A second phase of the same capacity is foreseen as a future possibility, however, this Specification deals only with 2 x 660 MW_{e, gross} unless otherwise and expressly stated.

The Plant shall be built on a "green field" basis. It shall be conceptualized in accordance with the above criteria, the thermodynamic cycle adopted must be capable of working successfully over prolonged periods and the system shall be able to withstand severe shocks when connected to the Grid as specified in this **Section B0**. The steam cycle shall operate with once-through technology at supercritical.

The Plant shall be based on supercritical technology. The main steam (MS) pressure at turbine inlet shall be in the range of 250 to 270 bar(g). The MS temperature at turbine inlet shall be in the range of 568 to 600 °C. The reheat steam (RH) temperature at turbine inlet shall be chosen by the Bidder/Contractor accordingly. That means, a proposed plant with a MS pressure at turbine inlet between 250 and 270 bar(g) and MS/RH temperature at turbine inlet upto 600°C/600° will be acceptable.

The Plant shall be suitable to be operated with the specified fuel. Only proven equipment and materials shall be used.

With the Tender the Bidder shall provide evidence:

- that the proposed Plant is based on proven supercritical technology, with similar MS pressure, MS/RH temperature, design and materials; However, Reference plant of MS pressure and temperature at turbine inlet in the range of 242 to 270 bar(g) and 565 to 600 °C respectively, shall also be considered to qualify.
- that the proposed design of the steam generator and auxiliary equipment has been fully proven by extensive successful commercial operation (the experience base for main component and the design data shall be demonstrated by the Bidder);



- that the proposed Plant is based on a reference plant(s) which shall be based on supercritical technology, which shall be of similar design and which shall use similar fuel as specified (The Bidder shall submit with the Tender detailed information on this reference plant(s) and shall allow the Employer and/or his representatives to contact and visit and examine the reference plant(s) in detail).

Regarding the Qualifying Requirements reference is made also to Section I IFB.

Transmission lines (OHL connections) from power plant to HV substation as well as transmission lines (GIL) within HV substation area are included in Bidder's/Contractor's scope of services and supplies. However, transmission lines for PGCB grid connection are out of Bidder's/Contractor's scope of services and supplies. For detailed scope at interface points refer to section B10.3.3 and B10.3.5.

The engineering design of the Plant shall be conceptualized in accordance with the above criteria, and therefore it is vital that the thermodynamic cycle adopted must be capable of working successfully over prolonged periods and the system shall be able to withstand severe load adjustments when connected to the Grid. The proposed Plant shall be based on a reference plant of equal size firing similar fuel, which shall have a proven track record. The Tenderer shall submit with the tender detailed information on this reference plant(s) and shall allow the Employer and / or his representatives to contact and visit and examine the reference plant(s) in detail.

The steam boilers shall be designed to burn coal from Australia, Indonesia, South Africa, Mozambique and potentially other countries and to burn high speed diesel for start-up and shut-down purposes. The Plant is designed for the coal range as per design coal list attached in the **Annexes in Part C**. The steam turbo-generators and thermal cycles shall be selected such, that the Plant heat rate would be optimized under consideration of the investment costs. The condenser cooling systems shall be realized with induced draft wet cooling towers. The turbine generators and all grid relevant parameters shall be designed in accordance with applicable Grid Code and the requirements of NLDC.

The Plant shall be equipped with suitable emission abatement technologies, consisting of primary measures for the CO- and NO_x-reduction, an electrostatic precipitator and a wet flue gas desulfurization plant operating with limestone.

The Project shall include the facilities for the export of the produced power consisting of switchyards, substations and transmission lines.

In addition the Plant shall include all auxiliary and ancillary systems required within the terminal points to render the Plant fit for purpose, this



shall also include workshops, admin and staff amenities buildings and the likes unless expressly excluded in this specification.

B0.2 General Plant Description

B0.2.1 General purpose of the plant

The Plant is intended to serve the increasing power demands of the electricity market in Bangladesh. It will be operated in base load operation but frequency support operation must also be possible.

The scope under the EPC turnkey contract shall cover all services and supplies required to meet the purpose of the Power Plant even if not expressly mentioned in the Bidding Documents. This shall include but shall not be limited to: design, engineering, manufacturing, shop testing, procurement, supply, transportation to site (location of use), handling, storage, insurance, taking any permit/approval required, erection, testing at site, commissioning, performance testing, training Employer's personnel and final completion of entire Power Plant inter alia including steam generators and auxiliaries, turbine generators and auxiliaries, all associated BOP packages, all civil, electrical and I&C works for the entire Power Plant as well as for the jetty and associated facilities and the 400kV/230kV substation as described in the Bidding Documents and complete in all respects for successful operation of both units of 660 MW to dispatch power from the Plant to the grid.

The Plant covers the following main systems and components (including all systems not specifically mentioned):

B0.2.2 General scope of supply

The following data are applicable per unit, unless they refer to common systems. For further information see the respective **Sections B1 to B12**.



- **Boiler systems** (refer to **Section B1**)
 - steam generator (supercritical once-through)
 - regenerative air preheater
 - coal pulverizers
 - coal bunker system
 - bottom ash extraction system (dry)
 - boiler fans (PA, SA/FD fans)
 - HP steam / feed water piping
 - HP bypass system
 - air system
 - auxiliary boiler

- **Turbine systems** (refer to **Section B2**)



- steam turbine generator
 - LP bypass
 - condenser system incl. evacuation
 - Condenser cleaning system
 - LP/HP heaters
 - deaerator/feed water tank
 - condensate pumps
 - feed water pumps
 - water/steam piping system
 - drip collecting and pump system
 - EOT crane and hoists.
- **Flue gas treatment systems** (refer to Section B3)
 - dust filter system (ESP)
 - FGD system (based on wet limestone process)
 - ID fans
 - flue gas ducts.
- **Fuel and Ash handling system** (refer to Section B4)
 - coal handling system, including:
 - coal unloaders (grab type)
 - stackers
 - portal scraper reclaimers
 - coal yard (90 days capacity at BMCR with worst coal)
 - coal yard roof cover (take-out option)
 - coal dust suppression systems
 - coal crushers
 - Coal screens
 - emergency coal supply by front end loader
 - belt conveyors, junctions towers and other systems as required
 - coal blending silos
 - limestone handling system, including:
 - Stacker
 - limestone yard for 90 days
 - limestone transportation system from jetty to stockyard, as required
 - transportation from stockyard to limestone intermediate silo by front end loader
 - HSD handling, including:
 - HSD truck unloading station
 - HSD tanks
 - HSD transfer pumps and pipe distribution system
 - fly ash handling , including:
 - pneumatic fly ash transportation to intermediate fly ash silos
 - intermediate fly ash silos
 - pneumatic fly ash transportation fly ash storage silos at jetty
 - fly ash storage silos at jetty with truck and ship loading
 - bottom ash handling, including:
 - bottom ash transportation to intermediate bottom ash silos
 - intermediate bottom ash silos



- bottom ash storage silos at jetty with truck loading
- gypsum handling, including:
 - Gypsum storage silo at jetty with truck and ship loading
- common residue handling systems
 - transportation of limestone, bottom ash and gypsum from intermediate silos to storage silos at the jetty by pipe conveyor
 - discharge of fly ash and bottom ash via high concentrated slurry/solids disposal (HCSD) to the ash point.
- **Plant Water and Cooling Systems (refer to Section B5)**
 - Plant water intake channel
 - Plant water intake structures
 - Plant water screening plant
 - Plant water supply pumps
 - Plant water pre-treatment and storage
 - Main cooling water system
 - Cooling Water pump station
 - Induced Draft Cell Cooling Towers
 - Main cooling water collection basin
 - Desalination feed water supply system
 - Auxiliary cooling water system
 - Plant water discharge system
 - Cathodic corrosion protection systems.
- **Water Treatment Systems (refer to Section B6)**
 - Plant water pre-treatment storage and supply
 - Electrochlorination plants
 - Desalination plant
 - Potable water treatment plant
 - Demineralization plant
 - Condensate polishing plant
 - FGD Waste Water Treatment Plant (FGDWWTP)
 - Process waste water treatment facilities including oil separators
 - Sewage treatment plant for sanitary wastes
 - Chemical handling and storage facilities
 - Chemical dosing of cooling water and feed water conditioning
 - Monitoring system for the water/steam cycle.

Note:

The Desalination and Demineralization Plant shall be common for all the units.

- **Electrical systems (refer to Section B7)**
 - All electrical components related to turbine / boiler / flue gas treatment system and BOP systems
 - Power transformers incl. GT, SUT, UAT, all MV- and LV-T
 - Switchboards and power distributions (busducts, cabling etc.)
 - Emergency diesel, DC and safe AC Systems



- 400/230kV GIS including auxiliary and ICT.

Electrical works like illumination, communication, etc. outside plant boundary are not included in the scope of works.

- **I&C systems (refer to Section B8)**
 - All I&C components related to turbine / boiler / flue gas treatment system and BOP systems
 - Central DCS and decentralized PLC Logics
 - Power Plant training simulator.
- **Civil works (refer to Section B9)**
 - site surveys and investigations to ensure safe civil design and undisturbed construction
 - site preparation (incl. site filling works) and temporary site installation.

No grading activities outside the plant boundary shall be considered.

- all civil related works for the Power Plant including turbine/boiler/flue gas treatment system/cooling water system/electrical system/balance of plant etc.
- Marine Works including coal jetty, plant water intake and discharge.
- Power Plant related buildings and structures
- ancillary buildings such as admin building, canteen, storage and workshop building
- ash pond
- HVAC
- Biomass generation plant (use organic waste of Township and Power Plant)

It is to be noted that the biomass plant shall not produce power. The biomass plant is understood as waste segregation and treatment plant. (Refer to B12.9 in Amendment No. 2).

- Cranes.

- **Infrastructure (refer to Section B9)**

The following works are included in the infrastructure lot

- all internal roads incl. tie-in with existing roads at bridge and access roads to nearest township

Bridge and highway from bridge to Khulna-Mongla-Highway will be provided by GOB.

The Interface Point is at the roundabout.

Remark:

Access Road

GOB will construct a 6 Km road connecting the Site with Khulna-Mongla Highway. It is to be highlighted that:



- Bidder/Contractor cannot expect that the access road will be available when the site works start.
- Bidder/Contractor cannot expect that the access road will be suitable for the transportation of heavy equipment to Site.
- Site access and transportation of personnel, material and equipment etc. to Site shall be in the sole responsibility of the Contractor.
- Bidder/Contractor shall execute a transportation study to familiarize himself with the local and Site condition and to elaborate how equipment can be transported to Site.

All roads, except town ship roads are in Bidder's/Contractors' scope. Interface is the roundabout, whereas the roundabout itself shall be constructed by the Bidder/Contractor.

- fencing, gate house inside the boundary
- landscaping in all areas where Contractor work will be performed
- Infrastructure related works outside the boundary wall

Electrical works like illumination, communication, etc. outside plant boundary are not envisaged.

- underground services (non-pressurized - rain water discharge, domestic waste water
- rain water retention basin
- oil water separators.
- **Electrical Works 400/230 kV Substation (refer to Section B10)**
 - 400 kV gas insulated switchgear
 - 400 kV AIS equipments and accessories
 - 230 kV gas insulated switchgear
 - 230 kV AIS equipments and accessories
 - 230 kV XLPE Cables
 - 400/230 kV 520 MVA interconnection transformers
 - Substation Control and Monitoring System (SCMS)
 - 11/0.415 kV auxiliary power transformers
 - Telecommunication Equipment
 - AC/DC installations
 - Power and control cables, bus ducts
 - Tariff metering
 - Substation outdoor lighting
 - Earthing system & lightning protection system
 - Power & auxiliary systems for 400 kV and 230 kV area, incl. coordination with overall system
 - Fire detection, alarm and fire fighting system
 - Substation other supply and services.
- **Jetty structure (refer to Section B11)**
 - Retaining wall
 - Revetment and Shore protection.



- **Auxiliary plant systems** (refer to Section B12)

- Compressed air system
- Hydrogen system
- Workshop and store
- Chemical laboratory
- Fire fighting system
- De-dusting system
- HVAC system

B0.2.3 Interface points

For interface points see below.

B0.2.4 Site conditions

The following information on local conditions is investigated or compiled by the Employer. The Contractor is hereby in no way relieved from his duties of carrying out all investigations required for satisfactory performance of his works. The Contractor shall perform his own Site visits and investigations, prior to Contract award in order to familiarize him with the existing conditions of the Site and the surrounding area.

Location, accessibility and present condition of the Site

The site for the Maitree-STPP Project is geographically located between 22° 37'0'' N to 22°34'30''N and 89°32'0''E to 89°34'5''E, approximately 14 km northeast of the Mongla Port and 14 km northwest of the Sundarbans, is infringed by the Passur and Moidara Rivers to the west and south east respectively. The project requires an area of approximately 500 acres.

The topographical survey indicates a natural ground level of +1.15 to + 1.35 meters above sea level. A severe cyclone in 2009 raised the level to 4.47 meters and it was decided to raise the Plant level to +5.00 meters.

Politically, the site is located in Rampal Upazila of the Bagherat District in the Rajnagar Union

Currently, the Site is accessible by boat only.

The nearest inland port is Mongla port at around 14km direct distance

The proposed Khan Jahan Ali Airport is located at a distance of approximately 12 km from the project site.

Soil conditions

First soil investigations of the Plant site and adjacent areas have been carried out. For information only the findings of these initial soil investigations are attached in Part C Annexes.



In general the subsoil conditions can be described as follows:

- top layer filled sand (with unknown silt content) in Plant area
- underlying layers of clay
- underlaying fine sand.

The Contractor shall conduct soil improvement measures at site. Beside other aspects, consolidation of filling shall be incorporated in soil improvement concept.

Seismic zone

Attention shall be paid to seismic parameters. Related to soil type as identified to Soil Investigation Report, the effect of local soils on earthquake ground motion shall be determined.

For site class "S1" and "S", as expected for the Project, site specific studies shall be carried out to determine the design acceleration response spectrum. During field study minimum the following tests shall be executed:

- Seismic cross hole test; and
- Seismic refraction test.

Based on these results a site specific Response Spectra shall be established. Peak spectral acceleration shall be determined, but shall be not less than 0.12g, as mentioned in BNBC 2012, Table 2.5.2.

Site climatic conditions

The Plant site is from the climatic point of view under maritime tropical conditions. The assumed meteorological conditions for the Site are as follows:

The project site is located in the country's South Central Zone consisting of three dominant seasons:

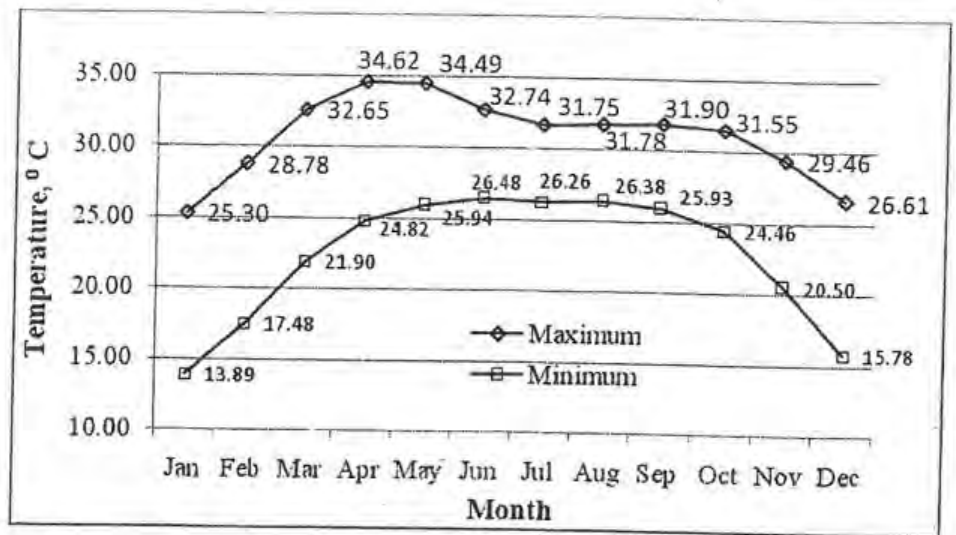
- summer season-March to May
- monsoon season-June to October
- winter season-November to February.

During the Monsoon Season occasional cyclonic storms can occur.

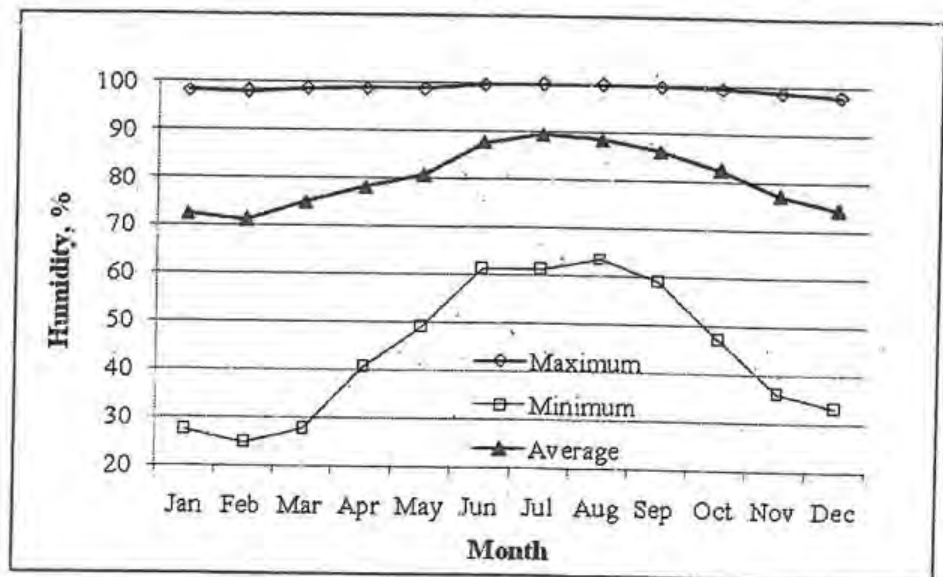
The climatic conditions in the area are continuously monitored by the Bangladesh Meteorological Department (BMD) at the Mongla Meteorological Station.

The temperature varies only slightly throughout the year with the highest temperature of 36.9°C and the lowest temperature of 12.2°C recorded in the period from 1989 to 2008. This distribution is depicted in figure below.





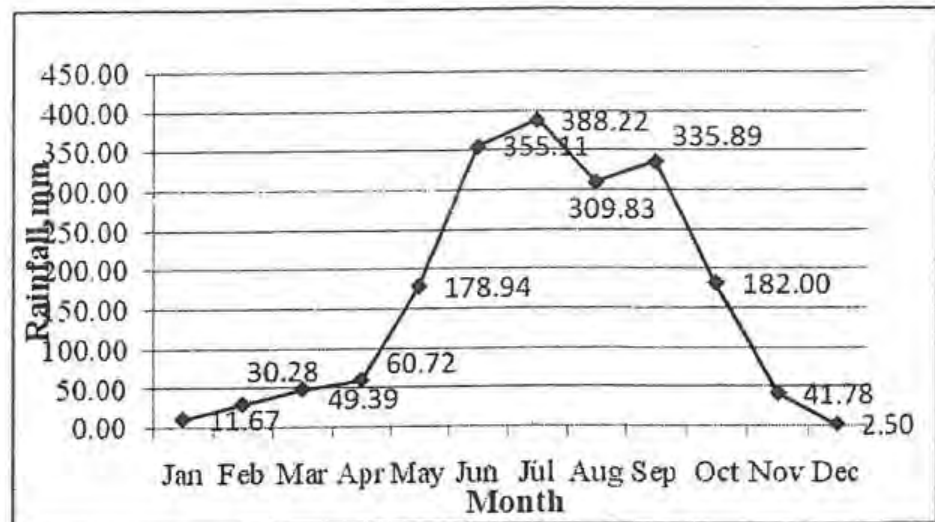
The relative humidity varies drastically during the Monsoon Season with 80% to 90% and the lowest levels of 20% to 30% during the Summer Season. The humidity profile recorded in the same period as the temperature is visualized in below figure.



The maximum rainfall occurs during the Monsoon Season by varying between 300 mm and 350 mm with almost no rainfall during the Winter Season.

The average evaporation in the project area varies between 3 - 5 mm/day with its peak of 16 mm/day during July. The average rainfall for the period between 1991 and 2008 is depicted in below figure.





Below definitions are to be used as typical data for the different climatically seasons at the site.

Average Site Condition ASC

Ambient Temperature: 27.3 °C
 Ambient Humidity 87 %
 Ambient Pressure 1007.6 mbar
 River Water Temperature: 29.8 °C

Summer Site Condition SSC

Ambient Temperature 36.9 °C
 Ambient Humidity 60 %
 Ambient Pressure 1007.9 mbar
 River Water Temperature: 33 °C

Winter Site Conditions WSC

Ambient Temperature 12.2 °C
 Ambient Humidity 100 %
 Ambient Pressure 1017.2 mbar
 River Water Temperature: 20 °C

Reference Site Conditions RSC

Ambient Temperature 31 °C
 Ambient Humidity 88 %
 Ambient Pressure 1007 mbar
 River Water Temperature: 32 °C

Reference Site Condition shall apply for the Guarantee Values as well as for the Guarantee Tests/Performance Test. However, Plant must cope with the Site Conditions as specified.



Wet bulb temperature shall be calculated by Bidder/Contractor based on ambient temperature (dry bulb), ambient humidity and ambient pressure for the different cases.

Bidder/Contractor shall determine the wet bulb temperature for all site conditions and not only for reference site condition.

Design ambient conditions for Electrical Systems

- | | |
|---|--------|
| • Maximum design temperature (outdoor) | 45°C |
| • Maximum daily average ambient shade temperature | 38°C |
| • Maximum monthly average temperature (in the shade) | 34.6°C |
| • Maximum annual average temperature (in the shade) | 27.3°C |
| • Maximum design temperature of the electrical equipment installed indoors in air conditioned rooms | 40°C |
| • Maximum design temperature of the electrical equipment installed indoors non in air conditioned rooms | 45°C |
| • Minimum design temperature | 0°C |

Marine conditions

Two tides (e.g. flood and ebb) are regularly observed in the Passur River, which enters into the project site through numerous connected creeks.

The tidal range varies between 1.2 and 3.1 meters. The mean water level (CD) is about 0.87 meters (PWD=CD -1.17 meters). The mean high water level varies due to spring-neap tide conditions between +1.60 m and +2.6m PWD. The Highest High Water Level (HHW) is about +3.1m PWD and the Lowest Low Water Level (LLW) is about -1.4m PWD.

The marine conditions are detailed in **Section B11**, with details about:

- water levels
- waves
- currents
- river bathymetry, topography.



The salinity of the Passur River system varies with the amount of fresh water entering the system which is highly seasonal dependent. The surface water temperature ranges between 22.9°C and 33.0°C and the different water quality parameters are tabulated in **Part C Annexes**.

The marine conditions as recorded at Mongla Port Gauge Station (approx. 14 km south-east to the site) are as follows:

- | | | |
|----------------------------|-------|-------------|
| • Highest High Water Level | (HHW) | + 2.642 MSL |
| • Lowest Low Water Level | (LWL) | - 1.858 MSL |

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These reference data are with respect to LAT, which corresponds to the Chart Datum (CD). The site land data is however with respect to the Bangladesh Land Survey Datum (BLSD), which corresponds to approx. +1.55 m CD (hence the MLSD corresponds to MSL).

The results of bathymetric investigations of the Possur River can be found in **Part C Annexes.**

No.	Date	T _{air}	T _{soil}	D _c	C _r	V _a	V _s	P _a	P _v	S _a	S _v	BOD	COD	Salinity
		°C	°C	m	mm	cm ³ /m ²	cm ³ /m ²	mm	mm	mm	mm	mg/l	mg/l	g/l
1	7-Jan	27.8	7.74	3010	879	36	68.7	1565	1510	55	5.1	0.8	55	1.6
2	7-Jan	27.1	7.72	3050	878.8	36	68.5	1570	1510	60	5.1	0.8	55	1.6
3	7-Jan	27.8	7.71	3030	879	36	68.8	1565	1610	55	5.1	0.8	55	1.6
1	11-Feb	29.8	7.66	4380	1262	36	182	2390	2180	210	4.7	1	76	2.3
2	11-Feb	29.2	7.63	4380	1268	36	178	2390	2190	200	4.7	1	76	2.3
3	11-Feb	28.1	7.65	4380	1263	36	179	2380	2180	300	4.7	1	76	2.3
1	9-Mar	32.6	7.56	11780	2944.4	38	176	6080	5890	190	4.7	1.2	76	6.7
2	9-Mar	32.6	7.57	11780	2945.2	38	178	6080	5890	190	4.7	1.2	76	6.7
3	9-Mar	32.1	7.55	11780	2946.4	38	177	6090	5890	200	4.7	1.2	76	6.7
1	17-Apr	32.6	7.59	25300	8273	36	185.6	12950	12700	250	4.6	0.7	136	15.5
2	17-Apr	32.6	7.59	25300	8273	36	184.2	12950	12700	250	4.6	0.7	136	15.5
3	17-Apr	32.6	7.59	25300	8273	36	184.8	12950	12700	250	4.6	0.7	136	15.5
1	5-May	32.6	7.59	29300	9480	36	198.6	14600	14600	300	4.5	1.2	177	17.6
2	5-May	32.9	7.54	29300	9470	36	198.6	14600	14600	300	4.4	1.2	177	17.6



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BIFPCL/EPC-Main Plant/2015/1/

Loc. id	Date	Temp. °C	pH	EC µS/cm	Cl- mg/l	T. Alkal. mg/l	Turbidity NTU	T.S. mg/l	TDS mg/l	SS mg/l	DO mg/l	BOD mg/l	COB mg/l	Salinity mg/l
3	5-May	33.2	7.57	29700	9470	36	199.6	14900	14600	300	4.5	1.2	177	17.6
1	13-Jun	31.6	7.69	18000	3820	36	112.6	9200	9000	200	4.7	1.1	97	10.3
2	13-Jun	31.6	7.69	18000	3800	36	113.2	9200	9000	200	4.7	1.1	97	10.3
3	13-Jun	31.6	7.69	18000	3810	36	112.4	9200	9000	200	4.7	1.1	97	10.3
1	1-Jul	31.6	7.69	440	32.6	36	76.6	285	220	65	5.2	0.8	26	-
2	1-Jul	31.6	7.69	440	32.6	36	76.6	285	220	65	5.2	0.8	26	-
3	1-Jul	31.6	7.69	440	32.6	36	76.6	285	220	65	5.2	0.8	26	-
1	5-Aug	31.6	7.69	275	15.6	36	68.6	192	137	55	5.3	0.7	22	-
2	5-Aug	31.6	7.69	275	15.6	36	68.6	192	137	55	5.3	0.7	22	-
3	5-Aug	31.6	7.69	275	15.6	36	68.6	192	137	55	5.3	0.7	22	-
1	8-Sep	31.6	7.74	270	15.6	36	65.6	180	135	45	5.5	0.7	22	-
2	8-Sep	31.6	7.74	270	15.6	36	65.6	180	135	45	5.5	0.7	22	-
3	8-Sep	31.6	7.74	270	15.6	36	65.6	180	135	45	5.5	0.7	22	-
1	13-Oct	30.6	7.78	290	26.6	36	63.6	192	145	47	5.6	0.7	22	-
2	13-Oct	30.6	7.78	290	26.6	36	63.6	192	145	47	5.6	0.7	22	-
3	13-Oct	30.6	7.78	290	26.6	36	63.6	192	145	47	5.6	0.7	22	-
1	5-Nov	24.6	7.79	340	38.6	36	56.6	210	170	40	5.6	0.7	22	-
2	5-Nov	24.6	7.79	340	38.6	36	56.6	210	170	40	5.6	0.7	22	-
3	5-Nov	25.6	7.79	340	38.6	36	56.6	210	170	40	5.6	0.7	22	-
1	13-Dec	21.5	7.72	320	62.6	36	72.6	320	260	60	5.1	0.9	25	0.4
2	13-Dec	20.9	7.71	320	62.6	36	73.6	320	260	60	5.1	0.9	25	0.4
3	13-Dec	21.1	7.72	320	62.6	36	71.6	320	260	60	5.1	0.9	25	0.4

Figure 2 Water quality of the Passur River at Mongla point
(Source: EIA-Report)

Additional information on water quality parameters is shown in Part C Annexes.

Wind data

The project region is characterized by southerly winds from the Bay of Bengal during the Monsoon Season and north-westerly winds from the Himalayas during the Winter Season. During the Summer Season, the wind blows from south-southwest to north-northeast. The annual average wind speed amounts to 1.7 meter/second and the wind rose for the entire year is shown in Figure 5.5.

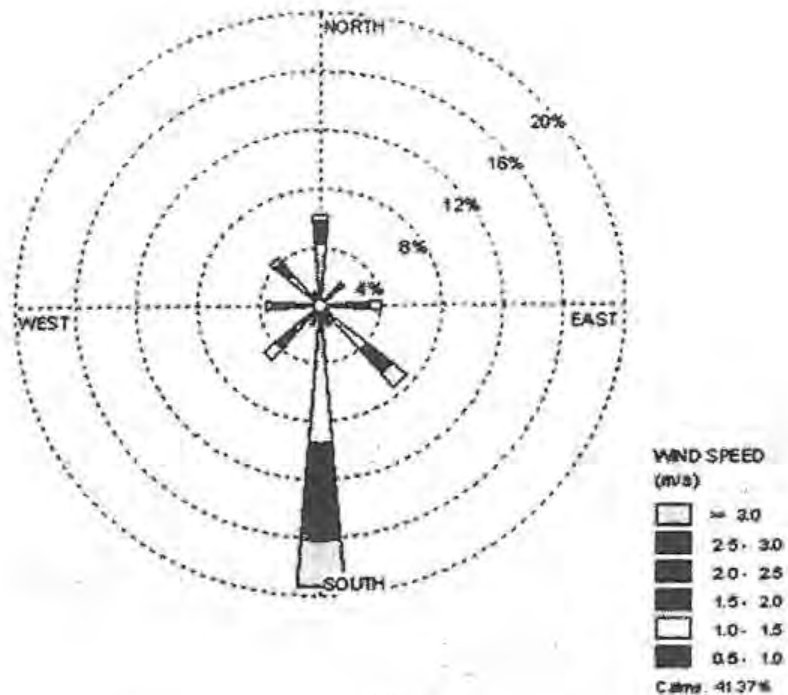
The wind load calculation for the buildings and structures shall be as per Bangladesh National Building Code -2012, Part 6, Chapter 2.4.

Basic wind Speed, V, shall be taken as 73 m/s, Three-second gust at 10 m above ground in exposure C, having a return period of 50 years.

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B0.2.5 Configuration

Two (2) Plant units mainly consisting of steam generator, steam turbine generator, flue gas treatment plants and associated equipment represent the core components of the Plant. The configuration of the power units and all of its main components shall be chosen according to proven and reliable vendor configuration. In doing so, adequate safety clearances, fire compartments, favourable layout of the Plant components for monitoring and maintenance and all other requirements such as those during Power Plant construction shall be taken into account.

The cooling requirement of the Plant shall be accomplished by induced draught cooling towers. The coal unloading facilities and the ash and gypsum loading facilities to ships shall be incorporated in a new jetty structure. Other main items are the power island, the coal yard, ash pond and other balance of plant facilities.

B0.2.6 Layout



The existing conditions at the location of the Plant are shown in the site overview as per the indicative layout in **Part C Annexes**. The Tenderer shall perform own Site visits and investigations prior to bidding in order to familiarize himself with the existing conditions. The Contractor shall propose the Plant layout deemed most practical and cost optimized for the Power Plant.



An indicative general layout is shown in **Part C Annexes** where only the major Plant components have been indicated. The indicative layout takes into consideration the location of the river water intake and jetty, however the final layout is subject to hydraulic studies and optimizations by the Contractor. The design shall allow access vessels with a draught of 9.60m at the jetty. The vessels shall be suitable for transport of coal, ash, gypsum and limestone. The dredging works for the construction of the intake and outfall are part of the Contractor's scope.

The intake and outfall locations may change according to the permitting process, results of calculations or model tests or clarifications with the Contractor.

The substations for the export of the produced power are located in the northern portion of the Site. The EHV transmission lines to Dhaka and Khulna are not part of these Tender Documents.

Any costs for relocations or reconfigurations shall exclusively be borne by the Contractor.

The general layout enclosed in Section V TS, Part C is only indicative. Bidder/ Contractor shall elaborate the final layout, which shall be subject to approval by BIFPCL during basic/detailed engineering.

B0.2.7 Design requirements

This specification entails a functional technical specification (FTS). Hence, the Contractor is given as much freedom as possible in designing the main Plant components, characteristics and design data according to the Contractor's experiences and good engineering practice. One main acceptance requirement is that the Contractor's proposed design work shall be based on a very good reference basis. Prototype equipment and/or design features will not be accepted. All parts and equipment shall be arranged in such a manner as to facilitate surveillance by the operator and for ease maintenance, operation and control.

In the event of contradictions or discrepancies within B0 or between requirements in B0 and stipulations other parts of the Technical Specifications these shall be clarified by mutual consent before Contractor signature. In case contradictions have been not clarified the more stringent requirements shall apply.

The main design features (basic design reports, drawings, PFD, P&IDs, design data etc.) and the main vendors and subcontractors shall be subject to the approval by the Employer.

The main equipment/system subcontractors for: steam generator, steam turbine, main transformers, flue gas desulphurization plant shall be firm with the tender. Bidder's/Contractor's sub-suppliers and vendors shall



comply with Provennes Criteria as stipulated elsewhere in the bidding document.

The Employer has the right to refuse design features and vendors or subcontractors, if the Contractor cannot verify the reliability of the suggested design, vendor or subcontractor.

Following transformers shall be considered as "Main transformers":

- generator transformer
- unit auxiliary transformer
- start-up/stand-by transformer
- 400/230 kV interconnection transformers.

The Plant is expected to operate in base-load mode with high plant load factor. The design lifetime of the Plant shall be of not less than 30 years of operation or 200,000 full load operating hours, whichever is longer. The Plant and all its auxiliaries shall be designed to operate for the complete lifetime under the site conditions as described in **Section B0** and dedicated other part of this FTS.

All Plant equipment and material must be suitable for the range of ambient site conditions. In particular the saline atmosphere has to be considered.

The thermodynamic process of the Plant is to be optimized by the Contractor according to the proposed equipment. An economic optimal balance between investment, maintenance and operation expenses and Plant availability (planned and unplanned outages) shall be proposed.

The Contractor shall ensure a design of the Plant to achieve an average target availability of 90 % (regarding the definition and calculation of the availability please refer to Chapter B0.2.9.5). The Contractor shall accordingly provide for all systems:

- sufficient redundancies
- sufficient storage capacity
- appropriate adjustment of control parameters, and
- shall provide an appropriate spare part concept/proposal as further described under Chapter B0.3.7.



A stockyard capacity of 90 days at BMCR operation with design coal is envisaged

The stockpile height shall be approx. 10 m and the angle of repose shall be approx. 37°.

But it is to be underlined that it is Bidder's/Contractor's sole responsibility to determine the actual coal yard dimensions (length, width, height angle etc.)

to achieve the envisaged stockyard capacity under consideration of the soil bearing capabilities and the selection of coal yard equipment.

The 90 days storage area is shown in Annex C-01. The extension for further 90 days storage shall be done on the areas which are marked as "construction laydown area" and "site installation".

Redundancy concept

All equipment shall be implemented with (n+1) redundancy - unless otherwise stated -, where n is the number of equipment required to maintain the maximum capacity of a unit. N+1 means that even in case of outage of the biggest component sufficient capacity is available to maintain the maximum capacity of the Power Plant unit.

For all components which are not redundant, the Contractor shall provide a maintenance and spare part concept to ensure that outage times are minimized and to ensure that the required availability is met (refer to Amendment No. 3 and Annexure I to Amendment No. 3, both already published on BIFPCL's Website). Each equipment whose unavailability due to a failure could result in damages to another equipment shall be backed up by a stand-by equipment, one of them being fed by an emergency source in case of external black out.

Failure of any single item of auxiliary equipment including the Power Plant's DCS and electrical systems shall not result in a reduction in power evacuated from the Power Plant.

Replacement and repair of redundant components shall be possible without interrupting Plant operation.

Future Extension

The Contractor shall ensure sufficient space to enlarge the coal storage capacity from 90 day storage to 180 day storage capacity.

All provisions to enable generally the later extension of the coal storage shall be implemented but no additional costs shall be incurred which are not immediately required for the first phase only, unless expressly mentioned here or in the respective parts of this specification.

B0.2.8 Fuel



The Plant shall be operated with imported sub-bituminous and bituminous coal as the principle fuel. Coal will be supplied via bulk carrier vessels (barges and vessels up to 25,000t, to be unloaded at the Coal Jetty.

The Plant will have to be able to be fully operational and in accordance with all guarantee parameters with all coals on a 100 % basis that comply with the coal characteristics as indicated in **Part C**.



For reference purposes, the list that contains the performance coal and the design range for the coals is included in **Part C Annexes**.

For start-up, low-load operation and shut-down, high speed diesel (HSD) shall be used. HSD will be supplied by truck. A typical analysis is given in **Part C Annexes**.

Special technical requirements for the HSD system are given in **Section B4**.

B0.2.9 Output, heat rate and availability requirements

B0.2.9.1 Guarantee definitions

The following guarantees are defined:

Acceptance Guarantees:

The acceptance guarantees must be met in all operating gases unrestrictedly. They are not subject to any correction. Acceptance Guarantees are specified in the Technical Schedules of **Section B0**. The acceptance guarantees are required to be achieved or executed as a condition precedent to Taking Over.

Special Guarantees:

These guarantees are subject to correction, e.g. for fuel characteristics or ambient conditions and if they are not met, they are subject to payment of performance damages. Special Guarantees are specified in the Technical Schedules of **Section B0**.

Minimum Acceptance level (MAL):

Minimum acceptance level (MAL) means the relevant minimum performance levels for the Plant as specified in the relevant part of the Technical Schedules of **Section B0**. The MAL are required to be achieved or executed as a condition precedent to Taking Over.

Liquidated Damages (LD)

Liquidated Damage means the monetary amount to be paid by the Contractor to the Employer if the Special Guarantees are below the Guaranteed Value but above Minimum Acceptance Levels.

B0.2.9.2 Plant output

Gross Electrical Power Output

The gross electrical power output per unit is determined at the turbine generator terminals to the isolated phase busbars, downstream of the connection for the excitation transformer.



The gross electrical power output per unit shall be: **660.0 MW_{e, gross}** (plus excitation power requirement in case of static excitation) and shall be kept for the whole coal range.

Net Electrical Power Output

The net electrical power output per unit is determined at the off-take point in the switchyard that means at the high voltage (HV) terminals of the dedicated generator transformer (GT).

The net output is determined by subtracting the consumption of the auxiliary transformer including transformer losses from the gross output.

Export Power Output

The export power output of the Plant is determined at the tariff meterings of the Plant.

The export power output of the Plant equals the net power output of both units minus the losses of the interconnection transformers (ICTs) and start-up transformers.

Dependable Capacity

Dependable Capacity means - according to the Power Purchase Agreement (PPA) - at any given time the net amount of capacity at the tariff metering; either for the first generating unit or for the Plant, as the case may be.

MCR - Maximum Continuous Rating

MCR is defined as the maximum continuous rating (gross electrical power output) of one (1) power plant, coal within the coal range, under Reference Site Conditions (RSC), governor valves being throttled to provide frequency variation as required, boiler in normal operating mode including blow down (if applicable), auxiliary steam consumption (if applicable) etc.). All load percentages apply to MCR, unless otherwise noted.

The dedicated net electric power output at MCR with PF and RSC is:

- $P_{MCR-PF-RSC}$ in [MWe]

The dedicated steam generator load at MCR with PF and RSC is:

- $F_{MCR-PF-RSC}$ in [kg/s]

TMCR - Turbine Maximum Continuous Rating / VWO - Valves Wide Open (Peak Load)

TMCR/VWO is defined as the maximum continuous rating, at which the steam turbine is capable of operating under normal operating conditions (see MCR). However, when the governor valves are fully opened TMCR/VWO shall be at least 103% of MCR, i.e.:

- $P_{TMCR} = 1.03 \times P_{MCR}$



That means, Gross Electrical Power Output at

- MCR shall be 660 MW ((plus excitation power requirement in case of static excitation)
- TMCR shall be 679.8 MW.

BMCR - Boiler Maximum Continuous Rating

BMCR is defined as the maximum continuous steam generating capacity, at which the boiler is capable of operating under normal operating conditions (see MCR). BMCR shall be at least 105% of MCR, i.e.:

$$F_{BMCR} = 1.05 \times F_{MCR}$$

The steam flow at superheater outlet at BMCR shall be 105% MCR flow.
Reheater steam flow at BMCR shall be as per Heat Balance Diagram.

MNCR - Minimum Continuous Rating

MNCR is defined as the minimum rating of a power plant unit under normal, continuous operating conditions (see MCR) with coal fire only (without back-up firing with start-up/ignition fuel) with any coal within the coal range. MNCR shall be 30% of MCR.

$$P_{MNCR} = 0.3 \times P_{MCR}$$

B0.2.9.3 Net heat rate

The guaranteed Net Heat Rates of the Units and the Plant are to be given in the Technical Schedules of **Section B0**.

The competitiveness of the bid will be evaluated by considering the lowest life-cycle-costs of the bids, which will strongly be influenced by the Bid price on the one hand and the guaranteed Net Heat Rate on the other hand. The optimization criterion which may be utilized by the Contractor in the determination of the proposed power station design is the penalty imposed by not achieving the guaranteed Net Heat Rate as per the Contract.

The guaranteed Net Heat Rates refer to the following load points:

- 100% MCR
- 80% MCR
- 60% MCR
- 50% MCR



The „Net Heat Rate” is the heat rate for the dedicated unit. It is defined according to ASME PTC 46.

Performance Tests/Guarantee Tests at MCR shall correspond to rated pressure (with throttled valves); whereas for part load (i.e 80%, 60%, 50% MCR) the Performance Tests/Guarantee Tests shall be under modified sliding pressure (with 5% throttled turbine inlet valve(s)).

B0.2.9.4 Auxiliary power consumption, losses, own consumption,

Auxiliary Power Consumption

The auxiliary power consumption is the power that is required by the auxiliary power transformer of each unit.

ICT Losses and Start-up Transformer Losses

The losses of the ICTs and start-up transformers apply for the complete switchyard of the Plant.

Own Consumption

The own consumption is the sum of the auxiliary power of both units and the ICT losses and start-up transformer losses.

B0.2.9.5 Plant availability

The Contractor shall:

- design and configure all components of the Plant;
- propose spare parts stock, comprising as minimum requirement the Initial Spare Parts as requested in Amendment No 3 and Annexure I to Amendment No.3 (both already published on BIFPCL's Website; and
- propose maintenance works

in such a way that the average availability of each unit for a period of two year is not lower than 90 %.

The availability for the year means the yearly availability of the Dependable Capacity of each unit for dispatch by the Control Centre, calculated in accordance with the following formula:

$$AF_n = \frac{DC \times \text{hours in the year} - ((MO_{cap} \times MOH) + (FO_{cap} \times FOH) + (SO_{cap} \times SOH))}{DC \times \text{hours in the year}}$$

Where:

AF_n

Availability Factor for the year "n"

DC

Dependable Capacity of the Unit as per the Contract

MO_{cap}

capacity reduction during each maintenance outage in the year "n"

MOH

maintenance outage hours for each maintenance

FO_{cap}	outage (MO_{cap}) in the year "n" capacity reduction during each forced outage in the year "n"
FOH	forced outage hours for each forced outage (FO_{cap}) in the year "n"
SO_{cap}	capacity reduction during each scheduled outages in the year "n"
SOH	scheduled outages hours for each scheduled outage (SO_{cap}) in the year "n"
$\Sigma(MO_{cap} \times MOH)$	maintenance outage energy for the year "n"
$\Sigma(FO_{cap} \times FOH)$	forced outage energy for the year "n"
$\Sigma(SO_{cap} \times SOH)$	scheduled outage energy for the year "n"

B0.2.9.6 Maintenance intervals

The Plant shall be designed to follow at least the following requirements for maintenance intervals:

	Recommended outage duration (days)	Recommended intervals between maintenance outages (years)
Scheduled Maintenance (Minor Overhauls)	to be determined by Contractor, see B0 TS	> two years
Major Overhaul	to be determined by Contractor, see B0 TS	> eight years

It is meant that the Bidder/Contractor shall determine the final maintenance intervals which shall > 2 years for minor overhauls and > 8 years for major overhauls, supposed that the plant is operated with the specified fuels and according to the operation and maintenance manuals.

In case a minor or major overhaul has to be carried out in the first two years after PAC that means during the warranty period it will have an impact on the availability and as the case may be on the availability guarantee.

B0.2.10 Mode of operation

The Plant shall be designed for base load operation and is expected to participate in the system frequency regulation by free governor operation.

All the equipment and the facilities shall be suitable for:

- Continuous and short-time operation under average ambient air and river water conditions present on site; and
- Continuous and short-time operation under extreme ambient air and river water conditions present on site.



The design of the Plant shall be based on the following operation and dispatching requirements:

- a. It shall be capable of following the daily and seasonal demand profile of the electrical network.
- b. Full compliance with the conditions of the admissible air pollution is required within the power range.
- c. The power generation shall be fully dispatchable within the technical limits of the Plant to be specified by the Contractor but at least between MNCR and 100 % of the Net Output of the Plant at BMCR.

The units shall be operated as base load plant. It must be capable for following operation modes:

- Fixed/Constant pressure operation upto 40% MCR load;
- Sliding pressure operation from rated pressure down to 40% of rated with as well as without any throttle reserve. At any operating load, the throttle reserve shall be sufficient so as to achieve an instantaneous increase in turbine output by 5% (except MCR, 3% for MCR) of the corresponding load by opening turbine control valve wide open VWO/TMCR). The throttle reserve shall be adjustable to 0% for pure sliding pressure mode operation;
- Fixed/Constant pressure from 100% MCR to 103% MCR (TMCR/VWO) load. Consequently the plant shall be designed also for fixed pressure operation as much higher load than 40% upto to 100% load;
- start-up modes from notice to start to synchronization:
 - hot start: start-up following a continuous shutdown for a period of 8 hours or less in max. 3 hours;
 - warm start: start-up following a continuous shutdown for a period between 8 and 48 hours in max. 4 hours;
 - cold start: start-up following a continuous shutdown for a period more than 48 hours in max. 12 hours;
- shut-down mode;
- Each Unit shall be capable of automatic operation and control and full cyclic operation between MNCR and BMCR without restriction;
- operation without HP heater;

With all HP heaters out of service 100% el. load shall be generated with maximum cooling water temperature, 3% make up and normal auxiliary steam requirement being tapped from cold re-heat line. For bypass of HP heaters a full bypass shall be considered.

- house load operation;
- In case of sudden load throw-off, the steam generator shall be capable of automatically bringing down the steam generating capacity from BMCR to match with HP-LP bypass capacity;



- The Power Plant shall be designed for minimum rate of loading/unloading mentioned below without compromising on design life of pressure parts;
- step load change: Minimum $\pm 10\%$ /min;
- ramp rate: Minimum $\pm 3\%$ /min (MNCR to 50% BMCR);
Minimum $\pm 5\%$ /min (50% MCR to 100% BMCR).

In addition to the the following requirements shall be considered:

- Steam Generator (refer also to Bidding Documents, Section V TS, B1.3.1.1 Operational requirements): "The steam generator shall be operable in the variable (i.e. sliding or modified sliding) and fixed pressure mode";
- Steam Turbine (refer to Bidding Documents, Section V TS, B2.3.15 Control and monitoring equipment): "The steam turbine shall be capable of operating in both the sliding and fixed pressure modes. The Bidder/Contractor shall propose the operating regime which will maintain a highest efficiency of the Plant at various loads."

The Performance Tests/Guarantee Tests shall be executed for the load points as specified. Performance Tests/Guarantee Tests at MCR shall correspond to rated pressure (with throttled valves); whereas for part load (i.e 80%, 60%, 50% MCR) the guarantee test shall be under modified sliding pressure (with 5% throttled turbine inlet valve(s)).

For more detailed requirements refer also to Chapter B0.2.12.

B0.2.11 Electrical network connection conditions

The Plant shall comply with:

- the Essential Electrical Requirement of the PPA
- the latest edition of the Electricity Grid Code of the Bangladesh Energy Regulatory Commission; and
- the Great Britain Grid Code.

In case of contradictions or discrepancies the order of precedence shall be as follows:

- Essential Electrical Requirements of the PPA
 - Electricity Grid Code of the Bangladesh Energy Regulatory Commission
 - Great Britain Grid Code.
- Any other requirements of the Bangladesh Power Development Board (BPDB) or Power Grid Company of Bangladesh (PGCB) shall also be considered.

The Tenderers shall list all those grid connection requirements which cannot be met by the proposed Plant.



B0.2.11.1 Essential Electrical Requirements of the PPA

In this chapter essential electrical requirements for the grid connection and Plant operation are extracted from the PPA. For ease of reference, the relevant chapters/articles of the PPA are indicated.

PPA Section 11: Power Evacuation and Switchyard

11.1 Power Evacuation

The Company shall deliver power at the Delivery Point and BPDB shall evacuate power from the Delivery Point. In this regard, BPDB itself or through PGCB shall construct Power Evacuation Facilities at its own costs and expenses. The Company shall construct switchyard for evacuation of power, with the provision for termination of two 400 kV circuits and two 230 kV circuits of PGCB. This switchyard along with line breaker, CT, PT and other necessary equipment and associated relays, controls, protection, communication and instrument system situated within this switchyard, will be operated and maintained by the Company. The company will also construct connecting lines (U/G or O/H) from power plant to this switchyard. The Company shall provide suitable interface unit at the Company premises for communication links to the power grid SCADA system to accommodate the PGCB and the National Load Dispatch Center (NLDC) requirements. The communication interface unit provided in the Company premises shall be adequate to fulfil the PGCB/NLDC information requirement and may be in the form of RTU or a suitable Gateway on company switchyard automation network at a mutually agreed communication protocol (i.e. IEC-60870-5-101/104). The Company shall be responsible for construction of the interconnections between the switchyard and the Facility. The company Switchyard including the interconnecting link with the generation facility should have design standards as per Minimum Functional Specification. Line relays and controls at the switchyard shall be provided by the Company.

In addition refer to B10.

Only the "start up transformer" and the "future GT's" shall be connected by means of 230 kV cables. Connection between GT's and GIS switchyard shall be done by overhead line.

BPDB shall provide by no later than two hundred and seventy (270) Days prior to Scheduled Initial Operation Date, the following facilities to the Company for the purpose of Commissioning, synchronization and operation of the Facility:

One number 230 KV D/C transmission line from the BPDB / PGCB 230 KV system, to be terminated at the specified point at the switchyard of the Facility;

- ii. (ii) Start-up power of not less than 50 MVA capacity, to be supplied to the Facility through this 230 KV transmission line, by no later



than two hundred and seventy (270) Days prior to Scheduled Initial Operation Date;

- iii. One number 400 KV D/C transmission line from the BPDB / PGCB 400KV system, to be terminated at the specified point at the switchyard of the Facility, with adequate capacity to evacuate entire power generated by the Contracted Capacity of the Facility, by no later than one hundred and eighty (180) Days prior to Scheduled Initial Operation Date;

11.2 Electrical

a. Communication link

The Company shall provide suitable interface unit at the Company premises for communication links to the power grid SCADA system to accommodate the PGCB and the National Load Dispatch Center (NLDC) requirements. The communication interface unit provided in the Company premises shall be adequate to fulfil the PGCB/NLDC information requirement and may be in the form of RTU or a suitable gateway on Company switchyard automation network at a mutually agreed communication protocol (i.e. IEC-60870-5-101/104).

The Company shall be responsible for construction of the interconnections between the switchyard and the Facility. The Company switchyard including the interconnecting link with the generation facility should have design standards as per Minimum Functional Specification. Line relays and controls at the switchyard shall be provided by the Company.

b. Control of Switchyard

Provision and installation of all control and signal cables between the company switchyard and the Facility shall be responsibility of the Company. Necessary interface shall be provided within the switchyard control facility for receiving the signals from PGCB grid control. It shall be responsibility of the Company to lay and terminate cables for this purpose.

All circuit breakers and disconnect switches shall be capable of being electrically controlled from the three control positions as follows:

- i. Local Control: Located adjacent to switching devices, to facilitate maintenance, inspection, and emergency operation.
- ii. Remote Control: Located at the switchyard control room, where switching devices are controlled by direct wire.
- iii. Supervisory Control: Located at the Load Dispatch Centre (NLDC) at Dhaka, for remote control and supervision via the tele-control systems to be supplied by the Company.

Also refer to B10.



The Company shall provide all the necessary control-selector switches, position indicating contacts, and interposing relays.

11.3 Electrical Protection, Communication and Instrument Systems

The Company shall provide a complete and comprehensive protection system for the generators/generator transformers/service transformers, transmission lines and the station electrical distribution systems. The Company shall undertake the installation of the protection relay panels within the control room, wiring between panels and switchyard equipment, and commissioning tests of the protection schemes.

The Company (in consultation with BPDB) shall provide suitable interface unit at the Company premises for communication links to the PGCB's SCADA system for Communication, control, monitoring and voice channels required for PGCB's National/Regional Control Center.

Communication, telemetry, fiber optical terminal, and tele-protection equipment (PLCC) shall be supplied and installed by PGCB at company switchyard end, matching with PGCB's remote substation end requirements. However, line trap and capacitive voltage transformer of required rating along with 48V DC/AC auxiliary supply at company switchyard end shall be provided by company. The wiring of all signalling and control circuits required for the system shall be cabled out to interface marshalling cubicles by the Company. The Company shall supply and install necessary cabling and cubicles. Cabling between the Company's cubicles and PGCB' LDC equipment shall be provided and installed by the Company.

PPA Schedule 1: Minimum Functional Specifications

3. ELECTRICAL REQUIREMENTS

3.1 Generators

- a. Each generator shall comply with IEC 34: Latest Edition and shall be rated to match [each][the] Steam turbine[s] and the steam turbine output over the full range of ambient temperatures. Generator and exciter windings shall possess insulation that is non-hydroscopic and of Class F type in accordance with IEC 85 standard.
- b. Not Used
- c. The quality management of the generator[s] and accessories shall be in accordance with the requirements of ISO 9001, EN 29001 or BS 5750 Part 1 or such other equivalent international quality standards and Prudent Utility Practices.
- d. Temperature detectors shall be provided (to be placed in the hottest zone as decided by manufacturer) to monitor the maximum operating temperature of the machine.
- e. The generator[s] shall be capable of operating within 48.5 Hz and 51.5 Hz and +/- 5% of nominal rated voltage within the power factor



range 0.85 lagging and 0.95 leading at the generator terminal. However, the combined variation in voltage and frequency shall not exceed 5%.

- f. Generator[s] shall have a minimum short circuit ratio complying with IEC 34.

3.2 Excitation System

- a. A continuous fast acting automatic excitation control system of proven design shall be provided to control each generator's voltage without hunting or instability over the entire operating range of the generators.
- b. The excitation system shall be provided with a fast acting MVAR limiter so as to prevent the generator output falling below safe limits. A power system stabiliser shall be incorporated in the excitation system of each generator. BPDB shall provide the settings for the power system stabiliser. The AVR shall be provided with but not limited to Quadrature Droop Compensation and Cross Current Compounding. Protection features, as part of the system shall include overvoltage, overcurrent, voltage transformer (VT) fuse failure, diode failure, overfluxing, and AVR power supply failure. A field shorting or discharge switch feature shall be included in the system as protection against over stressing the generator insulation in the event of a fault.
- c. Manual excitation control facilities shall be provided as back up to the automatic channel, and shall have an adequate range to allow for control of excitation for testing purposes. A true null balance shall be provided to allow for smooth excitation transfer between manual and automatic control.

Bidder's/Contractor's/OEM's standard and proven static excitation system with advanced dual channel digital voltage regulator system which do not require true null meter or follow up device for smooth AVR control transfer between auto and manual will be accepted.

The requirement related to on load tap changer is not applicable to excitation transformer.

3.3 Power and Auxiliary Transformers

The Facility shall include a main transformer for each generator, together with all protection, busbars and disconnectors where required. These main transformers shall be equipped with on load [to be discussed with BPDB] tap changers and shall be of OFAF (forced oil, forced air) or ODAF (oil direct, forced air cooled) or suitable type rated for the full continuous output of the generator.



All service station auxiliary transformers (utilization voltage <650V) shall be OFAF, ODAF or ONAN cooled if located outside, or resin type design if situated inside the buildings.

3.4 Control and Supervision

- a. Supervisory control, monitoring, and data acquisition information shall comply with BPDB's system control concept and proposed/current system. BPDB shall provide all supervisory control, monitoring, and data acquisition circuits from BPDB's National/Regional Control Center, all of which shall conform to the Company's requirements.
- b. Manual synchronising facilities, with such check facilities shall be provided as a minimum for all circuits except for station/service transformer circuits.
- c. The Facility shall be provided with a central on-site control room (CCR) so that operators can control the generators and perform switching and load dispatch duties. A Distributed Control System (DCS) shall be provided to coordinate the control and supervision of the Facility including half hourly Dependable Capacity correction for Reference Site Condition
- d. The Facility shall be equipped with terminals to receive command from the BPDB load dispatch center to allow control from Load Dispatch Center.

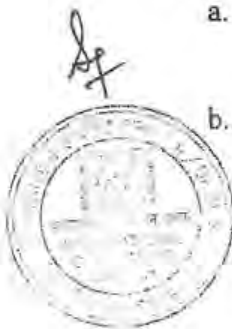
3.5 Electrical Protection, Communication Instrument Systems

The Facility shall incorporate a protection system for generators, generator transformers, service transformers, and station electrical distribution systems as per Prudent Utility Practice.

Communication, control, monitoring, and voice channels will be provided between the Facility and BPDB's National/Regional Control Center by BPDB. The Company shall provide interconnection within the Facility for all such communication circuits/channels.

3.6 Power Tariff Metering

- a. The Metering System to be installed at the Facility shall include tariff metering and indicative metering.
- b. For each unit, the measurements, which are used for calculation of the main tariff metered energy, are taken at the outgoing side of the interconnecting lines (main and check) and Back-Up Metering System on the high voltage side of each generator transformer and station transformers, as applicable. The tariff meters installed will measure the net energy sent out from the facility. As provided in Section 12.1, the Back-Up Metering System shall also be of the same type and identical to the Metering System.



Main and check meters shall be provided on HV side of generator and start-up transformer as well as at the outgoing side of the interconnection lines (Reference is made to chapter B10.3.13).

- c. The tariff meters shall have separate facilities for recording the net inflow to the Facility and net outflow of energy from the Facility, and the aggregate of these parameters. This information shall be available for transmission to remote locations via the communication circuit to be provided by BPDB.
- d. Sufficient indicative metering facilities will be installed to allow efficient normal operating and maintenance procedures and automatic control functions to be conducted at the Facility. The metering shall be logged by the Facility's DCS.

PPA Schedule 1: Technical Limits and Contracted Characteristics

1.3 Frequency, Power Factor and Voltage Limits

- a. At rated voltage and frequency, the Facility will operate at 100% load with a power factor in the range 0.85 lagging to 0.95 leading at the generator terminals, which range shall not be exceeded. The curves from the manufacture(s) showing the Reactive Power capability of the generators form part of Schedule 2.
- b. The Facility will operate within the line voltage range used in practice by BPDB and in no case shall the Facility be required to operate more than +5% or less than -10% on the 400 kV high voltage system.
- c. The Facility shall operate within the frequency range 48.5 Hertz to 51.5 Hertz which range shall not be exceeded. The Facility shall be capable of continuous operation for the periods defined in Table 3,



Table 3: As per PPA

Frequency Range (Hz)	Minimum Sustainable Operation
48.5 to 51.5	Continuous
47.5 to 48.5	10 minutes
Less than 47.5	Trip Condition
Greater than 51.5	Trip Condition

B0.2.11.2 Essential Requirements of Electricity Grid Code of the Bangladesh Energy Regulatory Commission

In this chapter essential requirements for the grid connection and Plant operation are extracted from the BGC. For ease of reference, the relevant chapters/articles of the BGC are mentioned in brackets.



The full compliance with the BGC shall be proven by electrical system studies and investigations.

The ratio of X/R can be considered as 40 based on the table 10 given in IEEE C37.010.

It is to be emphasized that there are some discrepancies between the requirements of the BGC and the requirements of the International Electrotechnical Commission Standard IEC 60034. In case of contradictions the requirements and stipulations of IEC 60034 shall prevail.

The Tenderer shall discuss all deviations from the grid connection conditions, which will result in an economic advantage for the investment and the operation of the Plant.

B0.2.11.2.1 System performance (Section 5.4)

Each generating unit shall be capable of generating at full rated power output within following ranges:

	From	To
Frequency	47.5 Hz	52 Hz
Rated Voltage	-10%	+ 10%
Power factor	0.85 lagging *)	0.95 leading

*) This value deviates from the BGC and is chosen as common for generator of this size.

The Transmission System frequency shall normally be 50.0 Hz and shall normally be controlled in the range 49.0 – 51.0 Hz (50 Hz $\pm$ 2%). The User shall however be subject to the grid discipline directed by the Commission.

Voltage variation on the Transmission System shall normally be $\pm$ 10% during emergencies and $\pm$ 5% during normal operation, in accordance with the provisions of Planning and Security Standards for Transmission System. Insulation coordination of the Users' equipment and rupturing capacity of switchgear shall conform to applicable Bangladesh Standards/Codes.

Protection schemes and Metering schemes shall be as detailed in the Protection & Metering Sections of the Code.

For new Power Stations the equipment within their site for data transmission and communications shall be owned and maintained by the respective Generator.

B0.2.11.2.2 Connection point (Section 5.6.1)

Unless specifically agreed with the Licensee the Connection point shall be the outgoing gantry of Power Station switchyard. The metering point shall be at the outgoing connection point. All the substation equipment including Protection, Control and Metering equipment owned by the Generator within

the perimeter of the Generator's site shall be maintained by the Generator. Other Users' equipment shall be maintained by the respective Users. From the outgoing feeder gantry onwards, the Licensee shall maintain all electrical equipment.

B0.2.11.2.3 Data requirements (Section 5.7)

Users shall provide the Licensee with data for this Section as specified in the Data Registration Section.

B0.2.11.2.4 Frequency management & responsibilities (Section 8.3 and 8.4)

Generators shall follow the dispatch instructions issued by the NLDC.

All Generating Units shall have the governor available and in service and must be capable of automatic increase or decrease in output within the normal declared frequency range and within their respective capability limit.

Under certain conditions the system frequency could rise to 52 Hz or fall to 47.5 Hz. All Generating Units should be capable of operating within the range and the NLDC informed promptly of any restrictions. **Generators** shall be responsible for protecting their Generating Units against damage should frequency excursions outside 52 Hz and 47.5 Hz ever occur. Should such excursions occur, the **Generator** should decide whether or not to disconnect his apparatus for reasons of safety of apparatus, Plant and/or personnel. The **Generator** shall inform the NLDC immediately after taking such action.

Sustained rising frequency

Under rising frequency conditions, the NLDC shall take appropriate action to issue instructions to **Generators** to arrest the rising frequency and restore frequency within normal range. Such instructions may include reducing generated output or de-synchronizing Generating Units from the Transmission System. When the frequency rises above 51.0 Hz actions must be taken immediately by the **Generator**. Under such condition, the Generating Units which were responsible for seeing frequency of the system shall decrease their Generating Output at a rate of – (minus) 2% per 0.1 Hz for departure of frequency above 51.0 Hz until the frequency is restored within the normal range. The **Generator** shall inform the NLDC immediately after taking such action.

Sustained falling frequency

Under falling frequency conditions, the NLDC shall take appropriate action to issue instructions to arrest the falling frequency and restore it to be within normal range. Such instructions may include dispatch instructions to **Generators** to increase output, to synchronize standby Generating Units to



the Transmission System and/or instructions to Distribution Utilities to reduce load demand by appropriate manual and /or automatic load shedding.

When the frequency falls below 49.0 Hz the Generating Units which were responsible for seeing frequency of the system shall increase their Generating Output at a rate of + (plus) 2% per 0.1 Hz (if available) for departure of frequency below 49.0 Hz until the frequency is restored within the normal range. The **Generators** shall be responsible for protecting own units should frequency excursions occurs outside 47.5 to 52 Hz range. The **Generator** shall inform the **NLDC** immediately after taking such action.

All Generating Units that have been declared available shall be required to be synchronized and loaded in the event of the sustained low frequency below 49.0 Hz provided local and safety conditions permit. This action shall be performed without delay after failed attempts to contact the **NLDC**. The Generator shall inform the **NLDC** immediately after taking such action.

B0.2.11.2.5 Voltage management (Section 8.5)

The **Licensee** and **NLDC** shall carry out load flow studies from time to time to predict where voltage problems may be encountered and to identify appropriate measures to ensure that voltages remain within the defined limits. On the basis of these studies the **NLDC** shall instruct **Generators** to maintain specified voltage levels at interconnecting points.

The **Licensee** shall continuously monitor 400 kV/ 230 kV/ 132 kV transmission grid voltage levels at strategic substations. The **NLDC** and the Licensee shall regulate voltage levels within the prescribed levels.

The **NLDC** and the **Licensee** shall jointly take appropriate measures to control Transmission System voltages that may include but not be limited to transformer tap changing and use of MVAR reserves with Generating units within technical limits agreed to between the **NLDC**, **Licensee** and Generating units.

All Generating Units shall have Automatic Voltage Regulator (AVR) in service.

Generators shall inform the **NLDC** of their reactive reserve capability promptly on request. **Generators** shall make available to the **NLDC** the up-to-date capability curves for all Generating Units, as detailed in **Section 5**, indicating any restrictions, to allow accurate system studies and effective operation of the Transmission System.

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B0.2.11.2.6 Monitoring of generation (Section 8.7)

For effective operation of the Transmission System, it is important that a **Generator's** declared availability is realistic and that any departures are continually fed back to the **Generator** to help effect improvement. The monitoring by the **NLDC** of Generating Unit output, and active and reactive reserve capacity, shall be carried out to evaluate the reliability and performance of plant.

The **NLDC** shall continuously monitor Generating Unit outputs and bus voltages (by SCADA). More stringent monitoring may be performed at any time, as detailed in the Testing Section, when there is reason to believe that a **Generator's** declared availability may not match the actual availability or declared output does not match the actual output.

Generators shall provide to the **NLDC** hourly generation summation outputs where no automatically transmitted metering or SCADA equipment exists.

The Generator shall provide other logged readings that the **NLDC** may reasonably require, for monitoring purposes where SCADA data is not available.

Generators shall submit data to **NLDC** as listed in Data Registration Section, termed as Frequency and Voltage Management.

B0.2.11.2.7 Contingency planning (Section 9)

Total System Blackout (Section 9.3.1)

NLDC shall instruct all relevant Generators having Power Stations with Black Start capability to commence their pre-planned Black Start procedure.

Remark: The Maitree-STPP shall **not** have Black Start capability.

Partial Transmission System Blackout (Section 9.3.2)

NLDC shall ensure with the **Licensee** and **Users** that security of the healthy part of the Transmission System is maintained.

NLDC and the **Licensee** shall gradually extend the healthy system to provide start-up power to appropriate Generating Units.

NLDC and the **Licensee** with close coordination with Distribution Utilities and **Generators** shall gradually restore demand to match generation as it becomes available.

All **Users** shall take care to ensure load generation balance is maintained all times under **NLDC's** direction.

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Special Consideration (Section 9.5)

During the restoration process following Transmission System blackout conditions, normal standards of voltage and frequency shall not apply.

B0.2.11.2.8 Protection (Section 12)

General Principals (Section 12.3)

No item of electrical equipment shall be allowed to remain connected to the Transmission System unless it is covered by appropriate protection aimed at reliability, selectivity, speed and sensitivity. Guidelines mentioned in protection manuals may be kept in view.

All Users shall co-operate with the Licensee to ensure correct and appropriate settings of protection to achieve effective, discriminatory removal of faulty equipment within the time for target clearance specified in this Section.

Protection settings shall not be altered, or protection bypassed and/or disconnected without consultation and agreement of all affected Users. In the case where protection is bypassed and/or disconnected, by agreement, then the cause must be rectified and the protection restored to normal condition as quickly as possible. If agreement has not been reached the electrical equipment will be removed from service forthwith.

Fault Clearance Times (Section 12.5)

From a stability consideration the maximum fault clearance times for faults on any User's system directly connected to the Transmission System, or any faults on the Transmission System itself, are as follows:

Target Clearance Times:

- i. 400 kV : 100 ms
- ii. 230 kV : 160 ms
- iii. 132 kV : 160 ms.



Slower fault clearance times for faults on a Users system may be agreed to but only if, in the Licensee's opinion, system conditions allow this.

Generator Requirements (Section 12.6)

All Generating Units and all associated electrical equipment of the Generator connected to the Transmission System shall be protected by adequate and coordinated protection so that the Transmission System does not suffer due to any disturbance originating from the Generating Unit.

In the event of failure of the protection systems provided to meet the fault requirements detailed above, backup protection shall be provided by the Generator with a fault clearance time not slower than 400ms for faults on the Generating Unit's HV connections. The protection shall also cover EHV lines and transformers to the standards as for the Transmission System and



circuit breaker fail, pole slipping, loss of excitation, power system stabilizer and negative phase sequence tripping.

Transmission Line Requirements (Section 12.7/12.7.1/12.7.3)

Every 400 kV Line and 230 kV Line taking off from a Power Station or a substation shall have main protection and backup protection as mentioned below. The **Licensee** shall notify **Users** of any changes in its policy on protection from time to time.

- Two distance protections plus directional earth-fault protection (in directional comparison scheme) shall be provided as the Main-1 and Main-2 protection respectively.
- One stand alone directional 3-phase or 2-phase over-current relay and one directional earth-fault relay shall provide the backup protection.
- Three pole and/or single pole single shot auto-reclosing equipment shall be fitted, as appropriate, as considered by the licensee. All auto-reclosing equipment will be made inoperative for three phase trip-out and/or back-up protection operation.
- Both distance and directional earth-fault functions shall have compatible communication aided transfer trip scheme.

For short transmission lines Line Differential Protection along with backup Directional normal, Directional time-lag and/or Non-Directional Over-current and Earth-fault protection shall be provided as an appropriate protection scheme.

Relay Panels for the protection of lines of the **Licensee** taking off from a Power Station shall be owned and maintained by the **Licensee**. **Generators** shall provide space, connection facility and access to the **Licensee** for such purpose.

The **Generator** shall ensure that all common facilities needed for installing required protective relaying are made available to the **Licensee**.

Transformer Requirements - Generating Station/Transmission System (Section 12.9.1)

All windings of auto-transformers and power transformers of EHV class shall be protected by differential relays and REF relays as main protection. In addition there shall be one backup time lag 3-phase Over-current and Earth-fault protection relay. For parallel operation such backup protection shall have directional feature. For protection against heavy short circuits, the Over-current and Earth-fault relays should incorporate a high set instantaneous element. In addition to electrical protection, gas operated relays, winding temperature protection and oil temperature protection shall be provided. Over-voltage, thermal overload and over-fluxing protection should also be provided.



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Substation Busbar and Fire Protection (Section 12.10.1/12.10.2)

All Users shall provide adequate main and backup bus zone protection incorporated with Local Breaker Backup (LBB) or Breaker Fail Protection (BFP) for busbars in all 400 kV, 230 kV and 132 kV class substations.

Adequate precautions shall be taken and protection shall be provided against fire hazards to all Apparatus of the Users conforming to relevant Bangladesh Standard Specification and/or provisions in the Electricity Rules, 1937 and amendments thereof and other standard engineering practices.

Data Requirements (Section 12.11)

Users shall provide the Licensee with data for this Section as specified in the Data Registration Section.

B0.2.11.2.9 Testing (Section 14)**Introduction (Section 14.1)**

This Section specifies the responsibilities and procedures for arranging and carrying out Tests which have (or may have) an effect on the Transmission System or the Generator's or Distributor's systems.

Objective (Section 14.2)

The objective of the Section are to establish whether Generating Units can operate within their Generation Schedule and Dispatch parameters as registered under the Data Registration Section and that the Generator and Distributor comply with the Connection Section. It shall also establish whether each Generating Unit's declared availability capacity is as declared and that the requirements of the provisions of frequency, voltage management and reserve capability are met in accordance with the provisions of the Grid Code.

B0.2.11.2.10 Performance standards for transmission (Section 17)**Purpose and Scope (Section 17.1.1/17.1.2)***Purpose:*

- a) To ensure the quality of electric power in the Grid.
- b) To ensure that the Grid will be operated in a safe and efficient manner and with a high degree of reliability; and
- c) To specify safety standards for the protection of personnel in the work environment

Scope of Application:

This Chapter applies to all Grid Users including:

- a) the Licensee
- b) the System Operator/ NLDC
- c) generators



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- d) distribution utilities, and
- e) any other entity (e.g. owners of HVDC converter, large furnaces, etc.) with a User System connected to the Grid.

Power Quality Standards (Section 17.2)

Power Quality Problems (Section 17.2.1)

For the purpose of this Article, Power Quality shall be defined as the quality of the voltage, including its frequency and the resulting current that are measured in the Grid during normal conditions.

A Power Quality problem exists when at least one of the following conditions is present and significantly affects the normal operation of the System:

- a) The System Frequency has deviated from the nominal value of 50 Hz.
- b) Voltage magnitudes are outside their allowable range of variation.
- c) Harmonic Frequencies are present in the System
- d) There is imbalance in the magnitude of the phase voltages.
- e) The phase displacement between the voltages is not equal to 120 degrees.
- f) Voltage Fluctuations cause Flicker that is outside the allowable Flicker Severity limits, or
- g) High-frequency Over-voltages are present in the Grid.

Frequency Variations (Section 17.2.2)

The nominal fundamental frequency shall be 50 Hz. The control of System frequency shall be the responsibility of the System Operator. The System Operator shall maintain the fundamental frequency within the limits of 49.0 Hz and 51.0 Hz during normal conditions.

Voltage Variations Section 17.2.3)

For the purpose of this Section, Voltage Variation shall be defined as the deviation of the root-mean-square (RMS) value of the voltage from its nominal value, expressed in percent. Voltage Variation will either be of short duration or long duration.

A Short Duration Voltage Variation shall be defined as a variation of the RMS value of the voltage from nominal voltage for a time greater than one-half cycle of the power frequency but not exceeding one minute. A Short Duration Voltage Variation is a Voltage Swell if the RMS value of the voltage increases to between 110 percent and 180 percent of the nominal value. A Short Duration Voltage Variation is a Voltage Sag (or Voltage Dip) if the RMS value of the voltage decreases to between 10 percent and 90 percent of the nominal value.

A Long Duration Voltage Variation shall be defined as a variation of the RMS value of the voltage from nominal voltage for a time greater than one minute. A Long Duration Voltage Variation is an Under-voltage if the RMS value of the voltage is less than or equal to 90 percent of the nominal voltage. A Long Duration Voltage Variation is an Overvoltage if the RMS



value of the voltage is greater than or equal to 110 percent of the nominal value.

The Grid Owner and the System Operator shall ensure that the Long Duration Voltage Variations result in RMS values of the voltages that are greater than 95 percent but less than 105 percent of the nominal voltage at any Connection Point during normal conditions.

Harmonics (Section 17.2.4)

For the purpose of this Section, Harmonics shall be defined as sinusoidal voltages and currents having frequencies that are integral multiples of the fundamental frequency. The Total Harmonic Distortion (THD) shall be defined as the ratio of the RMS value of the harmonic content to the RMS value of the fundamental quantity, expressed in percent.

The Total Demand Distortion (TDD) shall be defined as the ratio of the RMS value of the harmonic content to the RMS value of the rated or maximum fundamental quantity, expressed in percent. The Total Harmonic Distortion of the voltage and the Total Demand Distortion of the current at any Connection Point shall not exceed the limits given in Tables 17-1 and 17-2, respectively.

Harmonic Voltage Distortion

Voltage Level	THD*	Individual	
		Odd	Even
400 kV	1.5%	1.0%	0.5%
132-230 kV	2.5%	1.5%	1.0%
66 kV	3.0%	2.0%	2.0%

* Total Harmonic Distortion

Table 17-1: Maximum Harmonic Distortion Factor

Harmonic Current Distortion

Voltage Level	TDD*	Individual	
		Odd	Even
400 kV	1.5%	1.0%	0.5%
132-230 kV	2.5%	2.0%	0.5%
66 kV	5.0%	4.0%	1.0%

* Total Demand Distortion

Table 17-2: Maximum Harmonic Distortion



T.H.D of the line-to-line terminal voltage for the Generator shall be as per latest IEC 60034-3 (clause 9.11.2 - Limits (Total Harmonic Distortion (THD) for synchronous machines) will be accepted. As per this clause of IEC, it shall be limited to 5%. However, at the 400 kV and 230 kV grid connection points the requirements of the specification Section B0.2.11.2.10 shall apply.



Voltage Unbalance (Section 17.2.5)

For the purpose of this Section, the Negative Sequence Unbalance Factor shall be defined as the ratio of the magnitude of the negative sequence component of the voltages to the magnitude of the positive sequence component of the voltages, expressed in percent. For the purpose of this section, the Zero Sequence Unbalance Factor shall be defined as the ratio of the magnitude of the zero sequence components of the voltages to the magnitude of the positive sequence component of the voltages, expressed in percent. The maximum Negative Sequence Unbalance Factor at the Connection Point of any User shall not exceed one (1) percent during normal operating conditions.

The maximum Zero Sequence Unbalance Factor at the Connection Point of any User shall not exceed one (1) percent during normal operating conditions.

Voltage Fluctuation and Flicker Severity (Section 17.2.6)

For the purpose of this Section, Voltage Fluctuations shall be defined as systematic variations of the voltage envelope or random amplitude changes where the RMS value of the voltage is between 90 percent and 110 percent of the nominal voltage. For the purpose of this Section, Flicker shall be defined as the impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

In the assessment of the disturbance caused by a Flicker source with a short duty cycle, the Short Term Flicker Severity shall be computed over a 10-minute period. In the assessment of the disturbance caused by a Flicker source with a long and variable duty cycle, the Long Term Flicker Severity shall be derived from the Short Term Flicker Severity levels.

The Voltage Fluctuation at any Connection Point with a fluctuating demand shall not exceed one percent (1%) of the nominal voltage for every step change, which may occur repetitively. Any large Voltage Fluctuation other than a step change may be allowed up to a level of three percent (3%) provided that this does not constitute a risk to the Grid or to the System of any User. The Flicker Severity at any Connection Point in the Grid shall not exceed the values given in Table 17-3.

	Short Term	Long Term
132 kV and above	0.8 unit	0.6 unit
below 132 kV	1.0 unit	0.8 unit

Table 17-3: Maximum Flicker Severity

Transient Voltage Variations (Section 17.2.7)

For the purpose of this Section, Transient Voltages shall be defined as the high-frequency Over-voltages that are generally shorter in duration compared to the Short Duration Voltage Variations. Infrequent short-duration peaks may be permitted to exceed the levels specified in Section 17.2.4 for harmonic distortions provided that such increases do not



compromise service to other End-users or cause damage to any Grid equipment. Infrequent short-duration peaks with a maximum value of two (2) percent may be permitted for Voltage Unbalance, subject to the terms of the Connection Agreement or Amended Connection Agreement.

B0.2.11.2.11 House load operation (not requested by the Grid Code of Bangladesh)

Each Unit shall successfully go to house load operation in the event of disconnection or complete isolation of such Unit from the Grid. Each Unit shall be capable of performing house load operation up to a maximum of 2 hours. A Unit that has achieved house load operation shall not be shut down without the prior consent of the NLDC.

1. Within such time, each Unit on house load operation shall be ready to be resynchronized to the Grid System and able to increase output in the usual manner.
2. In the event the Grid System is not energized, each Unit on house load operation shall have the capability to energize a dead bus and to start the other Unit, when instructed by the NLDC. Subsequently, upon instruction by the NLDC, such Unit shall be able to increase output in the usual manner.

B0.2.12 Facility technical limits

The following sections describe the minimum requirements regarding the facility.

B0.2.12.1 Unit start

The facility shall be able to achieve the following operating levels within the same period (in minutes) specified in the following table.

Conditions	Boiler firing to turbine start	Steam turbine start to synchronous	Notice to start to steam turbine synchronous	Synchronous to full load	Total
Cold start after more than 48 hrs outage	TBD	TBD	12 hours	TBD	TBD
Warm start after 8 to 48 hrs shutdown	TBD	TBD	4 hours	TBD	TBD
Hot start after 8 hrs shutdown	TBD	TBD	3 hours	TBD	TBD

Table B0-3: Required start-up times (minutes)¹

¹ To be determined by the Tenderer



B0.2.12.2 Despatch ramp rates

Ramp rates of 3%/min to 5%/min are expected for the Power Plant when operating between 30% and 100% BMCR. Ramp rates of less than 5%/min are subject to Employer's approval.

The facility shall be able to achieve the following despatch ramp rates as specified in the following table:

Despatch ramp rates		(Excluding Pulverizer changing over time)	
		Loading (MW)	Ramp rates (MW/min)
Cold start	(0 to 7%)	0 – 42	TBD
	(7 to 30%)	42 – 180	TBD
	(30 to 50%)	180 – 300	TBD
	(50 to 75%)	300 – 450	TBD
	(75 to 100%)	450 – 660	TBD
Warm start	(0 to 7%)	0 – 42	TBD
	(7 to 30%)	42 – 180	TBD
	(30 to 50%)	180 – 300	TBD
	(50 to 75%)	300 – 450	TBD
	(75 to 100%)	450 – 660	TBD
Hot start	(0 to 7%)	0 – 42	TBD
	(7 to 30%)	42 – 180	TBD
	(30 to 50%)	180 – 300	TBD
	(50 to 75%)	300 – 450	TBD
	(75 to 100%)	450 – 660	TBD

Despatch ramp rates (per Unit)²



B0.2.13 Environmental impact requirements

Air pollution

The permissible exhaust gas emissions shall comply with the stipulations of the generating license granted. Compliance for the following pollutants shall be guaranteed and proved:

Emission	Unit	Maximum Threshold
Total PM	mg/Nm ³	50
Sulphur dioxide (SO ₂)	mg/Nm ³	200
Nitrogen oxide (NO _x)	mg/Nm ³	510

Table B0-5: Emission limits

Note:

- NO_x refers to oxides of nitrogen, referenced to NO₂.

Reference conditions for NO_x, SO₂, and particulates are 6 % O₂, dry (i.e. zero moisture), 0 °C and 1013 mbar atmospheric pressure, that means, unit for emissions is mg/Nm³

² To be determined by the Tenderer

The stack height shall follow the requirements of the Environment Conservation Rules, 1997 of Bangladesh.

Water pollution

Permissible emission limits for aqueous discharges into the river via the Plant Water Discharge System shall comply with the Waste Water Effluent Standards, see Technical Schedule of **Section B0** and IFC EHSG - TPP - Table 5 - Effluent Guidelines. If there are differences in effluent limits in the two guidelines the more stringent limit should be applied. But limit of TDS with 2100 ppm shall not be followed.

The findings of the Environmental Impact Assessment (EIA) shall be used for Plant design.

Other waste water which is not allowed to be discharged to the requirements waste water treatment plant will have to be disposed externally.

Soil contamination

The Plant should be designed, operated and maintained in such a way to prevent any soil contamination by oil and chemical spillage during subsequent operation and maintenance of the Plant.

Permissible noise levels

The Plant shall be designed and constructed inter alia in accordance with IFC Environmental, Health and Safety Guideline Thermal Power Plants (EHSG-TPP) to reduce the operating noise level as much as possible. No individual within the boundary of the Site shall be exposed to a noise level exceeding the limits stated in the EHSG-TPP and "The Sound Pollution (Control) Rules, 2006".

Far field noise under normal operation of the Plant measured along the Site boundary of the Plant towards the Township shall not exceed 50 dB(A) during daytime and 40 dB(A) during night-time.

For any other point of the Site boundary of the Plant the noise pressure level shall not exceed 60 dB(A) during daytime and 50 dB(A) during night-time. Day time is defined from 6:00 am to 9:00 pm. Night time is defined from 9:00 pm to 6:00 am.

During the engineering phase the Contractor shall award an independent Third Party to conduct noise propagation calculation to prove that the permissible noise levels at the Plant boundary are met.

In addition the statutory requirements of Bangladesh shall be followed as far as stricter as the other standards, such as EHSG-TPP.

Furthermore the following maximum noise pressure levels shall be not exceeded:

dB(A)

- At 1 m horizontal distance from equipment/enclosures and 1.5 m above operating floor 85
- Within turbine building 90 (Note 1 & 2)
- Steam generator 90 (Note 1)
- Within central control rooms in power plants 55.

Notes:

1. At normal operation
2. Generally at maximum 88 dB(A), exceptions are the turbine stop valve and control valves 95 dB(A) and turbine drive boiler feed pumps 97 dB(A).
3. Noise level from non continuous operating valves (like pressure control valve, water separator drain control valve, etc.) shall be limited to 90 dB(A).
4. The noise level for safety valves including ERV shall be limited to 115dBA for the safety valves provided with silencer as per OSHA standard. Noise level around Mill will be 90 dBA.
5. Noise level at the boundary fence as specified must be complied with.

High noise areas (areas with noise levels >85 dB(A)), which require that personal noise protecting gear shall be used when working in such high noise areas, shall be marked.

Electromagnetic Field (EMF)

In accordance with the EHSG-TPP the occupational EMF exposure shall be prevented or minimized.

All technical measures and the required equipment necessary to fulfil the EHSG-TPP shall be provided by the Contractor. Inter alia areas with expected elevated EMF levels shall be identified and marked.

Fire and explosion, electrical and chemical hazards

In accordance with the EHSG-TPP all technical measures to prevent, minimize and control physical, electrical and chemical hazards shall be include in the Contractor's scope of services and supplies.

B0.2.14 Provenness Criteria for Critical Equipments and Sub-systems shall be as per Annexure-I of B0 (Refer Amendment no.05 to Bidding Documents).

B0.3 Supplies and Services

B0.3.1 General

The scope of this specification covers all supplies and services required for meeting the purpose of the Plant, even if these are not expressively mentioned in the following.

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The works include the following main components, where the detailed scope of supply is given in the corresponding Sections as listed below:

- **Section B1:** Steam generator plants
- **Section B2:** Steam turbine generator plants
- **Section B3:** Air and flue gas systems
- **Section B4:** Fuel and Ash handling system
- **Section B5:** Plant Water and Cooling Systems
- **Section B6:** Water treatment systems
- **Section B7:** Electrical works
- **Section B8:** Instrumentation and control works
- **Section B9:** Civil Works
- **Section B10:** Electrical Works 400/230 kV Substation
- **Section B11:** Jetty
- **Section B12:** Auxiliary plant systems

The corresponding Annexes and Attachments are contained in **Part C**.

The relevant costs of these supplies and services to be given in the price schedules are to be assigned corresponding to the individual items concerned for each of the sections. The costs of the common equipment and services have to be included in the corresponding Section prices.

B0.3.2 Scope of engineering services

The Engineering services refer to the complete specified Plant and covers following services:

- **Basic and detail engineering**
- **Permit engineering**

The Contractor shall actively participate in drawing-up of all required licensing applications.

All services shall be performed by the Contractor to affect the required permits to commence the works and operate the Plant, including but not limited to:

- preparation of all documents as required according to the pertinent laws
- clarifications with authorities
- participation in all clarification meetings
- construction permits
- boiler and pressure vessel approvals
- water/waste water permits
- operation permits
- fire fighting approvals
- and all other services as required.

