

**KHURJA SUPER THERMAL POWER PROJECT  
(2 X 660 MW)**

**VOLUME – IIB**


**TECHNICAL SPECIFICATION  
FOR  
CONDENSATE POLISHING UNIT**

**SPECIFICATION NO.: PE-TS-475-155-A001 REV 00**



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

5-415/2020/PS-PEM-MSX P

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB
	2X660 MW KHURJA STPP	SECTION –
		REV. NO. 00

**CONTENTS**  
**VOLUME – IIB**

SECTION	DESCRIPTION	PAGE
	PROJECT INFORMATION	3-16
SECTION – I	SPECIFIC TECHNICAL REQUIREMENTS	17-19
SECTION – IA	SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL ANNEXURES	20-44
	• ANNEXURE I : QUALITY PLAN	45-57
	• ANNEXURE II : SUB VENDORS LIST	58-280
	• ANNEXURE III : FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES	281-284
	• ANNEXURE IV : DRAWING DOCUMENTS DISTRIBUTION SCHEDULE	285-298
	• ANNEXURE V : MANDATORY SPARES	299-306
	• ANNEXURE VI : OPERATION AND MAINTENANCE SERVICES	307-313
	• DRAWINGS	314-318
	• DATASHEET - A	319-328
SECTION – IB	SPECIFIC TECHNICAL REQUIREMENTS FOR ELECTRICAL	329-347
SECTION – IC	SPECIFIC TECHNICAL REQUIREMENTS FOR C&I	348-359
SECTION – II	GENERAL TECHNICAL REQUIREMENT	360-478
SECTION – IIA	GENERAL TECHNICAL REQUIREMENT OF POWER CYCLE PIPING	479-521
	GENERAL TECHNICAL REQUIREMENT OF LOW PRESSURE PIPING	522-549
	GENERAL TECHNICAL REQUIREMENT OF SURFACE PREPARTION & PAINTING	550-555
	GENERAL TECHNICAL REQUIREMENT OF MATERIAL HANDLING	556-577
	GENERAL TECHNICAL REQUIREMENT OF PUMPS	578-586
	PRE-COMMISSIONING & COMMISSIONING ACTIVITIES.	587-604
	FORMAT FOR OPERATION AND MAINTENANCE MANUAL	605-607
	SITE STORAGE & PRESERVATION GUIDELINES FOR MECHANICAL BOP's	608-622
SECTION – IIB	GENERAL TECHNICAL REQUIREMENT – ELECTRICAL	623-642
SECTION – IIC	GENERAL TECHNICAL REQUIREMENT – C&I	643-796
SECTION – III	LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID	797-798
	COMPLIANCE CUM CONFIRMATION SCHEDULE	799-799
	SCHEDULE OF PRE BID CLARIFICATIONS	800-800
	SCHEDULE OF DECLARATION	801-801
	SCHEDULE OF DEVIATIONS WITH COST OF WITHDRAWAL	802-802



TITLE:

TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001



VOLUME IIB



SECTION -



REV. NO. 00



DATE:

PROJECT INFORMATION

CLAUSE NO.		<p style="text-align: center;"><b>PROJECT INFORMATION</b></p>										
<p><b>1.00.00</b></p> <p><b>2.00.00</b></p> <p><b>3.00.00</b></p> <p><b>4.00.00</b></p>	<p style="text-align: center;"><b>KHURJA STPP (2X660 MW)</b></p> <p><b>BACKGROUND</b></p> <p>THDC India Limited (Formerly Tehri Hydro Development Corporation), is a joint venture of Govt. of India &amp; Govt. of Uttar Pradesh. THDC India Limited has been entrusted to execute a Thermal Power Project in Khurja at district Bulandshahar, Uttar Pradesh (UP) along with various other hydro projects.</p> <p>THDC has placed a Consultancy order to NTPC Ltd for Pre-award to Commissioning activities (consultancy) of Khurja Coal based power project (2x660 MW).</p> <p>The present proposal is to establish 2X660 MW coal based Khurja Super Thermal Power Project for the benefit of Uttar Pradesh, Rajasthan, Uttarakhand, Himachal Pradesh &amp; Delhi.</p> <p><b>CAPACITY</b></p> <p>PRESENT PROPOSAL: 2 x 660 MW</p> <p><b>MODE OF OPERATION</b></p> <p>Base Load</p> <p><b>LOCATION AND APPROACH</b></p> <p>Khurja Super Thermal Power Project is located in Bulandshahar district of Uttar Pradesh, between 28°08'35" to 28°10'25" Northern latitude and 77°53'47" to 77°55'22" Eastern longitude. The site is situated near villages Dushhara-kherli, Jahanpur, Naiphal (Unchagaon) and Rukunpur. The district Headquarters Buland Shahar is about 32 kms. The nearest railway station Danwar on Delhi-Kolkata Section (via Aligarh) is approximately 5 km away from the project site. The nearest major railway station is Khurja at a distance of about 11 kms.</p> <p>Vicinity Plan of the proposed project is placed at <b>Annexure-I</b>.</p> <p><b>Distance of the project site from nearest cities</b></p> <table border="0"> <tr> <td>Khurja</td> <td>11 kms</td> </tr> <tr> <td>Aligarh</td> <td>36 kms</td> </tr> <tr> <td>Delhi</td> <td>90 kms</td> </tr> <tr> <td>Bulandshaher</td> <td>32 kms</td> </tr> </table> <p>For further information, bidders are also advised to visit the project site and collect data regarding local site conditions.</p>				Khurja	11 kms	Aligarh	36 kms	Delhi	90 kms	Bulandshaher	32 kms
Khurja	11 kms											
Aligarh	36 kms											
Delhi	90 kms											
Bulandshaher	32 kms											
<p><b>KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES</b></p>	<p><b>TECHNICAL SPECIFICATION SECTION – VI, PART-A</b>  <b>BID DOC NO.:</b>  <b>THDC/RKSH/CC-9915-371</b></p>	<p><b>SUB-SECTION-A-0</b>  <b>PROJECT INFORMATION</b></p>	<p><b>PAGE</b>  <b>1 OF 13</b></p>									

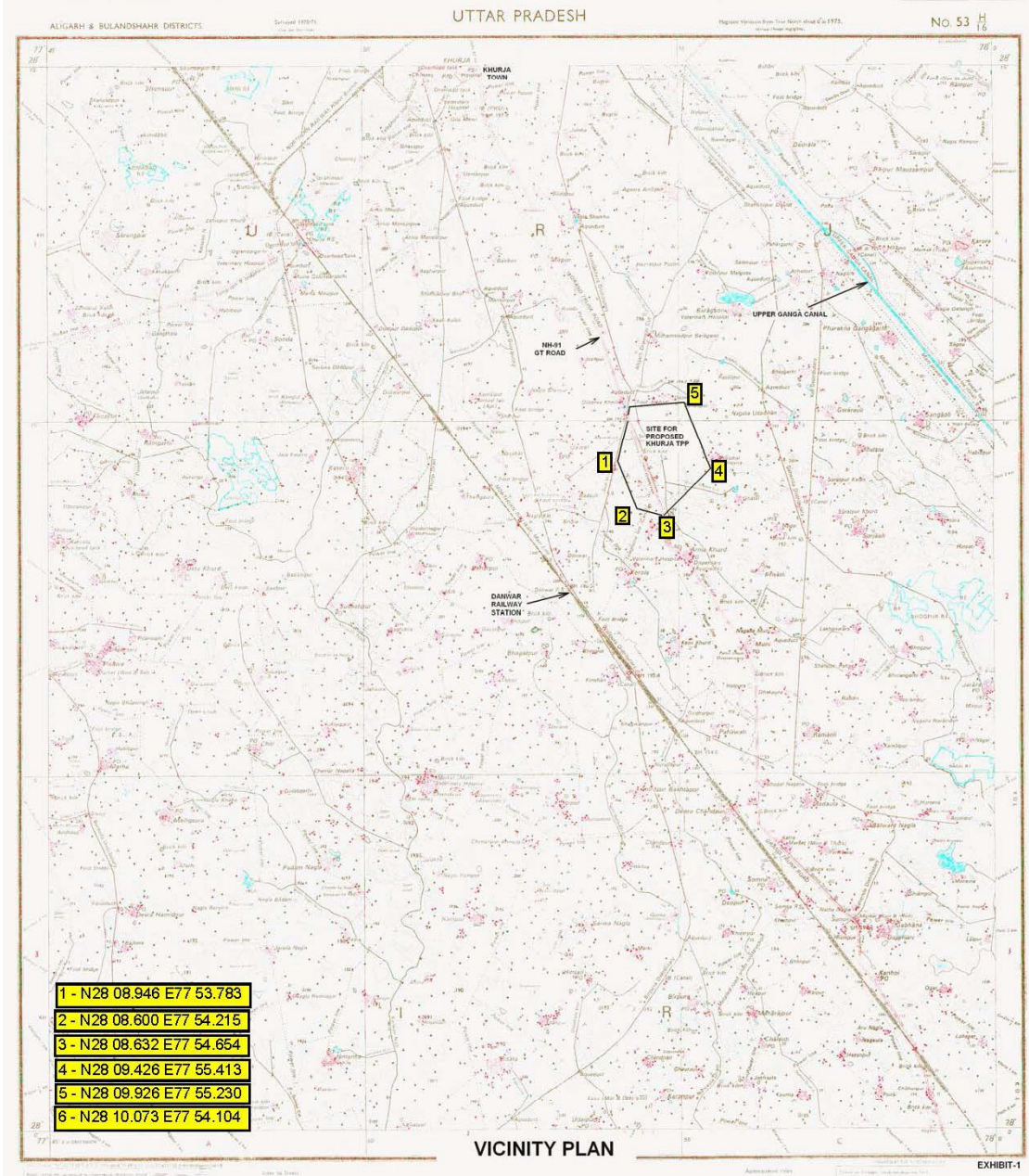
CLAUSE NO.	 <b>PROJECT INFORMATION</b> 		
4.03.00	<p><b>AIRPORT</b></p> <p>The nearest commercial airport at Delhi is located at a distance of approximately 120 kms from the project site.</p>		
5.00.00	<p><b>LAND</b></p> <p>The land requirement for the project has been estimated as 1400 Acres for Main Plant, Balance of Plant including Coal Handling Plant, Ash Disposal Area, Ash Disposal Pipeline Corridors, Construction Stores &amp; Offices, Laydown &amp; Fabrication Yard, and Labor Colony etc. Land has already been acquired through UPSIDC. Additional patches of required land shall be acquired.</p>		
6.00.00	<p><b>WATER</b></p> <p>The Upper Ganga Canal passes near by the Khurja STPP. The makeup water for the project is proposed to be drawn from Upper Ganga Canal at a distance of about 13 kms.</p> <p>Quantity of make-up water required for 2X660MW would be about 3265 Cum/hr with ash water recirculation system and 4415 Cum/hr with once through ash water system. Make-up water is proposed to be used for condenser cooling, ash sluicing, coal dust suppression and other plant processes. Make up water shall be drawn from the canal by constructing suitable intake structures. A Raw Water Reservoir is envisaged.</p> <p>Govt. of UP has conveyed commitment for supply of required quantity of water for the project.</p>		
<b>KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES</b>	<b>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371</b>	<b>SUB-SECTION-A-0 PROJECT INFORMATION</b>	<b>PAGE 2 OF 13</b>

CLAUSE NO.	 <b>PROJECT INFORMATION</b> 		
<b>7.00.00</b>	<b>COAL</b>		
7.01.00	<p><b>Coal Requirement, Availability and Linkage</b></p> <p>The daily coal requirement for 2x660 MW units shall be about 15261 tonnes based on Gross Calorific Value of 4200 Kcal/kg and 2248 Kcal/KWh unit heat rate, considering 90% plant load factor.</p> <p>Annual coal requirement for the plant shall be about 5.57 MTPA considering PLF of 90% and the same is proposed to be met from Amelia Coal Mine in District Singrauli, Madhya Pradesh, allotted to THDCIL by Ministry of Coal, Govt. of India. THDCIL has entered into an agreement with Nominated Authority, Ministry of Coal for the development of Amelia Coal Mine in Synchronization with the implementation of Khurja STPP. The distance between Khurja STPP plant site and Allotted Amelia Mine at Singrauli, Madhya Pradesh is around 900 Kms.</p>		
7.02.00	<p><b>Coal Transportation</b></p> <p>The envisaged mode of coal transportation from the coal mine to the power plant is through Indian Railways.</p>		
7.03.00	<p><b>Coal Quality</b></p> <p>The primary fuel for the main steam generator shall be coal. The coal quality parameters indicated in <b>Annexure-II</b> are to be considered for steam generator design.</p>		
8.00.00	<p><b>Fuel Oil</b></p> <p>The fuel oils to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel Oils having the characteristics &amp; and High Speed Diesel Oil having the characteristics given at <b>Annexure-III &amp; Annexure-IV</b> respectively.</p>		
9.00.00	<p><b>STEAM GENERATOR TECHNOLOGY</b></p> <p>The steam generators shall be based on super critical technology, once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.</p>		
10.00.00	<p><b>FLUE GAS DESULPHURIZATION SYSTEM (FGD) &amp; SCR:</b></p> <p>The project is envisaged with Flue Gas Desulfurization (FGD) system and Selective Catalytic Reduction (SCR) in compliance to the notification dated 07.12.2015 by Ministry of Environment, Forest &amp; Climate Change. The Tentative Limestone characteristic to be used for design of FGD system shall be as per the characteristic given at <b>Annexure-V</b>.</p>		
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371	SUB-SECTION-A-0 PROJECT INFORMATION	PAGE 3 OF 13



CLAUSE NO.	 <b>PROJECT INFORMATION</b> 		
11.00.0	<p><b>POWER EVACUATION SYSTEM</b></p> <p>Power Generated from each 660 MW unit would be stepped up to the evacuation voltage level through suitably rated Generator Transformer and will be evacuated through 400kV transmission systems. Associated Transmission System (ATS) of the project has already taken-up with PGCIL/CEA/UPPTCL and will be finalized soon.</p>		
12.00.00	<p><b>METEOROLOGICAL DATA</b></p> <p>The meteorological data from nearest observatory (Aligarh) is placed at <b>Annexure - VI.</b></p>		
13.00.00	<p><b>PLANT WATER SCHEME</b></p> <p>The Plant water scheme is described below.</p>		
13.01.00	<p><b>Condenser Cooling (CW) Water System</b></p> <p>It is proposed to adopt a recirculating type cooling water system with cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.</p>		
13.02.00	<p><b>Equipment Cooling Water (ECW) System (Unit Auxiliaries)</b></p> <p>The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a secondary circuit. The station auxiliaries such as Air compressors, Compressors of ash handling plant, compressor of mill reject system, FGD &amp; SCR system etc. shall also be cooled by Demineralized (DM) water in a closed circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator &amp; auxiliaries and TG &amp; its auxiliaries.</p>		
13.03.00	<p><b>Other Miscellaneous Water Systems</b></p> <p>CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, FGD system, make-up to fire water system. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused.</p> <p>FGD waste water shall be diverted to ash system after neutralization.</p> <p>The quality of clarified water &amp; DM water is given in this sub-section at <b>Annexure-VII-1 &amp; VII-2.</b></p>		
<p><b>KHURJA SUPER THERMAL POWER PROJECT</b> (2X660 MW) <b>TURBINE GENERATOR AND ASSOCIATED</b> <b>PACKAGES</b></p>	<p><b>TECHNICAL SPECIFICATION</b> <b>SECTION – VI, PART-A</b> <b>BID DOC NO.:</b> <b>THDC/RKSH/CC-9915-371</b></p>	<p><b>SUB-SECTION-A-0</b> <b>PROJECT INFORMATION</b></p>	<p><b>PAGE</b> <b>4 OF 13</b></p>



CLAUSE NO.		<b>PROJECT INFORMATION</b> 
------------	---	--



**VICINITY PLAN** **ANNEXURE-I**





<b>KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES</b>	<b>TECHNICAL SPECIFICATION SECTION - VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371</b>	<b>SUB-SECTION-A-0 PROJECT INFORMATION</b>	<b>PAGE 5 OF 13</b>
--	--	--	-------------------------

CLAUSE NO.	 <b>PROJECT INFORMATION</b> 				
<b>ANNEXURE-II</b>					
<b>COAL &amp; ASH CHARACTERISTICS</b>					
<b>PROPOSED COAL CHARACTERISTICS FOR KHURJA (2X660 MW)</b>					
S.No.	Characteristics (as received basis)	Range of 95 % coal supplies			Range of 5 % coal supplies
		Column - 1	Column - 2	Column - 3	
		Design	Worst	Best	
<b>1.0 PROXIMATE ANALYSIS</b>					
1.1	Total Moisture (%)	12	14	11.0	11-15
1.2	Ash (%)	32	35	28	28-36
1.3	Volatile Matter (%)	24	23	25	22-26
1.4	Fixed Carbon (%)	32	28	36.0	28-36
1.5	Total (%)	100	100	100	
<b>2.0 ULTIMATE ANALYSIS</b>					
2.1	Carbon (%)	42.9	37.81	48.01	35.21-45.4
2.2	Hydrogen (%)	3.2	2.8	3.3	2.9-4.2
2.3	Sulphur (%)	0.4	0.6	0.3	0.52
2.4	Nitrogen (%)	1	0.58	1.2	0.86
2.5	Oxygen (%) (By difference)	8.17	8.77	7.7	0.28
2.6	Carbonates (%)	0.27	0.38	0.45	0.3
2.7	Phosphorous (%)	0.06	0.06	0.04	0.04
2.8	Total Moisture (%)	12	14	11.0	22
2.9	Ash (%)	32	35	28	39
	Total	100	100	100	
2.10	GCV (Kcal/Kg)	4200	3650	4700	3600-4800
2.11	Hard Grove Index	60	52	65	50-65
2.12	YGP (mg/kg)	70	75	70	85-70
<b>3.0 ASH ANALYSIS</b>					
3.1	Silica (%)	58.2	59.54	58.00	58.1-63
3.2	Alumina (%)	28	26.3	27.20	22.2-26.1
3.3	Iron Oxide (%)	6.1	6.4	7.60	8.3-11.5
3.4	Titania	1.85	1.72	1.80	0.82-1.2
3.5	Phosphoric Anhydride (%)	1.91	1.57	0.48	0.48-1.91
3.6	Lime (%)	1.7	3.2	3.30	1.78-3.5
3.7	Magnesia (%)	0.7	0.6	0.50	0.5-0.9
3.8	Sulphuric Anhydride (%)	0.29	0.25	0.40	0.12-0.43
3.9	Sodium Oxide (%)	0.3	0.1	0.30	0.1-0.32
3.10	Potassium oxide	0.95	0.32	0.42	0.1-0.43
	Total	100	100.00	100.00	
<b>4.0 ASH FUSION RANGE</b>					
<b>REDUCING ATMOSPHERE</b>					
4.1	Initial Deformation Temp. (oC)	1200	1100	1150	1100
4.2	Hemispherical Temp. (oC)	1400	1300	1350	1200
4.3	Fusion Temperature (oC)	1400	1400	1350	1400
					1450

CLAUSE NO.	 <b>PROJECT INFORMATION</b> 		
<b>ANNEXURE-III</b>			
<b><u>LIGHT DIESEL OIL CHARACTERISTICS</u></b>			
AS PER IS 15770-2008			
	<b>Characteristics</b>	<b>LDO</b>	
	1. Pour Point (max)	21 °C & 12°C for Summer and Winter respectively	
	2. Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0	
	3. Sediment percent by mass (max)	0.10	
	4. Total sulphur percent by mass (max)	1.5	
	5. Ash percentage by mass (max)	0.02	
	6. Carbon residue (Rams bottom) percent by pass (max.)	1.50	
	7. Acidity inorganic	Nil	
	8. Flash point (Min.) - Pensky Martens	66 deg.C	
	9. Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2	
	10. Water content, % by volume (max)	0.25	
	11. GCV(kcal/kg)	10,000	
<b>KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES</b>	<b>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371</b>	<b>SUB-SECTION-A-0 PROJECT INFORMATION</b>	<b>PAGE 7 OF 13</b>

CLAUSE NO.	 <b>PROJECT INFORMATION</b> 		
<b>ANNEXURE-IV</b> <b>HIGH SPEED DIESEL OIL CHARACTERISTICS</b> <b>[AS PER IS 1460-2005 (BS-II)]</b>			
S. No.	Particulars	Unit	Value
1.	PHYSICAL PROPERTIES a. Distillation volume recovery @ 350 <sup>0</sup> C b. Distillation volume recovery @ 370 <sup>0</sup> C c. Kinematic Viscosity @ 40 Degree C d. Density @ 15 Degree C e. Pour Point - Summer - Winter f. Cold Filter Plugging Point - Summer - Winter g. Flash Point (Abal) h. Lubricity WSD 1.4 @ 60 Degree C	% vol. (min) % vol. (min) cSt kg/m <sup>3</sup> Degree C (max) Degree C (max) Degree C (max) Degree C (max) Degree C (max) Microns (max)	85 95 2.0 – 5.0 820 – 860 15 03 18 06 35 460
2.	HEATING VALUE a. Higher Heating Value (HHV) b. Lower Heating Value (LHV)	Kcal/Kg Kcal/Kg	11,000 10,300
3.	ACIDITY a. Inorganic b. Total	mg KOH/g mg KOH/g	Nil 0.2 (max.)
4.	Copper Strip Corrosion 3 hours @100 <sup>0</sup> C	No.	1 (max)
5.	RCR on 10% residue	% wt.	0.3 (max)
6.	CONTAMINANTS a. Ash b. Sediments c. Total Sulphur d. Water Content e. Trace Metals - Na + K - Vanadium - Lead - Calcium - Ni + Zn	ppm (wt.) % wt % wt % volume ppm (wt) ppm (wt) ppm (wt) ppm (wt) ppm (wt)	100 (max) 0.05 (max) 0.05 (max) 0.05 (max) 0.30 (max) 0.50 (max) 0.50 (max) 2.0 Nil
7.	Nitrogen content (FBN)	% wt.	0.015
<b>KHURJA SUPER THERMAL POWER PROJECT</b> <b>(2X660 MW)</b> <b>TURBINE GENERATOR AND ASSOCIATED</b> <b>PACKAGES</b>	<b>TECHNICAL SPECIFICATION</b> <b>SECTION – VI, PART-A</b> <b>BID DOC NO.:</b> <b>THDC/RKSH/CC-9915-371</b>	<b>SUB-SECTION-A-0</b> <b>PROJECT INFORMATION</b>	<b>PAGE</b> <b>8 OF 13</b>

CLAUSE NO.	 <b>PROJECT INFORMATION</b> 																																																																						
	<p style="text-align: right;"><b>ANNEXURE-V</b></p> <p style="text-align: center;"><b><u>LIMESTONE CHARACTERISTICS</u></b></p> <table border="1"> <thead> <tr> <th colspan="4"><b>Chemical Analysis(% by mass)</b></th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>CaO</td> <td>%</td> <td>47-51.0*</td> </tr> <tr> <td>2.</td> <td>MgO</td> <td>%</td> <td>0.9-3.8</td> </tr> <tr> <td>3.</td> <td>Fe<sub>2</sub>O<sub>3</sub></td> <td>%</td> <td>0.45-1.0</td> </tr> <tr> <td>4.</td> <td>Al<sub>2</sub>O<sub>3</sub></td> <td>%</td> <td>1.19-2.1</td> </tr> <tr> <td>5.</td> <td>Si<sub>2</sub>O<sub>3</sub></td> <td>%</td> <td>2.1-4.5</td> </tr> <tr> <td>6.</td> <td>Mn<sub>2</sub>O<sub>3</sub></td> <td>%</td> <td>&lt;0.12</td> </tr> <tr> <td>7.</td> <td>P<sub>2</sub>O<sub>5</sub>,</td> <td>%</td> <td>Traces</td> </tr> <tr> <td>8.</td> <td>Cl<sub>2</sub></td> <td>%</td> <td>&lt;0.015</td> </tr> <tr> <td>9.</td> <td>Na<sub>2</sub>O</td> <td>%</td> <td>&lt;0.16</td> </tr> <tr> <td>10.</td> <td>K<sub>2</sub>O</td> <td>%</td> <td>&lt;0.01</td> </tr> <tr> <td>11.</td> <td>TiO<sub>2</sub></td> <td>%</td> <td>&lt;0.02</td> </tr> <tr> <td>12.</td> <td>Total Sulphur</td> <td>%</td> <td>&lt;0.1</td> </tr> <tr> <td>13.</td> <td>LOI</td> <td>%</td> <td>39.0-41.3</td> </tr> <tr> <th colspan="4"><b>Physical properties</b></th> </tr> <tr> <td>1</td> <td>Bond Index</td> <td>kWh/t</td> <td>13</td> </tr> <tr> <td>2</td> <td>Granule size</td> <td></td> <td>Medium</td> </tr> </tbody> </table>			<b>Chemical Analysis(% by mass)</b>				1.	CaO	%	47-51.0*	2.	MgO	%	0.9-3.8	3.	Fe <sub>2</sub> O <sub>3</sub>	%	0.45-1.0	4.	Al <sub>2</sub> O <sub>3</sub>	%	1.19-2.1	5.	Si <sub>2</sub> O <sub>3</sub>	%	2.1-4.5	6.	Mn <sub>2</sub> O <sub>3</sub>	%	<0.12	7.	P <sub>2</sub> O <sub>5</sub> ,	%	Traces	8.	Cl <sub>2</sub>	%	<0.015	9.	Na <sub>2</sub> O	%	<0.16	10.	K <sub>2</sub> O	%	<0.01	11.	TiO <sub>2</sub>	%	<0.02	12.	Total Sulphur	%	<0.1	13.	LOI	%	39.0-41.3	<b>Physical properties</b>				1	Bond Index	kWh/t	13	2	Granule size		Medium
<b>Chemical Analysis(% by mass)</b>																																																																							
1.	CaO	%	47-51.0*																																																																				
2.	MgO	%	0.9-3.8																																																																				
3.	Fe <sub>2</sub> O <sub>3</sub>	%	0.45-1.0																																																																				
4.	Al <sub>2</sub> O <sub>3</sub>	%	1.19-2.1																																																																				
5.	Si <sub>2</sub> O <sub>3</sub>	%	2.1-4.5																																																																				
6.	Mn <sub>2</sub> O <sub>3</sub>	%	<0.12																																																																				
7.	P <sub>2</sub> O <sub>5</sub> ,	%	Traces																																																																				
8.	Cl <sub>2</sub>	%	<0.015																																																																				
9.	Na <sub>2</sub> O	%	<0.16																																																																				
10.	K <sub>2</sub> O	%	<0.01																																																																				
11.	TiO <sub>2</sub>	%	<0.02																																																																				
12.	Total Sulphur	%	<0.1																																																																				
13.	LOI	%	39.0-41.3																																																																				
<b>Physical properties</b>																																																																							
1	Bond Index	kWh/t	13																																																																				
2	Granule size		Medium																																																																				
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371	SUB-SECTION-A-0 PROJECT INFORMATION	PAGE 9 OF 13																																																																				

ANNEXURE-VI

BACK

ANNEXURE-VI

METEOROLOGICAL DATA



**जलवायवी सारणी**  
CLIMATOLOGICAL TABLE



आधारण STATION : Aligarh      देशात LAT. 27°53'      देशात LONG. 78°04'      उंची METRES 187      वर्षाव METRES 187

आधारण STATION : Aligarh      देशात LAT. 27°53'      देशात LONG. 78°04'      उंची METRES 187      वर्षाव METRES 187

MONTH	STATION LEVEL PRESSURE		MEAN		AIR TEMPERATURE		EXTREMES		HUMIDITY		CLOUD AMOUNTS		NO. OF RAINY DAYS		TOTAL IN DRIEST MONTH WITH YEAR		TOTAL IN HEAVIEST MONTH FALL IN 24 HOURS		DATE AND YEAR	MEAN WIND VELOCITY				
	mm Hg	hPa	Dry Bulb	Wet Bulb	Max	Min	Highest	Lowest	Relative	Wet Bulb	All Clouds	Low Clouds	Monthly Total	No. of Days	mm	mm	mm	mm						
JAN	996.0	993.3	10.8	9.2	20.6	7.4	25.1	3.8	30.7	28	0.6	16	1935	80	10.5	2.5	2.3	15.2	1.5	71.9	0.0	53.8	12	3.1
FEB	993.7	991.0	13.3	11.1	23.6	9.5	28.8	5.0	33.3	26	1.7	11	1950	75	11.6	2.5	2.2	13.9	1.4	141.0	0.0	71.1	2	3.5
MAR	990.9	988.1	19.3	15.2	30.0	14.1	35.5	8.9	41.7	31	3.9	6	1945	63	14.1	2.3	1.9	8.5	1.0	106.7	0.0	83.5	18	4.2
APR	986.6	982.9	26.8	18.9	36.8	20.1	41.5	14.3	44.5	29	10.9	9	1957	45	15.5	1.5	1.2	8.8	0.9	68.1	0.0	30.6	29	4.8
MAY	982.5	979.1	30.6	21.9	40.1	24.5	45.9	19.9	47.2	28	15.5	3	1988	45	19.2	1.5	1.3	21.0	2.2	75.7	0.0	41.1	20	4.9
JUN	978.7	975.3	31.2	24.8	39.3	26.6	44.4	22.3	46.7	7	18.6	2	1957	59	26.1	2.8	2.6	68.5	4.1	544.8	0.0	327.2	30	5.6
JUL	978.4	975.4	29.2	26.3	34.6	28.0	39.4	23.0	44.5	2	19.9	12	1988	79	31.9	6.1	5.9	217.7	10.2	576.1	1.5	164.6	3	4.7
AUG	984.6	977.3	28.3	26.1	33.2	26.4	36.9	22.9	42.1	11	20.1	13	1987	84	32.1	6.1	5.7	247.4	11.6	529.8	0.0	183.6	15	4.3
SEP	981.5	981.5	31.0	25.6	33.8	23.8	36.9	20.7	40.2	1	14.8	16	1994	78	28.6	3.2	2.9	104.1	5.2	590.5	0.0	220.6	26	3.7
OCT	987.2	987.2	23.5	19.8	33.0	18.8	36.2	14.4	41.7	4	11.0	9	1952	69	20.2	1.0	0.9	31.4	1.4	231.1	0.0	138.7	13	2.2
NOV	991.5	991.5	17.5	14.4	28.3	12.9	32.1	9.4	36.1	3	5.0	30	1944	69	14.0	0.8	0.7	4.2	0.5	34.8	0.0	26.2	14	2.1
DEC	996.7	993.6	12.3	10.4	22.5	8.5	26.7	5.3	32.8	2	1.2	30	1948	77	11.2	1.7	1.4	11.0	0.8	87.6	0.0	56.2	28	2.7
ANNUAL OR MONTHLY MEAN	987.7	984.7	22.5	18.6	31.3	18.1	44.1	3.4	47.2	28	0.6	16	1935	69	19.6	2.6	2.4	75.18	40.7	1342.9	204.5	327.2	30	3.8
NUMBER OF YEARS	29	29	29	29	29	29	29	29	68	68	68	29	29	29	29	29	29	29	28	28	64	64	66	15



CLAUSE NO.	 <b>PROJECT INFORMATION</b> 																			
	<b>ANNEXURE-VII-1</b>																			
	<b><u>ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER</u></b>																			
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">S.No</th> <th style="width: 60%;">Characteristics</th> <th style="width: 30%;">Value</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Silica (Max.)</td> <td>0.02 ppm as SiO<sub>2</sub></td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Iron as Fe</td> <td>Nil</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Total hardness</td> <td>Nil</td> </tr> <tr> <td style="text-align: center;">4.</td> <td>pH value</td> <td>6.8 -7.2</td> </tr> <tr> <td style="text-align: center;">5.</td> <td>Conductivity</td> <td>Not more than 0.1micro mho/cm excluding the effects of free CO<sub>2</sub></td> </tr> </tbody> </table>		S.No	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as SiO <sub>2</sub>	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 -7.2	5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO <sub>2</sub>
S.No	Characteristics	Value																		
1.	Silica (Max.)	0.02 ppm as SiO <sub>2</sub>																		
2.	Iron as Fe	Nil																		
3.	Total hardness	Nil																		
4.	pH value	6.8 -7.2																		
5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO <sub>2</sub>																		
<b>KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES</b>	<b>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371</b>	<b>SUB-SECTION-A-0 PROJECT INFORMATION</b>	<b>PAGE 12 OF 13</b>																	

CLAUSE NO.	 <b>PROJECT INFORMATION</b> 																																																																																							
	<b>ANNEXURE-VII-2</b>																																																																																							
	<b><u>DESIGN CLARIFIED WATER ANALYSIS</u></b>																																																																																							
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 5%;">S.No</th> <th rowspan="2" style="width: 35%;">PARAMETER</th> <th rowspan="2" style="width: 15%;">UNIT</th> <th style="width: 45%;">Clarified Water Analysis</th> </tr> <tr> <th>Calculated</th> </tr> </thead> <tbody> <tr><td>1</td><td>pH .</td><td>-</td><td>6.8-7.3</td></tr> <tr><td>2</td><td>Sp. Cond.</td><td>µs/cm</td><td>325</td></tr> <tr><td>3</td><td>TDS</td><td>mg/l</td><td>230</td></tr> <tr><td>4</td><td>Turbidity</td><td>NTU</td><td>10</td></tr> <tr><td>5</td><td>Total hardness</td><td>mg/l As CaCO3</td><td>155</td></tr> <tr><td>6</td><td>Calcium</td><td>mg/l As CaCO3</td><td>148.8</td></tr> <tr><td>7</td><td>Magnesium</td><td>mg/l As CaCO3</td><td>45</td></tr> <tr><td>8</td><td>Sodium</td><td>mg/l CaCO3</td><td>45</td></tr> <tr><td>9</td><td>Potassium</td><td></td><td></td></tr> <tr><td>10</td><td>P Alkalinity</td><td>mg/l As CaCO3</td><td>-</td></tr> <tr><td>11</td><td>M Alkalinity</td><td>mg/l As CaCO3</td><td>125.3</td></tr> <tr><td>12</td><td>Chlorides</td><td>mg/l As as CaCO3</td><td>42</td></tr> <tr><td>13</td><td>Sulphate</td><td>mg/l As CaCO3</td><td>71.5</td></tr> <tr><td>14</td><td>Silica (Total)</td><td>mg/l As SiO2</td><td>21</td></tr> <tr><td>15</td><td>Silica (Reactive)</td><td>mg/l As SiO2</td><td>20</td></tr> <tr><td>16</td><td>Silica (Collidal)</td><td>mg/l As SiO2</td><td>1</td></tr> <tr><td>17</td><td>TOC</td><td>mg/l</td><td>6</td></tr> <tr><td>18</td><td>COD</td><td>mg/l</td><td>45</td></tr> <tr><td>19</td><td>BOD</td><td>mg/l</td><td>18</td></tr> <tr><td>20</td><td>Fe</td><td>mg/l</td><td>-</td></tr> </tbody> </table>			S.No	PARAMETER	UNIT	Clarified Water Analysis	Calculated	1	pH .	-	6.8-7.3	2	Sp. Cond.	µs/cm	325	3	TDS	mg/l	230	4	Turbidity	NTU	10	5	Total hardness	mg/l As CaCO3	155	6	Calcium	mg/l As CaCO3	148.8	7	Magnesium	mg/l As CaCO3	45	8	Sodium	mg/l CaCO3	45	9	Potassium			10	P Alkalinity	mg/l As CaCO3	-	11	M Alkalinity	mg/l As CaCO3	125.3	12	Chlorides	mg/l As as CaCO3	42	13	Sulphate	mg/l As CaCO3	71.5	14	Silica (Total)	mg/l As SiO2	21	15	Silica (Reactive)	mg/l As SiO2	20	16	Silica (Collidal)	mg/l As SiO2	1	17	TOC	mg/l	6	18	COD	mg/l	45	19	BOD	mg/l	18	20	Fe	mg/l	-
S.No	PARAMETER	UNIT	Clarified Water Analysis																																																																																					
			Calculated																																																																																					
1	pH .	-	6.8-7.3																																																																																					
2	Sp. Cond.	µs/cm	325																																																																																					
3	TDS	mg/l	230																																																																																					
4	Turbidity	NTU	10																																																																																					
5	Total hardness	mg/l As CaCO3	155																																																																																					
6	Calcium	mg/l As CaCO3	148.8																																																																																					
7	Magnesium	mg/l As CaCO3	45																																																																																					
8	Sodium	mg/l CaCO3	45																																																																																					
9	Potassium																																																																																							
10	P Alkalinity	mg/l As CaCO3	-																																																																																					
11	M Alkalinity	mg/l As CaCO3	125.3																																																																																					
12	Chlorides	mg/l As as CaCO3	42																																																																																					
13	Sulphate	mg/l As CaCO3	71.5																																																																																					
14	Silica (Total)	mg/l As SiO2	21																																																																																					
15	Silica (Reactive)	mg/l As SiO2	20																																																																																					
16	Silica (Collidal)	mg/l As SiO2	1																																																																																					
17	TOC	mg/l	6																																																																																					
18	COD	mg/l	45																																																																																					
19	BOD	mg/l	18																																																																																					
20	Fe	mg/l	-																																																																																					
	<p>Note: Cooling water system is expected to operate at a design minimum cycle of concentration (C.O.C) of about 5 to 5.5.</p>																																																																																							
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW) TURBINE GENERATOR AND ASSOCIATED PACKAGES	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.: THDC/RKSH/CC-9915-371	SUB-SECTION-A-0 PROJECT INFORMATION	PAGE 13 OF 13																																																																																					

5- 415/2020/PS-PEM-MSX\_P



TITLE:

**TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT****2X660 MW KHURJA STPP**

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION - I

REV. NO. 00

DATE:

**SECTION - I  
SPECIFIC TECHNICAL REQUIREMENTS**



TITLE:

TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – I

REV. NO. 00

DATE:

### SPECIFIC TECHNICAL REQUIREMENTS:

- 1.1 This specification is intended to cover design, engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub-vendor's works, painting, forwarding, supply and delivery at site including start up and commissioning spares, mandatory spares, properly packed for transportation, unloading / handling and storage at site, in site transportation, assembly, erection and commissioning, trail run, preparation and submission of "As Built" drawings, site testing, carrying out performance guarantee tests at site and handover of **Condensate Polishing Units along with pre filters and common one number external regeneration systems** as per the details in different sections / volumes of this specification for **2X660 MW KHURJA STPP**.
- The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the specification.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning of Condensate Polishing Units along with pre filters and common one number external regeneration system within quoted price.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.
- 1.6 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.7 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 as "PRE BID CLARIFICATION SCHEDULE". In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of BHEL/Customer shall prevail and shall be complied by the bidder without any commercial and delivery 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 BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

5-415/2020/PS-PEM-MSX\_P



TITLE:

**TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT**

**2X660 MW KHURJA STPP**

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – I

REV. NO. 00

DATE:

- 1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.
- 1.11 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.12 BHEL's/Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

5- 415/2020/PS-PEM-MSX\_P



TITLE:

**TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT**

**2X660 MW KHURJA STPP**

BHEL DOCUMENTS NO.: PE-TS-475-155-A001


VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

**SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL**

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB	
		SECTION – IA	
	2X660 MW KHURJA STPP	REV. NO. 00	DATE:

## 1.0 GENERAL

The Condensate Polishing service vessels along with the pre filters with one (1) common set of external regeneration system and associated accessories shall conform to the technical specification for CONDENSATE POLISHING UNIT (CPU).

## 2.0 DESIGN CONDITIONS FOR CONDENSATE POLISHING UNIT

There shall be three numbers Condensate polishing service vessels (3X50% capacity) and two numbers back washable type cartridge pre filters (2x50% capacity) for each 660 MW unit. There are two 660 MW units. There shall be one complete set of external regeneration systems common for all the Condensate polishing plants.

## 3.0 BRIEF DESCRIPTION OF THE SYSTEM

The proposed condensate polishing units shall treat the entire condensate of the turbine generator of each unit of power station. The proposed schematic arrangement of the condensate polishing unit and its regeneration facility shall be as per the enclosed P&I Diagram. Arrangement of piping, valves and instruments shown in the P&ID are bare minimum. The bidder shall include the complete system including regeneration facility as elaborated in this specification meeting the contractual requirements.

Condensate pre filters followed by polisher unit (service vessels) shall be located in the TG hall of corresponding units. Condensate polisher service vessels alongwith the pre filters will be provided on the discharge side of the high pressure condensate extraction pumps.

The regeneration systems shall be external and common to the CPU of all the TG units. For regeneration, resin from the exhausted exchanger vessel will be transferred hydraulically/hydro-pneumatically to this facility. The exhausted resin charge will be cleaned, separated, regenerated, mixed and rinsed before being stored for the next use.

The regeneration process offered by the bidder shall be of proven design and shall essentially be the same process by virtue of which the bidder is qualified and shall give resin-separation compatible with the desired effluent quality.


## 4.0 SALIENT DESIGN DATA

### 4.1 NORMAL RUN (PRE FILTERS + CONDENSATE POLISHER UNIT (SERVICE VESSEL))

The following dissolved solids concentration and conditions shall be used as a basis of design for the condensate polishing system. The ionic concentrations indicated below are as such.

PARAMETERS	INFLUENT	EFFLUENT
Ammonia, ppb	100	---
Total solids, ppb	100	20
Silica, ppb	30	5 (refer Note 1)
Iron, ppb	50	5
Sodium, ppb	10	2
Chloride, ppb	10	2
pH	8 – 8.5	--
CO <sub>2</sub>	20	5
Crud, ppb	25	<5
Effluent conductivity after removal of ammonia and amines (micro mhos/cm) at 25 deg. C.	--	0.1 or less

Note 1: Silica value shall be 7 ppb as per resin supplier recommendations in case the temperature of the condensate is 50degC & above.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

Under the above operating and design flow through the polisher units, the un-ammoniated resins shall not reach “ammonia break-point” in less than 30 days (720 hrs) of continuous operation while maintaining the above effluent quality. Whenever specific conductivity starts increasing from 0.1 micro mhos/cm in the effluent, it is deemed that “ammonia break point” is reached. The effluent values indicated above shall be the maximum values.

#### 4.2 START-UP CONDITION

##### 4.2.1 START-UP CONDITION FOR PRE FILTERS

The condensate quality during start-up operation for Pre filters design shall be as follows:

PARAMETERS INFLUENT	PARAMETERS INFLUENT	PARAMETERS EFFLUENT
Crud, ppb (mostly black oxide of Iron)	1000 maximum	Recovery not less than 99.98% (At the outlet of Pre-Filter)

The pre-filter shall be designed for a crud loading of 1000 ppb. Service length of Pre Filter shall be minimum 50 hours.

##### 4.2.2 START-UP CONDITION FOR CONDENSATE POLISHER UNIT (SERVICE VESSEL)

During start up conditions, quality of the influent may deteriorate to –

TDS, ppb	2000 maximum
Silica, ppb	150 maximum
Crud, ppb (mostly black oxide of Iron)	1000 maximum

For design purposes, average crud loading shall be considered as 500 ppb. Under such conditions, total crud content of the effluent shall not exceed 150 ppb.

Service run during start – up condition will be 50 hours.


4.3 The bed cross section shall be such that the velocity of condensate through it, shall not exceed 2 meters/min at the design flow rate. Internal diameter of the service vessels (excluding the rubber lining) of cylindrical type shall be selected meeting the above mentioned velocity criteria. For vessels of spherical shape, where the bed cross section vary, the diameter (excluding the rubber lining) of the vessel shall be selected considering velocity not exceeding 1.75 meters/minute. The effective depth of the mixed resin bed in the condensate polisher service vessels shall not be less than 1100 mm.

4.4 Cation resins shall be regenerated by technical grade hydrochloric acid to IS:265 (concentration 30-33% by volume) and anion resins by sodium hydroxide, rayon grade to IS:252 available as 48% lye or as flakes. In no case, the regeneration levels cannot be lower than the values indicated below:

- Cation resin: 125 kg of 100% HCl per cubic meter of resin
- Anion resin: 160 kg of 100% NaOH per cubic meter of resin.

4.5 Rinse water outlet header of each condensate polishing unit shall be provided with a pressure reducing station with isolating valves, suitably designed to enable the water entry to the condenser hot well which is operating under vacuum. The pressure reducing station shall consist of either a pressure reducing valve from design pressure of service vessel to condenser vacuum or a combination of orifice plates to reduce pressure from design pressure of service vessel to 2 kg/cm<sup>2</sup> and a pressure reducing valve from 2 kg/cm<sup>2</sup> to condenser vacuum.

4.6 While calculating pump head, 10% margin (minimum) shall be considered of the value of friction losses. Pipe friction loss shall be calculated as per Willam-Hazen formula and “C” value to be adopted shall be as

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

described elsewhere in this specification. Pump recirculation with a regulating valve shall be provided for all the pumping system.

- 5.0** All the design parameters at clause no 4.0 of this chapter, i.e. the effluent quality, the design flow, design service length and Pressure drop across the resin bed in clean and dirty condition at rated design flow shall be guaranteed by the Bidder.

## **6.0 SYSTEM REQUIREMENT**

- 6.1** The regeneration process offered by the bidder, shall be of proven design and shall essentially be the same process by virtue of which the bidder is qualified and shall give resin-separation compatible with the desired effluent quality. Documentary evidence shall be submitted by the bidder to the Customer/BHEL to establish this requirement during detailed engineering stage as desired by BHEL/ Customer.
- 6.2** Pre filters (cartridge filter) shall be provided by bidder and same may be horizontal or vertical as per system requirement. The bidder shall offer only proven design in successful operation in previous installation at previous installation under similar working condition. Documentary evidence shall be submitted by the bidder during detailed engineering stage as desired by BHEL/ Customer for sub vendor acceptance with respect to pre-filter to establish this requirement.
- 6.3** The bidder shall include inert resin in the system if they feel that it helps in better resin separation.
- 6.4** In case, after separation of resins, there are undesired contaminant resins, the bidder shall provide a system either to eliminate this cross contamination of resins or to nullify the detrimental effect of entrapped resins to the effluent quality.

## **6.5 Exchange Resins**


- a. The bidder shall include with the plant adequate resins for all the condensate polisher service vessels. In addition, separate charge of resin shall also be included for using the resins during commissioning stage of unit. The total number of resin charges to be supplied by bidder shall be as mentioned in scope of supply elsewhere in this specification.
- b. The resins shall be in the form of spherical beads. Base of the ion-exchange resins shall be a copolymer of styrene and divinyl benzene forming a macroporous or macrorecticular structure. Other details are as follows:

Cation : Strong acid, with sulfonic acid functional group .  
Anion : Strong base, with quaternary ammonium (type I) functional group.  
Inert : Non ionic, compatible with the above resin types.

Cation resins shall be supplied in hydrogen form and Anion resins shall be supplied in hydroxide form.

### **c. Physical Properties:**

- i. Particle size: The resins shall be in the form of spherical beads. All resins, when wet screened with U.S. standard sieves, shall pass through a No.14 sieve no more than 2 percent shall be retained on a no. 16 sieve, and more than 2 percent shall pass through a no. 40 sieve. The particle sizes and densities shall be carefully controlled to facilitate clear separation between the resins during regeneration process.
- ii. Bead Strength: The average force required to fracture individual beads of cation resins in hydrogen form, anion resins in hydroxide form, and the inert resins, shall exceed 350 grams. Not more than 5 percent of the beads tested in each batch shall get fractured by forces less than 200

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB	
		SECTION – IA	
	2X660 MW KHURJA STPP	REV. NO. 00	DATE:

grams.

**d. Chemical Properties:**

- i. Total wet volume ion-exchange capacities in equivalents/liter shall not be less than the following:

Cation in hydrogen form: 1.7

Anion in hydroxide form: 0.8

- ii. The resins shall contain a minimum of metallic and organic impurities consistent with good processing. The processing procedure will include rinsing the resins with demineralized water before packing, so that further rinsing will not be required before use. Foreign objects in the resins shall constitute a basis for its rejection.
- iii. Cation-Anion resin ratio shall be 1.5 parts cation to 1.0 part anion by volume. In case the bidder's process requires any non-ionic resin the same shall represent at least 10 percent of the bed volume, but not less than 15 cm of the bed depth in the resin separation tank of the external regeneration facility.
- iv. Manufacturer: It is not the intent to pre-select any specific brand name for this application. Resins will be accepted by the BHEL/Customer strictly on their merits. The resins shall be of reputed manufacturer with adequate past record of successful service for not less than 3 years in similar application.
- v. Bidder shall submit all necessary data and information in this regard. Some of these possible resin terms are as follows:
1. Duolite C -26 TR & A - 161 TR Rohm and Hass 252 C & TRA-900C.
  2. Dowex MSC-1, MSA-1 C grades.
  3. Inert resin – Duolite sec, Rohm & Hass 359 or Dow-buffer beads.

Above listing is by no means exhaustive, and shall not be construed to be a recommendation for their selection for this plant. Bidder shall fully satisfy himself as to the suitability of the resin system selected by him before offering during detail engineering.


- e. The resin shall be suitable for the condensate temperature that may be achieved in all operating regimes of TG cycle. However, the anion resin shall be suitable for a minimum temperature of 60 deg.C.

- 6.6 The pressure vessels in the common external regeneration facility shall be provided with adequate freeboards over the top of the settled resins, to minimize resin loss during their use. Minimum freeboards to be are as follows:

- |  |       |
|--|-------|
| (i) Mixed resin Storage vessel                             | : 50% |
| (ii) Resin separation vessel                               | : 75% |
| (iii) Cation regeneration vessel                           | : 75% |
| (iv) Anion regeneration vessel and activated carbon filter | : 75% |

However, if a vessel is used for more than one service, then the vessel design shall be based on the service which gives maximum freeboard.

- 6.7 Design pressure of the condensate Polisher Service Vessels is indicated elsewhere. For all other

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB	
		SECTION – IA	
	2X660 MW KHURJA STPP	REV. NO. 00	DATE:

Pressure vessels, the design pressure shall be at least 8 kg/sq. cm (g).

- 6.8 All equipment for dosing of acid and alkali solutions shall be rated to provide a maximum dosing rate at least 20% in excess of that required from process calculation.

#### 6.9 Hot water tank (for alkali)

For heating of alkali diluent water, 2x50% electrical heating coil in a tank of mild steel rubber lined construction shall be provided. The capacity of tank shall be minimum 20% higher than the maximum water demand. This tank shall be provided with burn out protection, pressure relief valve, level transmitter, temperature transmitter & indicator etc. The heater shall be controlled by the temperature transmitters provided on the tank. The heaters shall be sized for heating the water from a temperature of 15 deg C to 50 deg C at the outlet. The water shall be heated to the required temperature within 5 hours.

#### 6.10 Activated Carbon Filter (for alkali):

Rated flow of the filter shall not be less than the design capacity of the alkali transfer-cum recirculation pump, and the maximum velocity through the filter for this flow shall not exceed 12 meters/hour. Depth of the filter material shall not be less than 1 meter.

The filtering medium shall be granulated activated carbon, meeting following minimum requirements.

Total Surface area	:	Not less than 850 sq.m/gm.
Bulk density	:	Not less than 400 kg/cu.m.
Iodine number	:	850 minimum
Uniformity coefficient	:	1.9 or less
Abrasion number	:	70 minimum
Ash	:	8% maximum

Mean particle diameter shall be about 1.5-1.7 mm with following size distribution:


On 20 mesh	:	Less than 3%
Through 40 mesh	:	Less than 10%
Through 50 mesh	:	Less than 1%

The filter shall be provided with all necessary valves and connections for manual backwashing and rinsing with demineralized water. Rate set valves shall be provided with adjustable limit stops for setting backwash and rinse rates.

#### 6.11 Resin Injection Hopper

The bidder shall provide a hopper type tank for resin make-up, using water slurry, to the condensate polishing systems. This make-up system will constitute a portion of the condensate polishing external regeneration system. The resin hopper shall have a conical bottom and a flat top. The top shall have a piano type hinged port, having a lifting handle, of sufficient size for easy resin loading. The resin shall discharge through a bottom connection to a water ejector for transport. Water shall be added to the hopper to assist in the resin transfer. The ejector discharge shall be to the resin separation-cation regeneration vessel. Demineralized water shall be used throughout for the resin transfer. Piping of the resin make-up system shall be the responsibility of the Bidder as a part of the external resin regeneration system.

- a) Capacity  
The resin make-up hopper tank shall be sized to handle up to 150 liters of as received new resin

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

per single injection.

b) Material


The resin make-up hopper tank shall be fabricated of mild carbon steel having a minimum thickness of 6 mm and lined.

## 7.0 SCOPE OF SUPPLY (MECHANICAL)

Broad scope of supply (mechanical) for this package is detailed below and as indicated in relevant portion of this specification. Please refer Electrical and C&I specifications also for respective scope of Electrical and C&I items.

### A. SERVICE VESSEL FACILITY

- 1) There shall be three numbers service vessels (3X50%) for each 660 MW TG unit each polishing 50 % of the condensate flow. Each Condensate polisher vessels shall be complete with condensate inlet and outlet connections, pre filter, connections for resin transfer to and from the vessels, bed support-cum-under drain system, inlet water distributors, air distribution arrangement for resin mixing, all fittings and appurtenances etc. as specified and as required.
- 2) There shall be two numbers (2x50%) back washable type cartridge pre filters at the upstream of condensate polishing service vessels along with all associated piping, valves, instrumentation etc. The pre-filters shall be designed for start-up period, commissioning period as first cleaning step as well as normal continuous operation.
- 3) Two (2) nos. (2X100%) capacity (1Working+1Standby) compressors to supply necessary air for backwashing the Pre filter for each 660 MW TG unit CPU. Each compressor shall be complete with motor, valves, instruments and other required accessories.
- 4) Backwash Waste water from Pre-Filter: Condensate water used for backwashing shall be collected in a RCC Pit with solvent free epoxy coating in Service Vessel area having holding capacity 1.5 times the capacity of Condensate water required for backwashing the one Pre filter and the same shall be pumped to Waste service water sump of ETP by means of two (2) numbers (1Working+1Standby) (2x100%) backwash waste water pumps for each TG unit. Additional pneumatic operated valves, piping, instruments, fittings etc. for this system as required shall also be in Bidder's scope for pre-filter facility.
- 5) External resin traps at the outlet of each of the polisher vessel, designed for in-place manual back washing.
- 6) Condensate inlet and outlet headers for each installation with pipe connections to each condensate polisher vessels.
- 7) Resin transfer headers and pipe lines connecting the external regeneration facilities to the condensate polisher vessels of each installation.
- 8) Rinse water outlet headers from condensate polisher vessels of each installation up to the hotwell.
- 9) A common drain header for the condensate polisher service vessels of each unit up to the hotwell.
- 10) Gland sealing water piping for the valves in the rinse water line.
- 11) An emergency bypass system for the total system (i.e. Pre filters + Service Vessel) shall also be provided by the bidder. This emergency bypass system will open automatically in case of pressure differential exceeding 3.5 Kg/cm<sup>2</sup>.
- 12) Emergency bypass between the condensate influent and effluent headers for condensate polisher vessels with a modulating automatic butterfly type control valve (double flanged/ lugged wafer), butterfly (lugged wafer) isolation valves (resilient material seated, to ensure bubble tight shut off) on both sides of control valve. The control valve can be of 2x50% or 1x100% configuration to achieve proper control under all operating conditions. Isolation valve shall be provided with geared operators for manual operation. The

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:


control system shall be so designed that the control valve is able to bypass 50% of rated flow when any of the service vessel is out of service, 100% of flow when both working vessels are taken out of service. When condensate temperature exceeds 60 degree Celsius the bypass valve shall be 100% opened automatically and the inlet / outlet of the condensate polisher mixed bed shall be closed to protect elements and resins inside the polisher.

- 13) At the design flow rate, the pressure drop in clean condition across the Pre filters including polisher service vessels shall not exceed 2.1 Kg/sq.cm. This pressure drop shall include losses due to pre filters, entrance and exit nozzles, distributors, under drains, resins and the effluent resin traps. Maximum pressure drop under dirty conditions across the Pre filters including polisher service vessels will be restricted to 3.5 kg/sq.cm including the pressure drop across effluent resin traps.
- 14) Two (2) nos. (2X100%) capacity (1Working+1Standby) oil free type, air blowers to supply necessary air for mixing the resins in the service vessels for each 660 MW TG unit CPU. Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter, silencer, flexible couplings and discharge snubber, acoustic hood, relief valve etc all mounted on a single base.
- 15) All necessary valves and fittings for the installations with actuators necessary for their remote operation. These shall include suitable fool proof arrangement to prevent accidental over pressurization of the resin transfer pipeline, DM water line, DM waste water line, Blower line, instrument airline and regeneration facilities connected to it which are designed for pressure much lower than that of the polisher service vessels.
- 16) All necessary drains, vents and sampling points, with valves as specified and as required.
- 17) Complete Instrumentation and Control for automatic operation.
- 18) Nine (9) complete charges of resins. One charge will be defined as cation, anion & inert resin (if applicable) requirement for one service vessel. Further one Year's topping requirements or 10 % of first fill quantity, whichever is more shall also be supplied by bidder.
- 19) Complete instrumentation and controls for this system, including the differential pressure transmitters, panel mounted indicating type controller with provision for remote manual operation, actuator for the control valve with positioner etc. All tubing, wiring, airsets, and other fittings, required to complete the system.
- 20) All the piping, valves, fitting, instruments, accessories etc. used in service vessel area (shall be based on the actual pressure rating to meet the system requirements but not less than 300 lb class) and shall be considered as high pressure side. Minimum instrumentation required as per enclosed P & ID included in this tender specification.
- 21) Operating platforms, ladders, supports and other structural works for each Condensate Polisher vessels and each pre filter to facilitate accessibility for operation and other equipment etc. shall be provided by the bidder.

#### **B. REGENERATION SYSTEM**

Regeneration area shall be considered as low pressure area. One (1) common external regeneration systems for regeneration of the ion exchange resins from the condensate polishers for all the turbo-generator units shall be provided by bidder. One (1) common facility for regeneration of the ion-exchange resins from the condensate polishers of all the turbo-generator units shall be provided utilizing three (3) tank concepts and consisting of following:

- 1) Resin Separation & Cation Regeneration Vessel with internals, integral pipe works, valves, instruments, ladders, platforms, lifting lugs, manholes etc. and all other accessories as required.
- 2) Anion resin regeneration vessel with internals, integral pipe works, valves, instruments, ladders, platforms, lifting lugs, manholes etc. and all other accessories as required.
- 3) Two (2) Numbers Mixed resin storage vessels with internals, integral pipe works, valves, instruments,


	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

ladders, platforms, lifting lugs, manholes etc. and all other accessories as required.

- 4) The regeneration vessels arrangement shall be as per the supplier recommendation/ process utilising three (3) tank concept as defined above. However, there shall be two numbers identical mixed resin storage vessels. If the process envisage the chemical regeneration arrangement in mixed resin storage vessel then additional mixed resin storage should also have chemical regeneration arrangement.
- 5) All internals, fittings and appurtenances for these vessels.
- 6) Common waste effluent header with one (1) number resin trap, total one (1) number for station designed for in place manual backwashing.
- 7) One (1) number Resin injection hopper, total one (1) number for station complete with water ejector system for resin make up. Resin Make up hopper shall be sized to handle up to minimum 150 liters of as received new resins.
- 8) Two (2) nos. (2X100%) (1Working+1Standby) oil free type air blowers with electric motor drives, for supplying all the process air required for cleaning of the resins and their regeneration processes. Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter, silencer, flexible couplings and discharge snubber, acoustic hood, relief valve etc all mounted on a single base.
- 9) Two (2) nos. (2X100%) (1Working+1Standby) DM water pumps with electric motor drives for water supply for chemical preparation, dilution water supply during dosing & regeneration etc. These DM water pumps will take suction from DM water storage tanks.
- 10) Two (2) nos. (2X100%) (1Working+1Standby) DM water pumps with electric motor drives for water supply and transfer of resin from service vessel to regeneration vessels and vice – versa. These DM water pumps will take suction from DM water storage tanks.

Waste water generated during regeneration: The DM water used for resin transfer operations shall be collected in a RCC pit with solvent free epoxy coating in regeneration area having holding capacity 1.5 times the capacity of DM water required for transferring the resins or 50 m<sup>3</sup> (min) and the same shall be pumped to employer's CW channel for recycle/re-use by means of two (2) numbers (1W+1S) (2x100%) of waste water recycle pumps. The material of construction of pumps shall be SS-316 (casing, impeller and shaft). Additional pneumatic operated valves, piping, instruments, fittings etc. for this system as required shall also be in Bidder's scope for service vessel and regeneration facility.

- 11) One (1) number alkali preparation tank complete with electrically driven stirrer, dissolving basket, carbon dioxide absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and all other required accessories.
- 12) One (1) number alkali day tank complete with electrically driven stirrer, dissolving basket, carbon dioxide absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and all other required accessories.
- 13) Two (2) numbers acid measuring tank, complete with fume absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and all other required accessories.
- 14) One (1) number lime tank, complete with electrically driven stirrer, dissolving basket, carbon dioxide absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and all other required accessories.
- 15) One (1) no. Activated carbon filter for alkali complete with internals, integral pipe works, valves, instruments, ladders, platforms, lifting lugs, carbon trap etc. and all other accessories as required.
- 16) One (1) no. hot water tank complete with heaters (2X50%), internals, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and all other accessories as required. Hot water tank shall be adequately insulated to restrict the outside temperature to 60 deg. C with 25 mm thick (mm) mineral wool insulation on all external surfaces, covered with 16 gauge galvanized iron sheet jacketing.
- 17) Two (2) nos. (2x100%) (1Working+1Standby) alkali solution transfer-cum-recirculation pumps of suitable


	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

capacity and head to meet the system requirements. These pumps shall be provided with a pulsation dampener at the outlet header of each pump along with necessary valves & instrumentation & accessories.


- 18) Two (2) nos. (2x100%) (1Working+1Standby) Acid dosing pumps for dosing hydrochloric acid (30% conc.) along with electric motor drive, pulsation dampener & safety relief valve at the outlet header of each pump all other required accessories etc.
- 19) Two (2) nos. (2x100%) (1Working+1Standby) Alkali dosing pumps for dosing NaOH (48% conc.) along with electric motor drive, pulsation dampener & safety relief valve at the outlet header of each pump all other required accessories etc.
- 20) All integral pipe works, valves, internals, fittings, hangers, supports and appurtenances etc for these vessels.
- 21) Safety equipment as indicated elsewhere in the specification.
- 22) There shall be Bulk Acid storage tanks (two numbers) and Bulk Alkali storage tanks (two numbers) along with acid unloading pumps (two numbers) and alkali unloading pumps (two numbers) for CPU Regeneration system and the same shall be under bidder's scope. Inlet piping from each bulk acid and bulk alkali storage tanks to regeneration area is in bidder's scope. Other details have been attached elsewhere in the tender technical specification
- 23) There shall be two numbers DM water storage tanks and the same shall be under bidder's scope. DM water inlet piping from each DM water storage tanks to each CPU resin transfer pumps and regeneration pumps shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification
- 24) Two (2) numbers of DM Tanks shall be provided and the tanks shall be of vertical cylindrical type in Mild steel construction internally painted with epoxy. The design features of the tanks & accessories shall be as per IS: 803. However, minimum thickness of shell plate, bottom plate and roof plate shall be 8 mm, 10 mm and 6 mm receptively. The tanks shall be provided with CO2 absorber and over flow seal pit. capacity of each tank shall be equivalent to 1.5 times the DM water required for one (1) regeneration operation of working vessels of one (1) TG unit including resin transfer operations from Condensate Polishing Plant to regeneration plant and regeneration plant to Condensate Polishing Plant and for preparation of chemicals for one (1) regeneration of working vessels of one (1) TG unit. However, the capacity of each DM water storage tank shall be 600 m<sup>3</sup> minimum. Water inlet pipe shall led up to the bottom of DM tanks (preferably through perforated pipe) to avoid turbulence/agitation.
- 25) Total two (2) numbers mixing tee for Acid and alkali dosing facility.
- 26) Grouting material required for equipment grouting.
- 27) Neutralising pit of RCC construction with acid/alkali resistant tiles shall be provided to receive drains from the regeneration If separate pit is envisaged for Condensate Polishing Plant, (as shown in relevant Tender drawing), contractor shall design the system so that pit shall be provided in two (2) sections and each section shall have a holding capacity of 1.5 times the waste effluent from each regeneration of each vessel.
- 28) Total three (3) numbers the waste recirculation/disposal pumps for Neutralising pit.

### C. PIPING

All the piping as listed below shall be in bidder's scope. The below indicated pipes shall be designed, supplied, erected, laid and tested by the bidder. Elbows, tees, flanges, counter flanges, Hangers and supports, embedment plates with lugs etc required for the below given piping shall also be provided by the bidder.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:


- 1) Service vessel inlet header shall be ASTM A 106 Gr-B (OD 355.6 X 9.27 mm thick).
- 2) Service vessel outlet header shall be ASTM A 106 Gr -B (OD 355.6 X 9.27 mm thick).
- 3) Rinse water outlet piping to Condenser Hotwell shall be ASTM A 106 Gr -B (OD 168.3 x 7.11 mm). The distance between CPU service vessel to condenser Hotwell shall be considered as 200 meters for each unit and this piping shall also be in bidder's scope.
- 4) The material of piping handling Pre filter backwash waste water shall be of stainless steel type 304 Sch.40 (Min). The piping distance between farthest service vessel and waste service water sump of ETP 1100 meters. Other details have been attached elsewhere in the tender technical specification.
- 5) Resin transfer piping shall be minimum 80 NB and of SS 304 Sch 40 (minimum). One way piping distance for resin Transfer Piping between farthest service vessel and regeneration area shall be 1000 meters. Complete resin transfer piping shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification.
- 6) Piping handling DM water shall be Stainless steel SS 304 Schedule 40 (minimum). One way piping distance for DM water piping between farthest service vessel and regeneration area shall be 350 meters. Complete DM water piping shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification
- 7) The material of piping handling DM waste water generated during regeneration shall be of stainless steel type 304 Sch.40 (Min). The piping distance from CPU regeneration area to CW channel is 750 meters. Other details have been attached elsewhere in the tender technical specification
- 8) Pipeline handling Alkali shall be of stainless steel type 316 Sch.10 (minimum).
- 9) Piping for Acid service (HCl) shall be carbon steel Poly propylene lined/CPVC as per ASTM F441(Sch.80).
- 10) Piping for air service shall be shall be of hot dip galvanized (heavy grade) steel.
- 11) Piping for instrument air shall be hot dip galvanized (heavy grade) steel.
- 12) All piping within each of the above skids/equipment shall also be in bidder's scope.
- 13) There shall be a Neutralisation Pit (N pit) for CPU regeneration and the same shall be under BHEL scope. The regeneration waste from CPU regeneration area shall be led to this N pit via drain.
- 14) Service water piping in CPU service vessel area (used for cooling of condensate sample), Service water piping in each CPU regeneration area, instrument air piping for each CPU service vessel area & regeneration area and service air piping for each CPU service vessel area & regeneration area, potable water piping for each CPU regeneration area etc. shall also be in bidder's scope.
- 15) Similarly, all piping between each external regeneration facility and the skids for chemical dosing and acid/alkali preparation shall also be designed, supplied, erected and tested by the bidder. These shall include demineralized water piping to the chemical dosing, acid /alkali piping from external bulk storage tanks to respective preparation skids, the alkali preparation skids from the external regeneration facility, alkali solution from its preparation facility to the alkali dosing skid, dilute chemical solution piping for acid and alkali from the dosing skids to the external regeneration facility, piping to the preparation/dosing facilities, instrument air piping and power supply for immersion heaters of the diluent water tank from the regeneration facility, and all instrumentation and control wiring between these skids, etc.
- 16) Bidder shall design, supply and erect the piping between the service units and the common external regeneration facility, for transferring the exhausted and regenerated resins as required.
- 17) All piping shall be laid above ground and generally laid in pipe trestles including crossing of road/pipe/cable trenches if any. Piping of between chemical tanks area and regeneration area etc. may be laid on pedestals if layout permits.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

- 18) The resin transfer pipeline arrangement shall avoid any sharp bends which cause segregation of the mixed resins, and pockets where the resins can get trapped. Suitable observation ports shall be provided in all critical areas to enable the operator to monitor completeness of the resin transfer operations. All necessary arrangements for venting and draining of the pipeline shall be provided.
- 19) The resin transfer pipeline shall be sized for a flow velocity of between 2.3 and 3.0 meters/sec. For other services, design criteria shall be generally in line with design philosophy described elsewhere in technical specification.
- 20) Remotely operated valves suitably interlocked with the plant operation, shall ensure that the resins get transferred to and from only the particular service vessel which has been selected by the operator.
- 21) All lined vessel connections and connections in unlined vessels (25 NB and larger) shall be flanged to ANSI 125 lb class except the polisher service vessels which shall be ANSI 300 lb class minimum, Flat face flanges shall be used throughout. Nozzle material shall be ASTM-106 Gr. B. Sch.80 pipe for all vessels. All flanged connections shall be supplied complete with matching counter flanges, nuts, bolts and full face gaskets. All the pipeline in service vessels area where pressure may attain same as service vessel shall be designed for 300 lb class minimum.
- 22) Complete supporting system for the pipeline shall be designed, fabricated and supplied by the Bidder. Inside the building, the overhead portion of the pipeline may be supported from the building structures. In outdoors, the pipeline may run on steel posts. Crossing of the roads shall be on a pipe bridge with a clear height of at least 6.1 meters over the road surface. All the steel structures of the pipe bridge and the supporting posts along with all necessary hanger, clamps, connecting steel, fixing bolts, nuts, etc. shall be supplied and erected by the bidder.
- 23) Routing of this pipe line shall be developed by the bidder and shall be finalized in coordination with the BHEL/ Customer, based on the space available and the final layout.
- 24) The condensate pipeline shall be sized for a flow velocity between 3 and 5 m/sec.

**D. VALVES:**

- i. All valves shall be designed as per applicable AWWA/BID/BS or equivalent international standard / codes.
- ii. The isolation valves on the resin transfer line shall be of eccentric plug type/ball valve (full bore type) of stainless steel construction (SS 316).
- iii. Emergency bypass control valve shall be of double flanged/ lugged wafer butterfly type. Isolation valves of wafer (lugged) type butterfly valves (resilient material seated, to ensure bubble-tight shut off) shall be provided on the upstream and downstream sides of the control valve.
- iv. The material of construction of valves handling condensate in service vessel area shall be SS-316 (for body, disc and shaft). Seat/seat rings should be of Teflon/titanium back up rings. Seal shall be of Teflon or equivalent.
- v. Isolation Valves handling Acid(HCL), Alkali, Ammonia etc shall be diaphragm type in MSRL (Mild Steel Rubber lined) construction.
- vi. Isolation Valves handling DM water shall be Butterfly or gate or globe type and shall be of SS -304 construction.
- vii. Non-return valves shall be constructed of SS-304 for DM Water & SS316 for alkali. For Hydrochloric acid, non-return valve shall be dual plate/ swing check/ lift ball check type of suitable material or as per manufacturer's standard practice.
- viii. All valves in service vessels area where pressure may attain same as service vessel shall be


	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

designed for 300 lb class minimum. For establishing the same vendor have to submit the supporting documents.

#### E. Pressure Vessels, Atmospheric tanks & Miscellaneous Items

- i. Design of all vertical cylindrical atmospheric storage tanks containing water, acid, alkali and other chemicals shall conform to IS: 803.
- ii. Unless otherwise mentioned design temperature of all pressure vessels and storage tanks shall be 10 deg.C higher than the maximum temperature that any part of the vessel/tank is likely to attain during operation.
- iii. All vessels/tanks without inside rubber lining shall have a corrosion allowance of minimum 2 mm and mill allowance (minimum 0.3 mm) for shell and dished ends. Thinning allowance of 2 mm (minimum) shall be considered for dished end of torospherical type.
- iv. All the atmospheric tanks shall have sufficient free board above the “Level High /Normal Level” as the case may be. The overflow level shall be kept at least 20 cm or 10% of vessel height above the “Level High /Normal Level” for all the tank except for the DM tanks for which a minimum height of 300 mm shall be provided over the “High Level”. Further, a minimum 100 mm free board shall be provided above the top of overflow level to the top of tank.
- v. All pressure vessels shall be designed and constructed in strict accordance with the ASME code Section VIII or acceptable equivalent international standard. Suitable mill tolerances shall be considered for determining the thickness of the shells and dished ends. A minimum thinning allowance of 2 mm shall be considered for the dished ends of torospherical type.
- vi. Pressure vessel ends shall be of dished design and constructed by forging, pressing or spinning process. Spherical vessels for CPU service vessels are acceptable. Conical or flat ends shall not be accepted. All the atmospheric vessels shall be atleast 6 mm thickness.
- vii. All pressure vessels shall be fabricated from carbon steel plates to SA-515 / 516 Gr. 70 and lined internally. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore -A meeting the requirements of IS:4682, Part-I. The lining shall be applied in three layers, resulting in a total thickness of not less than 4.5 mm anywhere on the internal surfaces of the vessels. The lining shall extend over the full face of all flanged connections and shall have a minimum thickness of 3 mm in all such external areas.
- viii. Vessel internals shall meet the following requirements:
  - Inlet water and regenerant distributor: - Hub and internals diffuser splash plate or header and perforated laterals. Material of construction shall be SS-316 except for acid service which will be of Hastelloy-B.
  - Under drains: Same as above with screened laterals with internal perforated pipes and rubber lined flat bottom. For resin separation/ regeneration/ mixed resin vessels, it may have fully screened bottom (NEVA - clog type with pora septanurese screen, fully supported by subway grid or equal).
  - All internal fasteners shall be of SS-316 and heavy duty locknuts shall be used throughout.
- ix. Resin Traps: Outlet of each condensate polisher vessel, activated carbon filter and waste effluent header of the common regeneration shall be provided with a resin trap. Pressure drop at design flow through a clean resin trap shall not exceed 0.35 kg/sq.cm. Resin trap shall be of rubber lined steel construction and internals (cord & screen) shall be of JOHNSON SCREENS IRELAND or equivalent (SS-316) construction. Resin traps of process effluent line shall have screen opening not exceeding 120 percent of associated process vessel under drain screen opening. Other resin

5/ 415/2020/PS-PEM-MSX P

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:


traps shall have screen opening of 60 mesh. In place manual back flushing shall be provided for all resin traps.

- x. Carbon Trap (for ACF): Outlet of each Activated Carbon filler on Carbon trap (media trap) shall be provided by bidder as per manufacturer standard.

#### F. ADDITIONAL REQUIREMENT


- 1) Operating platforms, permanent ladders (not rugs), supports and other structural works for each vessels, tanks, valves etc. to facilitate accessibility for operation and maintenance for all the condensate polisher mixed beds, regeneration vessels, storage tanks, alkali and acid measuring tanks & preparation tanks and other equipment's etc. is also in bidder's scope.
- 2) Initial charge of all lubricants & grease.
- 3) All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box. Finish paints for touch-up painting of equipment after erection at site in sealed container.
- 4) Painting requirement as indicated in Section- II are bare minimum. However, any variation in the painting schedule as finally approved by BHEL / Customer shall be taken care by the bidder without any commercial and delivery implication to BHEL / Customer. Colour coding scheme shall be intimated to vendor during detail engineering.
- 5) Start-up and commissioning spares as required.
- 6) Mandatory spares as indicated in Annexure – V.
- 7) Wherever pipe racks are not available, pipes shall run on pedestals or below ground. All auxiliary structure & fixing items such as U clamps, nuts, bolts, channels, insert plates etc. required to lay the pipes on pedestals shall be in bidder's scope of work. Coating, wrapping and protection required for buries pipes shall also be in bidder's scope of work.
- 8) For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/ sump/ reservoir from which the pumps draw water. However, the static head to be consider shall be 15 meters (minimum).
- 9) All the first fill and one Year's topping requirements 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 India are desired. Efforts should be made to limit the variety of lubricants to minimum.
- 10) The Condensate Polisher Service vessels, blowers etc. will be located indoor near corresponding units. Regeneration system equipment shall be kept under shed and one-meter height parapet wall shall be provided around this shed. Effluent re-circulation/disposal pumps, Bulk chemical storage tanks, unloading transfer pumps and DM water storage tanks for regeneration system etc. shall be kept in open area.
- 11) MCC shall be located in CPU regeneration area.
- 12) Space available for CPU service Vessels area & CPU Regeneration area (Vide ref. Dwg. No. PE-DG-475-100-M003 & General Layout Plan Dwg. No. 9915-370-301-PVC-B-034) are attached in this specification. Bidder to accommodate their equipment within the space provided. Further the location of other facilities has also been indicated in Dwg. No. 9915-370-301-PVC-B-034 attached in this specification. The location of DM waste water pit shall be in CPU regeneration area.
- 13) Bidder to submit BBU during detailed engineering after approval of Basic documents. Incomplete BBU shall not be reviewed by BHEL. The Breakup (%) of Supply prices of CPU plant package in the BBU shall be provided as per below:

S.No.	Break-up (%) of supply prices given at SI No-2.1 in price schedule (To be used during contract execution for Billing Purpose).
-------	--

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

1.0	Lumpsum firm price for supply of Service vessels along with pre filters inclusive of all taxes, duties and other levies as applicable.	28% of sl no 2.1 of Price Schedule.
2.0	Lumpsum firm price for supply of Pressure vessels other than Service vessels & pre filter inclusive of all taxes, duties and other levies as applicable.	10% of sl no 2.1 of Price Schedule.
3.0	Lumpsum firm price for supply of Resin inclusive of all taxes, duties and other levies as applicable.	10% of sl no 2.1 of Price Schedule.
4.0	Lumpsum firm price for supply of Atmospheric tank inclusive of all taxes, duties and other levies as applicable.	2% of sl no 2.1 of Price Schedule.
5.0	Lumpsum firm price for supply of Low Pressure Valves inclusive of all taxes, duties and other levies as applicable.	5% of sl no 2.1 of Price Schedule.
6.0	Lumpsum firm price for supply of High Pressure Valves inclusive of all taxes, duties and other levies as applicable.	10% of sl no 2.1 of Price Schedule.
7.0	Lumpsum firm price for supply of Instruments & Analyser inclusive of all taxes, duties and other levies as applicable.	7% of sl no 2.1 of Price Schedule.
8.0	Lumpsum firm price for supply of Rotary Equipments (Pumps, Blowers, Agitators etc.) inclusive of all taxes, duties and other levies as applicable.	3% of sl no 2.1 of Price Schedule.
9.0	Lumpsum firm price for supply of Piping & Fittings inclusive of all taxes, duties and other levies as applicable.	15% of sl no 2.1 of Price Schedule.
10.0	Lumpsum firm price for supply of Balance items inclusive of all taxes, duties and other levies as applicable.	5% of sl no 2.1 of Price Schedule.
11.0	Lumpsum firm price against approval of Basic Drawing & Documents inclusive of all taxes, duties and other levies as applicable.	5% of sl no 2.1 of Price Schedule.

- 14) Any statutory requirement / clearance required for the packages from government / local body shall be in bidder's scope.
- 15) 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 shall be taken from BHEL. 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.
- 16) 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.
- 17) KKS numbering as per BHEL/ Customer requirement shall be provided by the Bidder during detailed engineering stage without any commercial/ delivery implication to BHEL.
- 18) Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details w.r.t. existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.
- 19) Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.
- 20) Wherever CIVIL works is excluded from the bidder's scope, successful bidder shall furnish civil assignment / scope drawings. The corresponding CIVIL drawing prepared by BHEL / CIVIL agency, based on civil assignment drawing of bidder will be furnished to the successful bidder for concurrence. In case any modification is required in the civil work already carried out based on final civil inputs given by vendor, BHEL reserves the right to debit cost of such rework to vendor".
- 21) All the equipment, piping etc. shall be assembled on two (2) structural steel skids one (1) for acid and one (1) for alkali dosing equipment. The bidder shall supply all anchor bolts, foundation plates, sleeves, nuts, inserts etc. to be embedded in concrete for these equipment skids. Each equipment skid shall be

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:


provided with suitable lifting lugs, eye bolts etc. to facilitate erection and maintenance.

- 22) Wherever any design standard mentioned in this specification, bidder to consider latest standard for designing of all the items.
- 23) In order to facilitate erection at site chemical dosing preparation equipment shall be mounted on structural steel skids and assembled (including piping) at the manufacturer's shop, to the maximum extent possible, prior to shipping. The number of mechanical connections shall be minimised by the use of pipe headers wherever possible. Alkali solution preparation, alkali dosing and acid dosing system are a recommended listing of the main equipment skids to be furnished under this package. The bidder may also supply and install this equipment independently instead of assembling the skids.
- 24) Chain Pulley block/ Electric Hoist shall be in bidder's scope in line with selection criteria mentioned in section IIA.

## 8.0 CONTROL & OPERATION

### 8.1 General

- 8.1.1 It is not the intent to specify here the complete details of the control system. Basic type of controls required has been specified below. The bidder shall submit the complete detail of the system offered by him like the extent of automation offered, operation of the complete system, logic/flow diagrams, type and details of the presentation of information, the type of mimic, hardware details etc. along with detailed circuit descriptions.
- 8.1.2 It shall be possible to operate in Auto/Semi-Auto /Manual mode. In 'Auto' mode, once the sequence has been initiated, it shall proceed from step to step automatically. In 'Semi-Auto' mode each step shall be performed only after initiation by the operator. In 'Manual' mode complete operation shall be by the operator by operation of the Control switches on the panel.
- 8.1.3 'Close-Auto-Open' control facility shall be provided from OWS/control panel for solenoid valves. In 'Auto' position, the valves shall receive close / open command from the Control system.
- 8.1.4 'Stop-Auto-Start' Control facility shall be provided from OWS / control panel for the various drives. In 'Auto' position, the drives shall receive stop/start command from the Control system.
- 8.1.5 On control system failure, it shall be possible to operate the valves by means of manual operator of solenoid valves too.
- 8.1.6 The control system shall link the various steps such as closing/opening of different valves, starting/stopping of various pumps etc. which form a sequence. The logic system shall adhere to the correct sequence of operation and predetermined time intervals. The system shall have interlocks so that, criteria necessary for each step are complete prior to proceeding to the next step.
- 8.1.7 It shall be possible to switch mode of operation from one to the other at any moment and the operation shall proceed on the newly selected mode from that time.
- 8.1.8 For steps, which require frequent time adjustment, it shall be possible to change the time setting from the front of the panel. For all other steps it shall be possible to adjust the time setting from inside the panel.
- 8.1.9 For all sequences, the current step number, set time of the step, elapsed time of the step and the total elapsed time of the sequence shall be indicated in the OWS/control panel.
- 8.1.10 A mimic shall be provided for the CPP scheme and Regeneration system scheme shall be provided. Status of various vessels, drives, valves etc shall be indicated by on the mimic.
- 8.1.11 The system shall incorporate the necessary safety features. During automatic sequential operation, if any pre-requisite criterion is not fulfilled or missing for a pre-determined time interval, the steps should

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

not proceed further, and Alarm shall be provided. Missing criteria, sequence, which is under hold up etc., shall be displayed.

- 8.1.12 The safety system for any sequence/step shall check the opening of the required valves and closure of the remaining valves of the plant to avoid mal-operation.
- 8.1.13 Wherever standby equipments are provided, it shall be possible to select each of the drive on 'standby' duty.
- 8.1.14 The detailed logic for the sequence and for each of the drive shall be subject to the BHEL/Customer's approval.
- 8.1.15 Start, progress and stop of each of the sequence shall be annunciated.
- 8.1.16 The status of vessels of Condensate Polishing Plants shall be available in all the CPP panels of all TG units and as well as in the regeneration plant control panel. Similarly, the status of regeneration plant status shall be available in the panels of Condensate Polishing Plants of all TG units.
- 8.1.17 Details of control system specification and configuration details shall be as elaborated in the relevant C&I section II of the technical specification

## 8.2 Control & Operation of the Condensate Polishing Unit

8.2.1 It shall be possible to select each of the CPU vessel for any of the following operations or mode:

- (1) Standby (Applicable for where spare service vessel (s) are provided)
- (2) Service
- (3) Isolation from service.
- (4) Exhausted Resin Transfer from CPU vessel to Regeneration plant.
- (5) Regenerated Resin Transfer from Regeneration plant to CPU vessel
- (6) Rinse mode.


### Each mode or operation is described as below:

#### **Standby Mode:**

- (1) Among the vessels, any one of the vessels may be selected in this mode.
- (2) Under this mode, the vessel, which was regenerated in previous cycle and filled with regenerated resin, shall be kept ready for next Service cycle.
- (3) The selection of any vessel for Standby mode shall be initiated by operator and there shall be indication about the details such as "Condition of the resin; Whether it is filled with regenerated resin or exhausted resin, whether the standby vessel has undergone rinse cycle or not, date and time of receipt of regenerated resin and completion of rinse cycle etc

#### **Service mode:**

- (1) Service flow rate for each polishing vessel shall be monitored. During periods of low condensate flow the operator may select to remove one of the vessels from service by a manually initiated automatic sequence.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

- (2) High differential pressure across the influent and effluent headers will cause an alarm and bypass system shall be initiated as described elsewhere in this section.
- (3) By observing the individual vessel flow indicators, or conductivity at vessel outlet the operator can determine which vessel is contributing most to the pressure drop and is in need of resin cleaning.
- (4) Cation conductivity indicators shall monitor the polishing system influent and effluent streams as well as the discharge of each service vessel. A high influent conductivity alarm will alert the plant operator that a problem condition such as air or condenser cooling water leakage has occurred. This conductivity analyzer shall also provide contacts for an alarm at the power station main control room. A high effluent header or service vessel conductivity alarm will alert the operator to the need for regeneration of a polishing vessel.
- (5) When the vessel under Service mode is ready for regeneration, the operator shall change the same into "Isolation mode" in the panel. Subsequently the "Standby vessel" shall be selected for "Service mode" from the OWS/control panel. The selection shall follow, required sequences such as pressurization of the vessel, checking of the effluent quality and putting the vessel in service on satisfactory effluent quality.
- (6) The differential pressure (DP) across the inlet and outlet headers of CPU services vessels shall be measured and the bypass control valve will also modulate as per the DP. The bypass system shall also be actuated upon high condensate temperature.

#### **Isolation from Service:**


Normally "Service Vessel" once exhausted shall be isolated from service till the "Resin Transfer" operation is initiated. In addition, provision to be kept for isolation of one or all the vessels from service if required by operator from the panel.

#### **Resin Transfer from CPU vessel to Regeneration plant:**

- (1) When a vessel in a service mode needs regeneration as stated above, the resin transfer from the particular vessel to the regeneration plant shall be initiated from the panel of the condensate polishing plant.
- (2) The transfer of resin from the service vessel shall include operations such as isolation of the service vessel, hydraulic transfer of the resin to the external regeneration system (resin separation vessel) and the complete drain down of the service vessel.
- (3) The sequence of "Resin Transfer" operation shall be initiated from the Control system in panel of CPP and shall be controlled in the regeneration Panel.
- (4) The completion of the operation shall be exhibited in the panel.

#### **Resin Transfer from Regeneration Plant to CPU Vessel:**

- (1) When the regeneration is completed in the regeneration plant, the resin shall be transferred to the empty vessel of Condensate Polishing plant.
- (2) This shall be initiated by the operator from the control panel of condensate polishing plant of the unit from which resin was transferred to the regeneration plant in previous service. Provision shall also be kept to transfer the regenerated resin to any of the empty vessel of the CPP of any of the TG unit if required.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:


- (3) The transfer of resin from the regeneration plant shall include operations such as hydraulic transfer of the resin and the complete drain down of the water.
- (4) The sequence shall be initiated from the panel of CPP and shall be controlled in the regeneration Control Panel.
- (5) The completion of resin transfer operation shall be exhibited in both the Control panels.

#### **Rinse mode:**

- (1) After transfer of regenerated resin from the regeneration plant to the empty condensate polisher vessel, this rinse cycle shall be initiated from the Control system of the respective unit so that the vessel may be rinsed and kept ready for next service cycle.
- (2) The rinse mode shall be a manually initiated full automatic sequence. This sequence shall include the rinse down step using condensate at a suitable rate until the unit effluent quality is acceptable for boiler feed water. Prior to rinsing, the resin shall be given air scrub by means of air blowers provided near the CPP.
- (3) The effluent quality shall be determined by conductivity monitoring of the rinse water outlet, which is returned to the condenser hotwell for recycle.
- (4) Cation conductivity values shall be monitored and interlocked to prevent advancing of the automatic sequence until the rinse down is complete.
- (5) The completion of rinse operation shall be annunciated in the panel so that the rinsed vessel may be selected for “Standby mode” or “Service mode” as per requirement.

### **8.3 External Regeneration Control System**

- 8.3.1 A manually initiated automatic sequence for physical cleaning and chemical regeneration of the resin shall be provided. Control for chemical dosing system and alkali preparation facility shall also be provided in it.
- 8.3.2 Physical cleaning of the resin shall consist of three steps, drain to level, air scrub and rinse. The air scrub and rinse steps are of short duration, approximately 1 and 2 to 3 minutes respective time. However, the program will allow the operator to increase or decrease the number of times the sequence is repeated to meet the requirements existing at that time.
- 8.3.3 The chemical regeneration is a many step sequence. This will include hydraulic reclassification of the resins and the transfer of the resins to the respective regeneration vessels. The Bidder may include a layer of inert, intermediate density resin to achieve a better separation of the cation and anion resins, improve resin regeneration, and reduce leakage. The separated resins are then back washed, regenerated with hydrochloric acid and sodium hydroxide solutions respectively and then rinsed. Following the rinse step the resins shall be given an air scrub followed by a good backwash. The resin is then transferred back to the resin separation vessel and the resins are air mixed. The mixed resins after regeneration are given a final rinse with the discharge conductivity being monitored. The quality of this discharge will determine if the regeneration has been effective. If the quality is not satisfactory the regeneration sequence must be repeated. If satisfactory, the mixed resin is transferred to the resin storage vessel.
- 8.3.4 A resin mixing and final rinse may occur in the resin storage vessel provided that the system design will permit direct return of the resins to the resin separation vessel in the event of an unsatisfactory regeneration.
- 8.3.5 Upon satisfactory completion of regeneration, the status shall be annunciated audio-visually in the

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

regeneration system OWS/control panel and as well as in the Balance of Plant Control System. This repeat annunciation in the CPP OWS/panel shall facilitate the operator to initiate resin transfer operation from the regeneration plant to the desired vessel of the Unit in which the service vessel is empty.

8.3.6 Upon resin transfer operation from regeneration plant as described by the operator from the I Control System, the regeneration plant shall be ready to receive next batch of exhausted resin from any of the CPP. The status of regeneration plant (Whether ready to receive resin for regeneration or under regeneration etc) shall be available in the Control System of CPP.

8.3.7 Demineralized water shall be used throughout the regeneration process for backwashing, diluting the regenerant, rinsing and resin transfer.

8.3.8 A conical bottom hopper having a water ejector will be used for resin make-up.


8.3.9 At any time only one of the sequence shall be in progress.

#### 8.3.10 Interlocks

- All interlocks for safe operation of the plant shall be provided. They shall specifically include the following as minimum requirement.
- Service vessels can be back in service, only after they have been pressurized.
- Service vessels can be taken up for resin transfer only after they have been completely isolated from the condensate system and depressurized.
- Resin can be transferred to and from only one service vessel at a time.
- Resin transfer between the service and the regeneration skids shall be permitted only when the receiving vessel is initially empty.
- Regeneration sequence can commence, only when the level in the waste neutralization pit is low enough to receive the entire waste quantity of waste water from the regeneration operation.
- Wherever possible, completion of all timed steps in the regeneration and resin transfer process shall be physically verified by effluent conductivity etc, as applicable. The automatic sequence shall be prevented from advancing to next step, till these required physical conditions are achieved, and at the same time this delay shall be annunciated in the control panel, to draw the attention of the operator. The automatic sequence of operations shall be interruptive at any time by the operator and he shall be able to take over the control to manual from that step onwards. Further operator should be able to override sequence, if required. It shall be possible for the operator to extend the timing of a particular step by isolating the timer for the duration. The timer will restart once the operator puts back the system on 'auto' and the other steps will then follow as programmed.
- The regeneration sequence shall be prevented from advancing further in the event of tripping of a running motor or other fault condition, which do not permit the various desired parameter of this step to be achieved. A manual override for this shall also be provided.
- Annunciation logic shall be carefully designed so that the alarms are activated only under abnormal conditions. As for example, low flow of diluent water is only relevant when the chemical dosing is in progress. All other times, when no diluent water flow is required, this annunciation should be blocked. In general, Normal and trouble free operation of the plant shall not activate any of these alarms.
- Adequate diluent water flow shall be established before starting of the ejectors/ dosing pumps for acid and alkali.
- The immersion heater in the hot water tank can be put on only when there is adequate water level in the tank.
- CPU service vessel inlet & isolate valves will close automatically in the event of tripping of condensate extraction pump.

#### 9.0 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical as per specification / details indicated in Section IB & IIB.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

#### 10.0 SCOPE OF SUPPLY (C&I)

Complete C&I as per specification / details indicated in Section IC & IIC.


#### 11.0 SCOPE OF SUPPLY (CIVIL)

Total Civil work is in BHEL Scope of work; however Civil Input drawing shall be provided by bidder.

#### 12.0 SCOPE OF SERVICES

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

- (i) Unloading, Storage, handling and transportation at site.
- (ii) Minor civil work like chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself, excavation & filling of earth for buried MS pipes if and as required. To the extent possible, vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation. Wrapping, coating and protection of all the buried pipe shall be as per IS 10221 or AWWA C 203.
- (iii) Pre- Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- (iv) Erection and Commissioning of entire Condensate polishing plant.
- (v) Arrangement of all lubricants, instruments, reagents for carrying out trial run, commissioning and PG test.
- (vi) Monitoring gadgets, instruments and equipment's required for maintenance (till PG test & Plant Hand over).
- (vii) During FAT of DCS, bidder will depute his concerned representative for technical support as and when required by customer / BHEL.
- (viii) All personnel required during maintenance and PG test.
- (ix) Trial run for requisite period.
- (x) Performance testing.
- (xi) Painting of all equipment within scope of supply as per Surface preparation & painting specification.
- (xii) Bidder shall also provide one final coat additionally of same DFT as specified in tender specification at site after completion of erection of each equipment / item.
- (xiii) Preparation of civil assignment drawings i.e. pedestals details; insert plates / embedment's plates required for supporting pipes and equipment etc. and review of civil drawing prepared by BHEL based on civil assignment drawing of bidder. In case any modification is required in the civil work already done based on civil inputs given by vendor, rework shall be done at the cost and risk of the vendor.
- (xiv) Preparation & submission of all drawings & documents as per drawing/documents requirement & distribution schedule enclosed as Annexure-IV.
- (xv) Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
- (xvi) All other facilities/ services as described in section on site services in specification and related to Condensate polishing system scope of work.

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

- (xvii) Relevant requirements as per GTR, GCC, ECC & SCC.
- (xviii) AMC requirement for analyser instruments is in bidder's scope and shall be governed as per Section IC & IIC.
- (xix) Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of services.

### 13.0 TERMINAL POINTS

#### 13.1 CONDENSATE POLISHING PLANT - SERVICE VESSEL AREA


- (i) Service vessel inlet – (OD 355.6 X 9.27 mm thick, ASTM A-106 Gr-B) - Single piping connection at 5 meters from nearest Vessel of each TG Unit. Further piping is in bidder's scope.
- (ii) Service vessel outlet – (OD 355.6 X 9.27 mm thick, ASTM A-106 Gr-B) - Single piping connection at 5 meters from nearest Vessel of each TG Unit. Further piping is in bidder's scope.
- (iii) Rinse water outlet- Rinse water outlet piping (OD 168.3 x 7.11 mm, ASTM A-106 Gr-B) till condensate return tank for each unit is in the scope of bidder.
- (iv) 25 NB connection of Instrument air supply at 5 to 7 kg/cm<sup>2</sup> (g) – At 5 meter distance from service vessel area. Further piping is in bidder's scope.
- (v) 25 NB connection of Service air supply at 5 to 7 kg/cm<sup>2</sup> (g) – At 5 meter distance from service vessel area. Further piping is in bidder's scope (if required).
- (vi) Gland sealing water supply & analyser rack cooling water supply piping - Service water connection (50 NB) at 5 meter distance from service vessel area. Further piping is in bidder's scope.

#### 13.2 EXTERNAL REGENERATION AREA

- (i) 25 NB Instrument air supply at 5 to 7 kg/cm<sup>2</sup> (g) – At 5 meter distance from the regeneration building at 0.5 meters above FGL at end closer to pie rack/ pedestal. Further piping is in bidder's scope.
- (ii) 25 NB Service air supply at 5 to 7 kg/cm<sup>2</sup> (g) - At 5 meter distance from the regeneration building at 0.5 meters above FGL at end closer to pie rack/ pedestal. Further piping is in bidder's scope (if required).
- (iii) Service water (50 NB) - At 5 meter distance from the regeneration building at 0.5 meters above FGL at end closer to pie rack/ pedestal. Further piping is in bidder's scope.
- (iv) Potable water (50 NB) - At 5 meter distance from the regeneration building at 0.5 meters above FGL at end closer to pie rack/ pedestal. Further piping is in bidder's scope.

### 14.0 EXCLUSIONS

- 14.1 All civil works including foundation of equipment. However complete grouting for equipment, fixing and any concreting inside vessels and lining shall be in the scope of the bidder. But civil works including operating / maintenance platforms and interconnection platforms (if any) with ladders / stairs & handrails, structural supports and hangers for pipes / cables / ducts, crane rails, all embedment and inserts with

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

lugs including anchor fasteners, bolts etc., dressing of foundations, grouting of pockets and underpinning of base plates for equipment / structures and fixing supports, filling and finishing of openings in walls, floors, cladding, roof and trenches shall be in vendor's scope.

- 14.2 Main pipe trestles interconnecting CPU regeneration building and Service vessel Pipe trestle. However, auxiliary structure, hanger/support components for all the piping (CPU regeneration area, in acid/alkali handling area, interconnecting acid/alkali storage area ,CPU service vessels, DM water piping, DM waste water piping, resin transfer piping, instrument air piping, service air piping, service water piping, potable water piping etc.) are in bidder's scope.
- 14.3 Instrument air & service air up to terminal points.
- 14.4 All chemicals except lubricants, reagents, monitoring gadgets required for pre- commissioning, commissioning, trial run and PG test.
- 14.5 Air conditioning, ventilation & fire fighting facilities.
- 14.6 Other exclusions are mentioned in the electrical & C&I parts of this specification.
- 14.7 Service water & DM water up to terminal points.

#### 15.0 QUALITY PLAN(QP) REQUIREMENTS

- 15.1 Minimum QP requirements are specified as ANNEXURE -I. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any commercial & delivery implication to BHEL. BHEL & customer reserves the right for inspection of imported items by BHEL/customer officials (if felt necessary). The same shall be decided during detail engineering during approval of QP's. The cost of third party inspection for all components shall also be in bidder's scope.

#### 16.0 SUB-VENDOR ITEMS

The sub vendor list (Annexure- II) enclosed is indicative only and is subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.

Bidder to propose sub vendor list with following back up documents within 4 weeks of placement of LOI/LOA. Thereafter no request for additional sub-vendor shall be entertained. The sub vendor list shall subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.

- Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.
- End user performance certificate that the equipment/system has been operating satisfactorily for minimum one year as on the scheduled date of bid opening.

Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.


For approval of Sub vendor list proposed by bidder, meetings shall be arranged by BHEL in Customer office for which bidder representative along with sub supplier as desired by BHEL/Customer will attend the meetings.

#### 17.0 DESIGN/ CONSTRUCTION

In addition to the requirements of Section I & II the following shall also be complied under scope of this specification.

The P&I diagram is enclosed herein in this section for bidders compliance.

The material of construction specified in data sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

which shall be subject to BHEL / Customer approval during detail engineering without any commercial & delivery implication to BHEL.

## 18.0 SPARES

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares as indicated in the relevant sections of specifications. The general requirements pertaining to the supply of these spares is given below: -

### 18.1 MANDATORY SPARES


- 1) The list of mandatory spares considered essential by the BHEL & Customer is indicated in Annexure V. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidder's design) 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.
- 2) BHEL reserves the right to buy any or all the mandatory spares parts.
- 3) The prices of mandatory spares indicated by the Bidder in the price schedule shall be used for bid evaluation purposes.
- 4) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.
- 5) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.
- 6) Inspection of mandatory spares shall be in line with the approved quality plans for the respective items/equipments. The inspection categorisation of mandatory spares shall also be in line with the approved Categorisation plan for the respective items/equipments.

### 18.2 START-UP & COMMISSIONING SPARES

Start-up and commissioning spares are those spares which are required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the BHEL/Customer shall come under this category. The Bidder shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Bidder.

- 18.3 The Bidder shall indicate the service expectancy period for the spares parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.
- 18.4 All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.
- 18.5 All the spares (both recommended and mandatory) shall be manufactured alongwith the main equipment components as a continuous operation as per same specification and quality plan.
- 18.6 The Bidder will provide cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable BHEL to identify and finalise order for recommended spares.
- 18.7 Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.

5-415/2020/PS-PEM-MSX P

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
		VOLUME IIB	
		SECTION – IA	
		REV. NO. 00	DATE:

- 18.8 All cases, containers or other packages are to be opened for such examination as may be considered necessary by BHEL / Customer.
- 18.9 The Bidder will provide the BHEL/Customer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the BHEL/Customer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
- 18.10 The Bidder shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.
- 18.11 In addition to the recommended spares listed by the Bidder, if the BHEL/Customer further identifies certain particular items of spares, the Bidder shall submit the prices and delivery quotation for such spares within 30 days of receipt of such request with a validity period of 6 months for consideration by the BHEL/Customer and placement of order for additional spares if the BHEL/Customer so desires.
- 18.12 The Bidder shall guarantee the long term availability of spares to the BHEL/Customer for the full life of the equipment covered under the contract. The Bidder shall guarantee that before going out of production of spares parts of the equipment covered under the Contract, he shall give the BHEL/Customer at least 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-Bidders. Further, in case of discontinuance of manufacture of any spares by the Bidder and/or his sub Bidders, Bidder will provide the BHEL/Customers, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the BHEL/Customer for the purpose of manufacture/procurement of such items.
- 18.13 The bidder to provide datasheets/assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which the mandatory spares to be supplied can be uniquely identified.

5-415/2020/PS-PEM-MSX P



TITLE:

TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

ANNEXURE-I

QAP FOR CONDENSATE POLISHING UNIT (CPU)

5-415/2020/PS-PEM-MSX P



TITLE:

**TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT**

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

Items / Components	Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic / Water Fill	Performance Test	Test as per relevant Std/ Appd. Data Sheets	Other Tests	Remarks
<b>1. Horizontal Centrifugal Pumps</b>				Y	Y			Y <sup>1</sup>	Y		<b>LEGENDS:</b> Applicable tests are identified by 'Y'. Y <sup>a</sup> One per Heat/Heat Treatment batch./Lot Y <sup>b</sup> On machined surfaces only. Also 100% on Butt Welds & 10% on Fillet Welds. Y <sup>c</sup> UT shall be done for shafts with Dia 50 mm or above & Plates of Thickness 25 mm or above. Y <sup>d</sup> Dynamic Balancing per ISO: 1940, Grade 6.3 minimum shall be conducted for rotating assy. Y <sup>1</sup> As per HIS, USA. Y <sup>2</sup> Random 10% RT to be conducted on butt welds for Thk $\geq$ 10 mm. Y <sup>3</sup> Seat Leakage Test for actuator operated valves shall be done by operating the valve with job actuator. Y <sup>4</sup> Tests on Rubber Diaphragms shall be conducted per batch of Rubber mix for Tensile, Elongation, Hardness, Thickness, Bleed Resistance. In addition, Type Test for 50,000 cycles for each type of diaphragm shall also be conducted. Y <sup>6</sup> Blue Matching, Wear Travel for Gate Valves and reduced pressure test for check valves shall be conducted as per relevant standards.
1.1. Casing	Y <sup>a</sup>		Y <sup>b</sup>		Y		Y				
1.2. Impeller	Y <sup>a</sup>		Y <sup>b</sup>		Y					Y <sup>d</sup>	
1.3. Shaft	Y <sup>a</sup>		Y		Y					Y <sup>c</sup>	
<b>2. Vertical Pumps</b>				Y	Y			Y <sup>1</sup>	Y		
2.1. Casing	Y <sup>a</sup>		Y <sup>b</sup>		Y		Y				
2.2. Impeller	Y <sup>a</sup>		Y <sup>b</sup>		Y					Y <sup>d</sup>	
2.3. Shaft	Y <sup>a</sup>		Y		Y					Y <sup>c</sup>	
2.4. Fabricated Parts	Y <sup>a</sup>	Y	Y <sup>b</sup>		Y	Y <sup>2</sup>	Y				
<b>3. Dosing/ Metering Pumps</b>	Y <sup>a</sup>						Y	Y <sup>1</sup>	Y		
<b>4. Gate/ Globe/ Check Valves</b>	Y <sup>a</sup>		Y <sup>b</sup>		Y		Y	Y	Y	Y <sup>6</sup>	
<b>5. Dual Plate Check Valves</b>	Y <sup>a</sup>		Y <sup>b</sup>		Y		Y	Y	Y	Y <sup>12</sup> / Y <sup>6</sup>	
<b>6 Diaphragm Valves</b>	Y <sup>a</sup>				Y		Y <sup>3</sup>		Y	Y <sup>4</sup>	
<b>6. Butterfly Valves (Low Pr.)</b>				Y	Y		Y <sup>3</sup>	Y	Y		
7.1 Body (Cast)	Y <sup>a</sup>		Y <sup>b</sup>								
7.2 Disc (Cast)	Y <sup>a</sup>		Y <sup>b</sup>								
7.3 Shaft	Y <sup>a</sup>		Y <sup>b</sup>							Y <sup>c</sup>	
<b>8. Plug/ Ball Valves (Low Pr.)</b>	Y <sup>a</sup>		Y <sup>b</sup>	Y	Y		Y	Y	Y		
<b>9. Blowers/Compressors</b>	Y <sup>a</sup>		Y <sup>b</sup>	Y	Y			Y	Y	Y <sup>dc</sup>	

5-415/2020/PS-PEM-MSX P



TITLE:

**TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT**

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

10. Atmospheric Storage Tanks/ Pressure Vessels	Y <sup>a</sup>	Y	Y <sup>b</sup>	Y	Y	Y <sup>c</sup>	Y		Y <sup>c</sup>	Y <sup>f</sup>	
Tests/Check	Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic / Water Fill	Performance Test	Test as per relevant Std/ Appd. Data Sheets	Other Tests	Remarks
Items / Components											
11. Rubber lining	Y <sup>a</sup>				Y				Y	Y <sup>d</sup>	Y <sup>f</sup> Heat Treatment of the Tank/Vessel shall be done per fabrication code requirement. Welded dished ends shall be stress relieved. Dished ends manufactured by cold working shall also be stress relieved as per the requirement of code.
12.Butterfly valves(HP)	Y <sup>a</sup>			Y	Y		Y	Y			Y <sup>g</sup> RT as per fabrication code requirements. However, dished ends welds, if manufactured by using welded plates shall be subjected to 100% RT.
13.Ball valves(HP)	Y <sup>a</sup>			Y	Y		Y	Y			Y <sup>g</sup> Rubber Lining Mix shall be subjected to Bleed Resistance Test on mould sample. Adhesion Test, Spark Test and Hardness Test for the Rubber lined jobs shall also be conducted.
12. Resins / Activated Carbon Filter	Y <sup>a</sup>	Y	Y <sup>b</sup>	Y	Y				Y	Y <sup>10</sup>	Y <sup>10</sup> Gear Boxes shall be checked for smooth No Load Operation at shop to verify noise and vibration levels. Gear Ratio and Kerosene Leak Test shall also be conducted.
13. Hoists & Cranes	Y <sup>a</sup>	Y	Y <sup>b</sup>	Y	Y	Y <sup>c</sup>		Y	Y		Y <sup>11</sup> One Fan of each type & size shall be routine performance tested as per corresponding code fir air flow, static pressure, total pressure, speed, efficiency, power consumption, noise & temperature rise. Also all Fans shall be subjected to run test of 4 hours during which noise, vibration, temperature rise and current drawn shall be measured.
14. Agitators /Flash Mixer/ Flocculator	Y <sup>a</sup>	Y	Y <sup>b</sup>	Y	Y			Y		Y <sup>10</sup>	Y <sup>12</sup> Dry cycle test on valve spring for 1, 00,000 cycles shall be carried out as type test, if not carried out earlier, for the similar MOC, size and type of spring.
15. Pipes (Fabricated)	Y <sup>a</sup>	Y	Y	Y	Y	Y	Y		Y		
16. Ventilation/Exhaust Fan	Y <sup>a</sup>		Y <sup>b</sup>	Y	Y			Y <sup>11</sup>	Y	Y <sup>dc</sup>	
17. Wrapping and Coating Material	Y <sup>a</sup>								Y		
<p>After erection the complete piping system along with valves &amp; fittings shall be hydraulically tested at 1.5 times design pressure or 2 times working pressure whichever is higher.</p>											

1) The above mentioned requirement are bare minimum. However any additional comments provided by BHEL / Customer shall be adhered by successful bidder without any commercial and delivery implication to BHEL/Customer.

5- 415/2020/PS-PEM-MSX P



TITLE:

TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

ANNEXURE - I

QAP FOR LOW PRESSURE PIPING (LP PIPING)

5/ 415/2020/PS-PEM-MSX P



TITLE:  
TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001


VOLUME IIB

SECTION – IA


REV. NO. 00

DATE:

	Tests/Check  Items / Components	Material Test	DPT/MPI / RT	Ultrasonic Test	WPS/ WQS/PQR	Hydraulic / Water Fill Test	Pneumatic Test	Assembly F R up	Dimensions	Functional/operational Test	Other Tests	All Tests as per relevant Std	REMARKS
1	Pipes & Pipe Fittings	Y <sup>a</sup>	Y <sup>c</sup>			Y <sup>1</sup>		Y				Y	
2	Diaphragm Valves	Y <sup>a</sup>				Y <sup>5</sup>		Y			Y <sup>2</sup>		
3A	Cast Butterfly Valves (Low Pressure)					Y	Y	Y	Y	Y	Y <sup>1</sup>		
	Body	Y <sup>a</sup>	Y <sup>c</sup>										
	Disc	Y <sup>a</sup>	Y <sup>c</sup>										
	Shaft	Y <sup>a</sup>	Y	Y <sup>c</sup>									
3B	Fabricated Butterfly Valves	REFER NOTE 14											
4	Gate/ Globe/Swing Check / Ball Valves	Y <sup>a</sup>	Y <sup>c</sup>	Y <sup>e</sup>		Y <sup>5</sup>	Y	Y	Y	Y	Y <sup>2</sup>		
5	Dual Plate Check Valves	Y <sup>a</sup>	Y <sup>c</sup>	Y <sup>e</sup>		Y	Y	Y	Y	Y	Y <sup>2</sup>		
6	Rolled & Welded Pipes and Mitre Bends	Y <sup>a</sup>	Y <sup>3</sup>		Y	Y <sup>3</sup>		Y			Y <sup>3</sup> &15	Y	
7	Coating & Wrapping of Pipes	Y <sup>2</sup>									Y <sup>2</sup>		
8	Tanks & Vessels	Y <sup>a</sup>	Y <sup>c</sup>		Y	Y		Y			Y <sup>10</sup>		
9	Strainers	Y <sup>a</sup>	Y <sup>c</sup>		Y <sup>#</sup>	Y					Y <sup>11</sup>		#For Fabricated Strainer
10	Rubber Expansion Joints	Y <sup>a</sup>				Y <sup>12</sup>	Y	Y			Y <sup>13</sup>		
11	Internal Lining of Pipes	Y <sup>a</sup>						Y			Y <sup>6</sup>		
12	Site Welding		Y <sup>10</sup>		Y	Y							

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB
	2X660 MW KHURJA STPP	SECTION – IA
		REV. NO. 00

b	On machined surfaces only for castings and on butt welds.
c	For shaft/spindles > or = 50 mm
1	100% Hydraulic test shall be carried out. Weld joints not subjected to hydraulic test shall be subjected to 100% RT
2	Spark Test, Adhesion Test and Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221/IS 15337 as applicable.
3	Followings are the testing requirements for fabrication of pipes at site
	<b>TESTS QUANTUM OF CHECKS</b>
	WPS, PQR, Welder Qualification Test 100%
	DPT on root run 100% for pipes up to 1200 mm diameter
	DPT after back gauging 100% for pipes above 1200 mm diameter
	RT / UT by TIME OF FLIGHT 5% ( 100% of T Joints)
	DEFRACTION (TOFD) Technique
	DPT on finished butt weld joints 10%
	Hydraulic Test 100%, 1.5 times the design pressure or 2 times the working-pressure whichever is higher.
4	Dry Cycle Test on Dual Plate Check valve spring for one lakh Cycles shall be carried out as a type test. If Dry Cycle test carried out earlier for same material & diameter, Test report shall be reviewed.
5	Seat Leakage Test for Actuator Operated Valves, shall be done with by closing the valves with actuator.
6	Tests on rubber parts shall be conducted per batch of rubber mix for tensile, Elongation, hardness, adhesion, spark test, bleed resistance test. In addition, type test for 50,000 cycles of each type of diaphragm shall also be conducted.
7	Hydraulic Test of Body, Seat and disc-strength shall be carried out in accordance with governing design standard in presence of owner's representatives. Actuator operated valves shall be checked for Seat Leakage by closing the valves with actuator. For Proof of Design Test refer respective chapters of engineering portion in the technical specification
8	Blue matching, wear travel for gates, valves, pneumatic seat leakage, and reduced pressure test for check valves shall be done as per relevant standard. Maximum allowable vacuum loss is 0.5 mm of Hg abs. for valves to be tested for vacuum operation for internal pressure 25 mm of Hg abs. for a period of 15 minutes. Fire safe test for ball valve shall be done wherever specified. In case of already carried out, the test report shall be submitted for review and acceptance by NTPC Engineering. Valves shall be offered for hydro test in unpainted condition.

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB	
	2X660 MW KHURJA STPP	SECTION – IA	
		REV. NO. 00	DATE:

9	Tensile, Elongation, Hardness, Specific Gravity, Lining Thickness, Humidity Check, Pipe temperature check, Adhesion Test and Holiday Detection Test etc as per applicable standard shall be done for all lining material and application.
10	10% of welds (Root and finished welds) shall be subjected to DPT.( 100% DPT for compressed air line and boiler & deaerator fill line.).
11	Pressure drop across the strainer for each type and size as a special test shall be carried out. In case of already carried out, the test report shall be submitted for review and acceptance by NTPC Engineering.
12	During hydraulic and vacuum tests at 25mm Hg abs in 3 positions, the change in the circumference of arch should not be more than 1.5%. 24 hrs after the test permanent set in dimension should not exceed 0.5%.
13	Tests on rubber for tensile, elongation, hardness, hydraulic stability check as per ASTM D 471, ozone resistance test as per ASTM D 1149 aging test and adhesion strength of rubber to fabric, rubber to metal adhesion shall be carried out.
14	In addition of all tests as indicated for Cast Butter Fly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butter Fly Valve: <ul style="list-style-type: none"> <li>a. UT as per ASTM A-435 on plate material for body and disc shall be carried out for plate thickness 25mm and above.</li> <li>b. 100% RT and DPT as per ASTM, Section-VIII, Division-I, on butt joints of body and disc. 10% DPT on other welds shall be done.</li> <li>c. Post weld heat treatment as per ASME, Section-VIII, Division-I on butt joints of body and disc.</li> <li>d. Welders and WPS shall be qualified as per ASME- section IX</li> </ul>
15	Maximum number of segments in segmental flanges shall be four (04) only. All butt weld joints in the segmental flanges shall be examined by RT/UT. Segmental flanges exceeding 37.5 mm thickness shall be stress-relieved as per norms of ASME Section VIII after welding
16	For pressure vessel welds RT shall be done as per design code requirements.

5- 415/2020/PS-PEM-MSX P



TITLE:

TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

QAP FOR POWER CYCLE PIPING IN CPU SERVICE VESSEL AREA



**TITLE:**  
**TECHNICAL SPECIFICATION FOR  
 CONDENSATE POLISHING UNIT**  
**2X660 MW KHURJA STPP**

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

### POWER CYCLE PIPING

1.00.00

#### H.P.PIPING FOR TURBINE GENERATOR & AUX.

1.01.00

##### Piping:

- (a) All raw materials used shall have co-related mill test certificate meeting material specification.

All tests, as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes the tests wherein it is specified in the ASTM code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code

- (b) All pipe lengths under this package, including piping where alloy steel is used shall be subjected to 100 % ultrasonic examination as per material specification standard with acceptable notch depth of 5% of the selected wall thickness (1.5mm maximum) except for the following piping system:

DOWN STREAM OF AUX. PRDS ( where carbon steel is used) and aux. steam piping system (station HDR, unit HDR, interconnection) where notch depth of 12.5% of the selected wall thickness (1.5mm maximum) will be adhered to.

- (c) The edge preparation for shop and site welds in stainless steel /alloy steel shall be subjected to a dye penetrate check.
- (d) Pipe bend shall be checked for ovality and thinning by ultrasonic or other acceptable methods on first off lot & on random samples for subsequent pieces for high pressure applications. Outer surface of bends shall be subjected to magnetic particle examination/LPI.
- (e) Non-destructive examination of welds shall be carried out after post weld heat treatment, if any.
- (f) All butt welds in alloy steel piping of P-91, X -20 , X-22 & material P-5B group & above shall be checked for RT/ UT & MPI after SR.
- (g) For welds in P91, X20 & X22 and material P5B group & above Materials requiring heat treatment, induction type of heating shall be deployed for post weld heat treatment, or heat treatment can be carried out in furnace.
- (h) Non-destructive examination of welds shall be carried out in accordance with the relevant design/manufacturing codes. However, as a minimum, the following requirements shall be met. Further statutory requirement, wherever applicable shall also be complied with.
- (1) Temperature > 400 Deg, C or pressure exceeding 71 bar.
- (i) 100% RT/UT on butt welds and full penetration branch welds.
- (ii) 100% MPE.



<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR          CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	VOLUME IIB	
	SECTION – IA	
	REV. NO. 00	DATE:

(2) Temperature > 175 Deg. C upto 400 Deg. C or pressure exceeding 17 bar and upto 71 bar.

(i) 100% RT/UT on butt welds and full penetration branch welds for pipe dia. more than 100 NB.

(ii) 10% RT/UT on butt welds and full penetration branch for pipe dia upto 100NB.

(iii) 100% MPE.

(3) For all other pipes not covered above, shall be subjected 100% MPE/ DPT in case of under ground pipes and 10% MPE/DPT in case of piping above the ground. Further, 10% of butt welds of underground piping shall be subjected to RT.

(i) Wherever SR/PWHT is envisaged for alloy steel, above NDTs shall be after SR/PWHT.

(j) Hardness survey of welds shall be carried out on alloy steel/stainless steel piping (100% Hardness survey of welds on P91, X20 & X22 & above material grade of P5B above piping) and 3% hardness survey on welds of other alloy steel).

1.02.00

**Fittings :**

(a) Raw material of all forged/formed fitting shall be ultrasonically tested. All mother pipes used for fitting shall be ultrasonically tested or hydraulic tested. Forged fitting shall be ultrasonically tested and formed fittings shall be MPI tested.

All tests, as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes the tests wherein it is specified in the ASTM code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code

(b) Fittings shall be subjected to suitable NDT as per applicable standards. However following minimum. NDE requirement shall be applicable / met.

(i) For fittings X20, P-91 and material group 5B & above

- 100% MPI &

- 10% hardness check.

- Also 100% UT/RT, for fittings of 200 NB & above


(ii) 100% UT/RT for fittings of 200 NB & above for boiler feed discharge, recirculation and spray piping of boiler feed system.

(iii) 100% UT/RT for fittings of all other piping of size OD 508 mm & above.

1.03.00

**Hangers & Supports:**

(a) All raw materials used shall have co-related mill test certificate meeting mandatory checks of material specification.

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	TECHNICAL SPECIFICATION FOR CONDENSATE POLISHING UNIT	VOLUME IIB	
	2X660 MW KHURJA STPP	SECTION – IA	
		REV. NO. 00	DATE:

	<p>(b) Completed springs shall be tested for Scragging Test &amp; Load vs Deflection Test and for dia. &gt; 25mm MPI shall be carried out.</p> <p>(c) Butt Welds shall be tested for UT and fillet welds shall be tested for MPI.</p> <p>(d) Turn buckle/ pipe clamps/ Hangers of thickness &gt; 25mm shall be checked by MPI/DPT on bent portion.</p> <p>(e) Assembled Hangers shall be checked for Variation in deflection and Travel vs Load test and shall meet the requirements of NTPC data sheet.</p>
1.04.00	<b>Thermal Insulation &amp; Lagging, Cladding:</b>
1.04.01	<p><b>Light resin bound mineral wool:</b></p> <p>LRB mattresses of Rockwool / Glasswool confirming to IS-8183, tested as per relevant clauses of IS 3144 and shall meet the requirements of NTPC data sheet. Type tests except Thermal Conductivity shall be regularly carried out once in three months, Thermal Conductivity Type Test shall be carried out minimum once in twelve months by the manufacturer. Requirements of various components like Binding wires, Lacing wires, Wire mesh, etc. shall be as per NTPC approved data sheet / as given in respective Sub-Section of Technical Requirements of Power Cycle system.</p>
1.04.02	<p><b>Lagging &amp; Cladding:</b></p> <p>Aluminium sheeting confirming to ASTM B-203-1080 temper H14 from reputed manufacturer meeting the requirements of NTPC data sheet.</p>
1.05.00	<p><b>Valves:</b></p> <p>(a) Pressure retaining parts of valves shall be subjected to (min.) NDT as per Table 1.</p> <p>(b) Hardened/stellitted valve disc and seat are to be subjected to LPI and hardness check.</p> <p>(c) Color matching of valve disc/plug and seat shall be carried out to ensure min. 80% contact and no through passage.</p> <p>(d) Hydraulic pressure test and seat leak test shall be carried out as per ANSI 10.34/ IBR.</p> <p>(e) Air seat leak test shall be carried out as per applicable Standards/Codes.</p> <p>(f) Functional testing shall be carried out on each valve to check the following as per the approved valve data sheet.</p> <p>(1) Smooth operation</p> <p>(2) Valve travel, closing and opening time.</p> <p>(3) Current drawn by actuators.</p>



**TITLE:**  
**TECHNICAL SPECIFICATION FOR  
 CONDENSATE POLISHING UNIT**  
**2X660 MW KHURJA STPP**

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION – IA

REV. NO. 00

DATE:

- (g) Springs for safety valves shall be tested with suitable NDT and for spring rate.
- (h) Safety and safety relief valves shall be tested for performance.
- (i) All forgings rounds above diameter 40 mm shall be ultrasonically tested.

**TABLE-1**

Valve size NB in mm	ANSI Class upto 300	ANSI Class above 300 upto 600	ANSI Class above 600 below 900	ANSI Class 900 & above & below 4500
Less than 50	Visual	Visual	Visual	MPI
50 & above but below 100	Visual	Visual	MPI	MPI & RT (on 10% of valves on 100% area)
100 & above but less than 300	Visual	MPI	MPI & RT (on 10% of valves on change of section & weld ends)	MPI & RT (on 100% area)
300 and above	MPI	MPI	MPI & RT (on change of sections & weld ends)	MPI, RT on 100% area)

**NOTE:** For body and bonnet forgings UT with MPI may be adopted in place of RT

For austenitic steel MPI may be replaced by LPI.

1.06.00

**CHEMICAL DOSING SYSTEM (HP/LP/OXYGENATED)**

- (a) Pumps of chemical dosing system shall be performance tested as per relevant international codes.
- (b) In case of diaphragm type of pumps, the life cycle test shall be done on pumps. If this test is already conducted for same model in earlier projects of NTPC, then TCs for same shall be reviewed.
- (c) Dosing skid shall be subjected to leakage test and functional test.
- (d) Oxygen cylinders shall be as per relevant standard meeting statutory requirements.



<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR  CONDENSATE POLISHING UNIT</b>  <b>2X660 MW KHURJA STPP</b>	BHEL DOCUMENTS NO.: PE-TS-475-155-A001	
	VOLUME IIB	
	SECTION – IA	
	REV. NO. 00	DATE:

1.07.00

**MEATLLIC EXPANSION JOINT FOR PIPING ( IF APPLICABLE)**

- (a.) Hydraulic pressure test shall be carried out on each pipe and expansion bellow.
- (b.) Longitudinal butt weld on bellow shall be subjected to suitable NDT examination before forming, and after forming MPE / DP test shall be carried out.
- (c.) All welds shall be subjected to 100% magnetic particle/dye pentrant check and butt welds shall be subjected to 100% radiographic testing.
- (d.) All the bellows subjected to vacuum service shall be subjected to vacuum test.
- (e.) The bellows shall be subjected to movement test to establish suitability to perform satisfactorily in site conditions. During this test spring rate shall also be measured.
- (f.) Life cycle test, meridional yield rupture test and squirm test to be carried out on a prototype/expansion bellow as per Sec.D clause 3.2 of standards of Expansion joint Manufacturer Association (EJMA). In case these tests have already been accepted by NTPC on a prototype expansion bellow, as defined in Sec.D Clause 3.2 of Expansion Joints Manufacturers Association (EJMA) test reports may be furnished by manufacturer for consideration and approval of Employer.

5-415/2020/PS-PEM-MSX P



TITLE:

TECHNICAL SPECIFICATION FOR  
CONDENSATE POLISHING UNIT

2X660 MW KHURJA STPP

BHEL DOCUMENTS NO.: PE-TS-475-155-A001

VOLUME IIB

SECTION - IA

REV. NO. 00

DATE:

ANNEXURE-II

SUB-VENDOR LIST

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :		
Package:		EPC						DATE:	06.04.2017	
Supplier:		BHEL								
Contract No.:		CS-9585-001-2			STEAM GENERATOR/RAW SUB-SYS MATERIALS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submissio n schedule	Remarks
1	SEAMLESS TUBES					TUBOS REUNIDOS	SPAIN	A		CS,T-11,T-12,22,T-23,T-91
						VALLOREC & MANNESMANN	GERMANY	A		T-92,T-91,T-23,T-22,T-11,T-12,CS
						VALLOREC TUBES	FRANCE	A		T-92,T-91,T-23,T-22,T-11,T-12,CS
						TENNARIS GLOBAL(NKK TUBES)	JAPAN	A		T-91,T-22,T-11,T-12,CS
						HENGYANG VALIN STEEL TUBE CO.	CHINA	A		CS & AS UPTO T-22(with TPI INSPECTION) SUB TO CONDITIONS
						TENNARIS GLOBAL(DALMIN ITALY)	ITALY	A		T-22,T-11,T-12,CS
						JINAGSU CHENGDE STEEL TUBE	CHINA	A		T-92,T-91,T-22,T-11,T-12,CS SUB TO TPIA INSPECTION CONDITIONS
						JEE(KAWASAKI)	JAPAN	A		T-92,T-91,T-22,T-11,T-12,CS
						TENNARIS GLOBAL(SILCO, ROMANIA)	ROMANIA	A		CS,T-11,T-22,T-23,T-91,T-12,
						CHANGZHOU CHANGBAO PRECISION	CHINA	A		CS
						PRODUCTUS TUBLARES	SPAIN	A		T-91,T-22,T-11,T-12,CS
						SUMITOMO METALS	JAPAN	A		T-92,T-91,T-23,T-22,T-11,T-12,CS
						BENTLER	GERMANY	A		T-92,T-91,T-22,T-11,T-12,CS,SS
						IBF	ITALY	A		T-91,T-22,T-11,T-12,CS
						WAYMAN GORDAN	USA	A		T-91,T-22,T-11,T-12,CS,
						BHEL SSTP	TRICHY	A		T-22,T-11,T-12,CS
						JINDAL SAW LTD.	NASHIK	A		CS,T-11,T-22 ,T-12,SUB TO CONDITIONS
						REMI	INDIA	A		CS,T-11,T-22 ,T-12,SUB TO CONDITIONS
						ISMT	AHMEDANAGAR/BARAMATI	A		CS,T-11,T-22 ,T-12,SUB TO CONDITIONS
						MSL	RAJGAD	A		CS SUB TO CONDITIONS
						BAOSHAN IRON & STEEL CO. LTD.	CHINA	A		CS,T-11,T-22,T-12,( WITH TP1) SUBJECT TO CONDITIONS



22

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*  
A-SAKTHI BAWESH  
Engineer - QA/BHEL-Trichy

*[Handwritten signature]*

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :		
Package:		EPC						DATE:	06.04.2017	
Supplier:		BHEL								
Contract No.:		CS-9585-001-2				STEAM GENERATOR/RAW				
					SUB-SYS MATERIALS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks
		\$				HMT	GUJARAT	A		HOT FINISHED CS GRADE (UPTO 78.2 MM OD & 12 MM THK)
		\$				CHANGZHOU CHANGBAO PRECISION	CHINA	A		T-11,12
2	SEAMLESS TUBES(RIFLED)	\$				SALZGITTER MANESS/AMANN PRECISION	FRANCE	A		CS
		\$				CHANGHOU CHANGBAO PRECISION	CHINA	A		T-11,12
		\$				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,SS347H
		\$				POSCO SPL STEEL CO	KOREA	A		SS 304,347H,SUPER 304
		\$				TUBACEX	SPAIN	A		
		\$				SMST	ITALY	A		SS 304,347H, SUPER 304
	SEAMLESS TUBES(SS)UPTO DIA<78.1MM	\$				SUMITOMO METAL IND LTD.	JAPAN	A		SS 304,347H, SUPER 304
	SEAMLESS TUBES(SS) UPTO OD 159.0MM & WT-12.5MM	\$				HUADI STEEL GROUP	CHINA	A		SS 304, 304H,347H( WITH TPI) SUB TO CONDITIONS
	SEAMLESS TUBES(SS) UPTO OD 159.0MM & WT-12.5MM	\$				ZHEJIANG JIULI HI TECH	CHINA	A		SS 304, 304H,347H( WITH TPI) SUB TO CONDITIONS
		\$				PRODUCTUS TUBLARES	SPAIN	DR		
4	SEAMLESS PIPES	\$				TUBACEX	SPAIN	A		SS PIPES
		\$				SUMITOMO METALS	JAPAN	A		P-92,P-91,P-22,P-11,P-12,CS
		\$				VALLOREC TUBES	FRANCE	A		P-92,P-91,P-22,P-11,P-12,CS



24

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*  
06-04-2017

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				DOC. NO. :	CS-9585-001-2	
Package:	EPC						REV. NO. :			
Supplier:	BHEL						DATE:	06.04.2017		
Contract No.:	CS-9585-001-2									
								STEAM GENERATOR/RAW SUB-SYS MATERIALS		
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks
	\$					HENGYANG VALIN STEEL TUBE COL	CHINA	A		CS
	\$					BHEL SSTP	TRICHY	A		CS
	\$					TUBOS REUNIDOS	SPAIN	A		P-91,P-22,P-11,P-12,CS
	\$					VALCONVY TRUB	CZECH REP	A		CS,P-11,P-12,P-22
	\$					ACELOR MITTAL	ROMANIA	A		CS
	\$					WAYMAN GORDAN	USA	A		P-91,P-22,P-11,P-12,CS
	\$					TENNARIS GLOBAL(NKK TUBES)	JAPAN	A		P-91,P-22,P-11,P-12,CS
	\$					IBF SPA	ITALY	A		P-92,P-91,P-22,P-11P-12,CS
	\$					JFE(KAWASAKI)	JAPAN	A		P-92,P-91,P-22,P-11,P-12,CS
	\$					PRODUCTUS TUBLARES	SPAIN	A		P-91,P-22,P-11P-12,CS
	\$					VALLOREC & MANNESMANN	GERMANY	A		P-92,P-91,P-22,P-11,P-12,CS
	\$					TENNARIS GLOBAL(DALMINE)	ITALY	A		P-91,P-22,P-11,P-12,CS
	\$					JINDAL SAW LTD.	NASHIK	A		CS,P-11,P-22,P-12,SUB TO CONDITIONS
	\$					ISMT	AHMEDANAGAR/BARAMATI	A		CS,P-11,P-22,P-12, SUB TO CONDITIONS
	\$					YANGZHOU CHENGDE STEEL PIPE CO. LTD.	CHINA	A		P-92,P-91,P-22,P-11,P-12,CS SUB TO TPIA INSPECTION CONDITIONS
	\$					MSL	RAJGAD	A		CS SUB TO CONDITIONS
	\$					REMI	BHARUCH	A		CS,P-11,P-22,P-12,SUB TO CONDITIONS
	\$					RATNAMANI	MUMBAI	DR		CS
	\$					ZIZIANG GROSS	CHINA	DR		CS
	\$					PRODUCTUS TUBLARES	SPAIN	DR		FOR P92 GRADE
	SEAMLESS PIPES(DIA UPTO 159MM)	\$				TENNARIS GLOBAL SILCO TUBES)	ROMANIA	A		P-91,P-22,P-11,P-12,CS
	SEAMLESS PIPES(UPTO 160MM)	\$				BENTLER	GERMANY	A		P-92,P-91,P-22,P-11,P-12,CS
	SEAMLESS PIPES(UPTO 219.0MM)	\$				JIANGSU CHENGDE STEEL TUBE	CHINA	A		P-92,P-91,P-22,P-11,P-12,CS SUB TO TPIA INSPECTION CONDITIONS



8

25

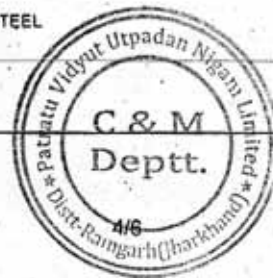
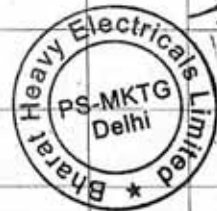
5/1

*Handwritten signature*

*Handwritten signature*  
06-04-2017

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC					REV. NO. :			
Supplier:		BHEL					DATE:	06.04.2017		
Contract No.:		CS-9585-001-2				STEAM GENERATOR/RAW SUB-SYS MATERIALS				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submissio n schedule	Remarks
	SEAMLESS PIPES(UPTO 68.9MM)	\$				BAOSHAN IRON & STEEL CO. LTD.	CHINA	A		CS SUBJECT TO CONDITION
	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	A		CS-SA515 AS UP TO GR-91
		\$				ILSENBURGER GROBBLECH(SALZGITTER MANESSMANN)	GERMANY	A		CS-SA 299, SA515, BS EN 10025, IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-91
		\$				DILLINGER-GTSVENTES	GERMANY	A		CS-SA 299, SA515, BS EN 10025, A36, IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-91
		\$				ARCONI D.O.O.	SLOVENIA	A		CS- SA515, BS EN 10025, A36, IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-91
6	PLATES & ROLLED SECTION(UPTO GRADE 22)	\$				THYSEEN KRUPP	GERMANY	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES. AS UPTO GR.-22
		\$				INDUSTEEL LOIRE	FRANCE	A		CS-SA 299, SA515; AS UPTO GR.-22
		\$				ESSAR STEEL LTD.	HAZIRA	A		CS- SA515, BS EN 10025, A36, IS 2062, OTHER STRUCTURAL STEEL GRADES; AS GR.-12 & 22
		\$				VOESTALPINE GROBBLECH GMBH	AUSTRIA	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		\$				SAIL	BHILAI/SALEM	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		\$				NIPPON STEEL	JAPAN	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		\$				POSCO	KOREA	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.



*Sahaygunkh*  
06-04-2017

26

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC						REV. NO. :		
Supplier:		BHEL						DATE:	06.04.2017	
Contract No.:		CS-9585-001-2			STEAM GENERATOR/RAW SUB-SYS MATERIALS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks
		\$				REINER BRACH GMBH & CO.	GERMANY	A		CS- SA 209 SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		\$				JFE	JAPAN	DR		
		\$				CLABECO	BELGIUM	DR		
		\$				JSPL	INDIA	DR		
		\$				DUFERCO	GERMANY	DR		
		\$				GULDE	GERMANY	A		MEMBRANE FINS UPTO GR-22
		\$				ARCELLOR MITTAL	ROMANIA	DR		
		\$				METAL ONE	JAPAN	DR		MEMBRANE FINS UPTO GR-12
		\$				LLYODS STEEL INDUS LTD(UTTAM VALUE STEEL)	INDIA	A		UPTO GR.-22; SUBJECT TO CONDITION
7	PLATES & ROLLED SECTION(CS)	\$				ARCELLOR 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
		\$				LLYODS STEEL INDUS 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
8	PLATES(SS)	\$				OUTOKUMPU	SWEDEN	A		SS PLATES UPTO 20 MM THK
		\$				INDUS STEEL	BELGIUM	A		GR-304,309,310,316



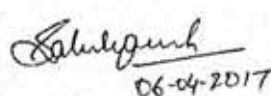




*Sahay*  
06-04-2017

27

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				DOC. NO.:	CS-9585-001-2	
Package:	EPC						REV. NO.:			
Supplier:	BHEL						DATE:	06.04.2017		
Contract No.:	CS-9585-001-2									
								STEAM GENERATOR/RAW MATERIALS		
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks
		\$				JSL STAINLESS	JAIPUR	A		LINER SS 304
		\$				INDUSTEEL LOIRE	FRANCE	A		GR-304,309,310,316
		\$				SAIL	BHILAI/SALEM	A		GR-304,309,310,317
		\$				COLUMBUS STAINLESS STEEL(ACRINOX)	SOUTH AFRICA	A		GR-304,309,310,318
		\$				NIPPON STEEL CORP.	JAPAN	DR		
		\$				THYSEEN KRUPP	GERMANY	DR		
		\$				SUMITOMO	JAPAN	DR		
		\$				ACRONI SLOVENIS	JAPAN	DR		
		\$				DKC	KOREA	DR		
9	ALUMINIUM CLADDING	III				MAIN CONTRACTOR'S APPROVED SOURCES				
NOTE 1:	VENDORS UNDER A(Accepted Category) are approved and accepted by NTPC in past with or without conditions. Similar conditions as the case may be shall be applicable for this project also.									
NOTE 2:	VENDORS UNDER DR (DETAILS REQUIRED) CATEGORY SHALL BE REQUIRED TO SUBMIT THE DETAILS IN NTPC QUESTIONNAIRE.									
NOTE 3:	PRE DESPATCH INSPECTION FOR ALLOY/SS GRADES NEEDS TO BE TIED UP BY MAIN CONTRACTOR OR THIRD PARTY INSPECTION AGENCY AS REQUIRED.									
NOTE 4:	(\$) REVIEW OF MILL TC FOR RAW MATERIAL TO BE DONE BY NTPC AND SHALL BE INCLUDED IN THE QP OF CORRESPONDING EQUIPMENT.									

This is a Part of Technical Specification No. PE-TS-475-155-A001

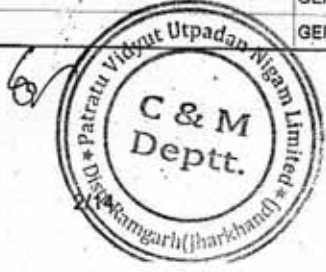
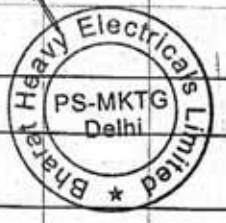
Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
1	SEPARATOR & STORAGE TANK					ALSTOM	USA	A		
						BHEL	TRICHY	A		
						ALSTOM	DURGAPUR	A		
						SHANGHAI BOILER WORKS	CHINA	DR		
						ALSTOM SURABHAYA	INDONESIA	DR		
						ALSTOM	WUHAN	DR		
2	HEADERS AND SUCTION MANIFOLDS					ALSTOM	USA	A		
						BHEL	TRICHY	A		
						ALSTOM	DURGAPUR	A		
						SHANGHAI BOILER WORKS	CHINA	DR		
						ALSTOM SURABHAYA	INDONESIA	DR		
3	TUBULAR PRODUCTS- ONLY SPIRAL WALLS					BHEL	TRICHY	A		
						ALSTOM	DURGAPUR	A		
						ALSTOM	USA	A		
						SHANGHAI BOILER WORKS	CHINA	DR		
						ALSTOM WUHAN	CHINA	DR		
						ALSTOM SURABHAYA	INDONESIA	DR		
4	TUBULAR PRODUCTS (COILS & PANELS) EXCLUDING SPIRAL WALL					ALSTOM	DURGAPUR	A		
						BHEL	TRICHY	A		
						ALSTOM	USA	A		



*Date:*  
(NITIN KUMAR)  
PS-M  
BHEL

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
5	CRITICAL PIPING / PCP (MS, CRH,HRH & FW) AND BOILER PIPING					BHEL	TRICHY	A		
						ALSTOM	DURGAPUR	A		
6	MISC HP PIPING EXCLUDING CRITICAL PIPING (CS, AS UPTO 91 GRADE)					BHEL	TRICHY	A		
						ALSTOM	DURGAPUR	A		
7	NON IBR PIPING / LP PIPING (Pr upto 10 Ksc)	III				MAIN CONTRACTOR'S APPROVED SOURCES				
8	FORMED FITTINGS(Grø1)	I				BHEL	TRICHY	A		
9	SPHERES	I				BHEL	TRICHY	A		
						ALSTOM	DURGAPUR	A		
						BHEL	TRICHY	A		
						ALSTOM	USA	A		
10	GRAVIMETRIC COAL FEEDERS	I				REFER SUB OR LIST				
11	RAW COAL GATE ASSEMBLY FOR GRAVEMETRIC FEEDER	I				BHEL	TRICHY	A		
12	COAL BURNER ASSY & SOFA	I				ALSTOM	USA	A		
						BHEL	TRICHY	A		
13	AIR COOLED OIL GUN ASSEMBLY	I				BHEL	TRICHY	A		
14	OIL PREHEATER & PRESSURISING SKID ASSY.	III				MAIN CONTRACTOR'S APPROVED SOURCES				
15	HFOILFO PUMPS	I				ALWEILER	GERMANY	A		
						BOURMANN	GERMANY	A		



30

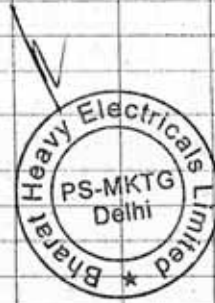
*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

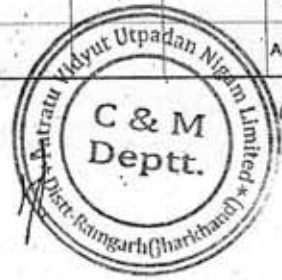
Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
						TUSHACO PUMPS	DAMAN	A		SCREW TO BE IMPORTED FROM ALLWEILLER GERMANY
						LEISTRITZ	GERMANY	A		
						BOURMANN	GERMANY	A		
						KRAL	AUSTRIA	A		
						ALEKTON	CHENNAI	A		
						UT PUMPS	FARIDABAD	A		SUBJECT TO CONDITIONS
16	SOOT BLOWERS(LRSB,WALL DESLAGGER, ROTARY BLOWER,TEMP. PROBE)					BHEL	TRICHY	A		
17	ELECTRIC HOIST WITH TROLLEY, UNDERSLUNG CRANE									Main BOIs eg. Hook, motors and C&I item from NTPC approved sources
						CONSOLIDATED HOISTS	SATARA	A		EOT CRANES UPTO 40 TONS & HOISTS UPTO 40 TONS.
						POWER BUILD P LTD	VV NAGAR	A		HOIST UPTO 10 TONS
						CONSOLIDATED HOISTS	PUNE	A		HOIST UPTO 20 TONS
						TRACTOR TRIFOR	FARIDABAD	A		HOIST UPTO 15 TONS
						HERCULES HOIST LTD.	MUMBAI	A		HOIST UPTO 30 TONS
						GRIP ENGINEERS	HYDERABAD	A		HOIST UPTO 40 TONS
						ANUPAM INDUSTRIES	VITHAL UDYOGNAGAR	A		EOT CRANES UPTO 50 TONS
						DYNAMMECH CRANES	THANE,MUMBAI	A		UPTO 20 TONS
						ARMSEL MHE PVT. LTD.	BANGALORE	A		UPTO 20 TONS
						HERCULES HOIST LTD.	MUMBAI	A		HOIST UPTO 20 TONS
						UNIVERSAL HOIST	THANE,	A		HOIST UPTO 20 TONS
						LIFTING EQUIPMENTS	DELHI	DR		
						TECHNO INDUSTRIES	AHMEDABAD	DR		



21

# This is a Part of Technical Specification No. PE-TS-475-155-A001

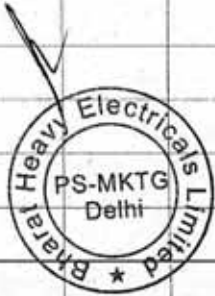
Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
18	ELECTRIC HOIST WITH TROLLEY, UNDERSLUNG CRANE - CAPACITY UPTO 5 TONS	III				MAIN CONTRACTOR'S APPROVED SOURCES				
19	RECIRCULATION PUMP	I				REFER SUB OR ITEMS LIST				
20	LP CONDENSATE TRANSFER PUMP	I				ITT GOULD	USA	A		
		I				FLOW SERVE	USA	A		
		I				SULZER	NAVI MUMBAI	A		
21	AUXILIARY BOILER	I				REFER SUB OR ITEMS LIST				
22	SCANNER AIR FAN	I				ANDREW YLE	KOLKATA	A		
		I				ACCEL	AHMEDABAD	A		
		I				PATEL AIRTEMP(I) LTD.	AHMEDABAD	A		
		I				TLT INDIA	GUJARAT	A		
		I				BHEL_BAP	RANIPET	A		
		I				CB DOCTOR(IMM)	AHMEDABAD	A		
		I				AIROCHEN ENGG. CO.	KOLHAPUR	DR		
		I				AR CONTROL & CHEM ENGG. CO. LTD.	MUMBAI	DR		



*Delhi*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU 3x800 MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				DOC. NO. :	CS-9585-001-2		
Package:		Steam Generator Island Package				REV. NO. :	0			
Supplier:		BHEL		BHEL TRICHY		DATE:	04.04.2017			
Contract No.:		CS-9585-001-2		SUB-SYST STEAM GENERATOR						
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
23	SEAL AIR FAN					CB DOCTOR & CO.	AHMEDABAD	A		
						ACCEL	AHMEDABAD	A		
						TLT INDIA	AHMEDABAD	A		
						PATEL AIRTEMP(I) LTD.	AHMEDABAD	A		
						BHEL,BAP	RANIPET	A		
						ANDREW YLE	KOLKATA	A		
24	FURNACE MAINT. PLATFORM(SKY CLIMBER)					NV SKYMAN INT. SA	BELGIUM	A		
						NV SKCLIMBER EUROPE SA	BELGIUM	A		
						POWER CLIMBER	BELGIUM	DR		
						DAEO PRECISION	KOREA	A		
						HINGWING GONDOLA	HONGKONG	DR		
25	QUICK ERECT FURNACE SCAPPHOLDING									VENDORS TO BE PROPOSED LATER DURING PROJECT EXECUTION
26	METALLIC EXPANSION JOINT					BHEL	TRICHY	A		



*Handwritten signature/initials*

*Handwritten signature/initials*

*Handwritten signature/initials*

*Handwritten signature/initials*

33

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRATU 3x800 MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				DOC. NO. :	CS-9585-001-2		
Package:		Steam Generator Island Package				REV. NO. :	0			
Supplier:		BHEL		BHEL TRICHY		DATE:	04.04.2017			
Contract No.:		CS-9585-001-2		SUB-SYST STEAM GENERATOR						
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submissio n	Remarks
27	DUCT ASSY, FLOWMETER WEIGHTING UPTO 10 TONS	III				MAIN CONTRACTOR'S APPROVED SOURCES				
28	DUCT ASSY TRANSITION PIECE, DUCT ASSY, FLOWMETERS WEIGHTING > 10 TONS	III				MAIN CONTRACTOR'S APPROVED SOURCES				Trial Assembly Audit Check by NTPC.
29	LIGHT BONDED MINERAL WOOL	I				MINWOOL ROCK FIBRES LTD.	RAJNANDAON, BHILAI	A		
						LAPINUS ROCKWOOL LTD.	GWALIOR	A		
						LLOYDS INSULATION, CHENNAI	BHILAI	A		
						PUNJSTAR INSULATION	BHILAI	A		
						GOENKA ROCK WOOL	RAIPUR	A		
						THERMOCARE ROCKWOOL PVT. LTD. ES. LTD.	RAJNANDAON	A		
						SHREERAM EQUITECH	DURG	A		
						MINWOOL ROCK FIBRES LTD.	RAJNANDAON, BHILAI	A		
						ROCKWOOL INDIA LTD.	MEDAK-AP	A		
						DHANBAD ROCKWOOL INSULATION PVT. LTD.	DHANBAD	A		
						MINSULATE MFG. CO.	JAMSHEDPUR	A		
						POLYBOND PROJECTS PVT. LTD.	DURG	A		
						HI-TECH ROCK FIBRE LTD.	RAJNANDGOAN	A		
						JAMSHEDPUR MINERAL WOOL	JAMSHEDPUR	A		
						ROCKWOOL INDUSTRIES	BHILAI	A		
30	CASTABLE REFRACTORY	III				MAIN CONTRACTOR'S APPROVED SOURCES				
31	POURABLE INSULATION	III				MAIN CONTRACTOR'S APPROVED SOURCES				
32	CLH & VLH	I				BHEL	TRICHY			other vendorS as per BHEL PIPING CENTER LIST



**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package					REV. NO. :	0		
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
						BHEL HERP	VARANASI			
33	HANGER & SUPPORTS- (OTHER THAN CLH & VLH)	iii				MAIN CONTRACTOR'S APPROVED SOURCES				
34	CONVENTIONAL VALVES(GATE,GLOBE & CHECK)									91/92 GRADE CASTINGS FOR CONVENTIONAL VALVES SHALL BE FROM MAIN CONTRACTOR'S APPROVED SOURCES WHICH ARE HAVING ELECTRIC ARC FURNACE, VOD AND LRF FACILITIES
						BHEL	TRICHY	A		CONVENTIONAL VALVES(GATE,GLOBE & CHECK) BHEL RANGE, 2/3 WAY VALVES
						VELAN	H4T1X8 MONTREAL CANADA	A		GATE/CHECK V/V UPTO 22"CI 2500
						LEADER VALVES	JALANDHAR	A		CCS GLOBE V/V 24" CI 600, GLOBE V/V 24"CI 300,CHECK V/V 24"CI 600
						CRESCENT VALVES	MUMBAI	A		UPTO NB 300 CL 600
						VELAN VALVE CORP	USA	A		GATE V/V 2-24"CI 900-4500,CAST STEEL GATE V/V 18-48"CI150-600
						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	QUBEC CANADA	A		GATE/GLOBE/CHECK V/V UPTO 3"CI 2680
						L&T VALVES	COIMBATORE	A		1) CAST 2500 CI GATE(CS &AS) UPTO 20" & CHECK(CS&AS) UPTO 16"; 2) FORGED 4500 CI(CS&AS) GATE UPTO 1" & GLOBE/CHECK UPTO 2".



*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

35

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. CaL	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
						BDK	HUBLI	A		UPTO NB 300 & CL 600, FORGED UPTO NB 50 CL. 800
						FOURESS ENG. INDIA LTD.	MUMBAI	A		UPTO NB 200 CL 600, NB 250-600 CL 300
						NITTON VALVES	AURANGABAD	A		WCB/WCC(GATE VALVE UPTO 36" CI 600)
						SAMSHIN	SOUTH KOREA	A		2500 CL GATE/GLOBE/CHECK UPTO 24"; CL 3500 GATE UPTO 18" & GLOBE UPTO 6"; 4500 CL GATE UPTO 6" & GLOBE/CHECK/ANGLE UPTO 2"
						VELAN	H4T1G2 MONTREAL CANADA	A		GATE/GLOBE/CHECK UPTO 24" CI 4500
						VELAN	PORTUGAL	A		CAST STEEL GATE/GLOBE/CHECK 2-12" CI 150-600
						ROCKWELL	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						CRIS	FRANCE	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						OKANO VALVES	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						RAIMONDI	ITALY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						HP VALVES	NEITHERLANDS	A		TRIM VALVES; APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						FLOW SERVE	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						DRESSED MASONRY	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER



*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

36

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU 3x800 MW		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL		BHEL TRICHY				DATE:	04.04.2017	
Contract No.:		CS-9585-001-2		SUB-SYST STEAM GENERATOR						
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
						OKANO VALVES	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						TOA	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						CRIS	FRANCE	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						TYCO SEMPELL	GERMANY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						MIL CONTROLS	KERALA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						FOURESS ENG. INDIA LTD.	INDIA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						DEUTSCHE BABCOCK	GERMANY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						KSB	COIMBATORE	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						SPX PROCESS EQUIPMENTS/COPES VULCAN	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						TOAMEIWA	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						RAIMONDI	ITALY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						BABCOCK BORSING	ESPANA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
						DEWARANCE	UK	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
35	SAFETY VALVE(SPRING TYPE)					DRESSER	USA	A		
						SEMPELL AG	GERMANY	A		
						TYCO(PENTAIR VALVES & CONTROLS)	USA	A		
						FUKUI	JAPAN	A		
						RIENEKE GMBH	GERMANY	A		HYD TYPE



37

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
		I				BOPP & REUTHER	GERMANY	A		HYD TYPE
		I				VALVE TECHNOLOGIES	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				MEIWA	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				BHEL	TRICHY	A		
36	ERV	I				VALVE TECHNOLOGIES	USA	A		
		I				FUKUI	JAPAN	A		
		I				SEMPELL AG	GERMANY	A		
		I				DRESSER	USA	A		
		I				MEI WA CORP.	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				RIENEKE GMBH	GERMANY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
37	PLUG VALVE	I				FLOW SERVE INDIA CONTROLS	KANCHIPURAM	A		UPTO 150 NB CI 300,UPTO 400 NB CI 150
		I				HAWA VALVES	MUBAI	A		UPTO 8" SIZE AND CLASS 300
		I				3Z CORP.	KOREA	A		UPTO 10" SIZE AND CLASS 300
		I				BDK	HUBLI	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				ZED VALVES CO. PVT. LTD.	AHMEDABAD	DR		
38	SAFETY VALVE SILENCERS	III				MAIN CONTRACTOR'S APPROVED SOURCES				

*Handwritten signature*

*Handwritten signature*



*Handwritten signature*



*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2		
Package:		Steam Generator Island Package					REV. NO. :	0		DATE:	04.04.2017
Supplier:		BHEL			BHEL TRICHY						
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR						
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks	
39	PRIMARY STRUCTURE - CEILING GIRDERS, MAIN COLUMNS, AUX COLUMNS, BUILT UP BEAMS, BOXES, BUCKSTAY, BRACINGS, MILL BAY STR, APH SUPPORT STR, TRANSFER TOWER	I				NTPC APPROVED VENDORS				PROJECT SPECIFIC APPROVAL OF EACH VENDOR TO BE TAKEN BY BHEL FROM NTPC; VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION	
40	BUCK STAY, BRACINGS MFD FROM ROLLED SECTIONS	III				MAIN CONTRACTOR'S APPROVED SOURCES				VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION	
41	SECONDARY STRUCTURE-PLATFORMS, GALLERIES, WALKWAY, STAIRCASE, LADDER, DUCT SUPPORT STRUCTURE, ANCHOR BOLTS ETC	III				MAIN CONTRACTOR'S APPROVED SOURCES				VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION	
42	ELECTROFORGED GRATINGS	II				INDIANA GRATINGS P. LTD.	PUNE	A			
		II				KARDE ANAND UDYOG	PUNE	A			
		II				PREMIER POWER PROJ.	HOWRAH	A			
		II				BHOLA RAM STEEL	PATNA	A			
		II				PINAX STEEL	PATNA	A			
		II				GREATWELD	PUNE	A			
		II				VIN FAB ENGG. PVT. LTD.	MUMBAI	A			
43	STRAINERS	III				MAIN CONTRACTOR'S APPROVED SOURCES					



39

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package					REV. NO. :	0		
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2		SUB-SYST			STEAM GENERATOR			
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
44	CERAMIC LINED COAL PIPES & BENDS	I				BHEL EDN	BANGALORE	A		
						BHEL	JAGDISHPUR	A		
45	COAL PIPES & BENDS(W/O CERAMIC LINES)	III				MAIN CONTRACTOR'S APPROVED SOURCES				
46	COAL BUNKER	I				NTPC APPROVED VENDORS				
47	SOOT BLOWER PRESSURE REDUCING VALVES & BLOCK					REFER C&I VENDOR LIST				
48	91/92 GRADE FITTINGS (NOTE 6)	I								
		I				PETROL RACCORD SPA	ITALY	A		P-91, P-92 FORMED/FORGED
		I				BOKOYOUNG METAL CO.	LOREA	A		P-91,FORGED
		I				TF TECH CO. LTD.	KOREA	A		P-91 FORGED
		I				FLASH FORGE	VIZAG	A		91 WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
		I				BGH EDELSTAHL SIEGEN GMBH	GERMANY	A		P-91 FORGED
		I				ERNE FITTINGS GMBH	AUSTRIA	A		P-91 FORMED
		I				GAM RACCORD SPA	ITALY	A		P-91 FORMED



*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
		I				TECHNO FORGE SPA	ITALY	A		P-91, P-92 FORMED
		I				MEGA SPA	ITALY	A		P-91 FORGED/WELDED
		I				BASSI LUIGI SPA	ITALY	A		P-91 FORGED/WELDED
		I				IBF SPA	ITALY	A		P-91, P-92 FORMED/FORGED
		I				ALLIED INT. (TACTUBI RACCORDI SPA, VIA ROMA 150, 29027 PODENZANO)	ITALY	A		P-91, P-92 FORMED
		I				BRUCK STRASSE 16 ENSHEIM	GERMANY	A		P-91 FORGED/WELDED
		I				SUNGKWANG BEND CO. LTD.	KOREA	A		P-91/F-91 FORMED/FORGED/WELDED
		I				TK CORP. FORGITAL	KOREA	A		P-91 FORMED
		I				TIANJIN JINDING PIPING CO. LTD.	CHINA	A		91 FORMED (ELBOW, TEE, REDUCER)
		I				RINGMILL SPA	ITALY	A		FOR SEAMLESS AS (UPTO 91 GRADE) FORGED PIPE
		I				FORGITAL	ITALY	DR		
		I				DEE DEVELOPMENT	PALWAL	A		91 WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
		I				CHW FORGE LTD.	GHAZAIBAD	A		91 WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
		I				FORGE MONCHIERI SPA	ITALY	A		91 FORGING- WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
		I				VIAR SPA	ITALY	DR		91 FORGINGS
		I				TIANJINDING PIPING CO. LTD.	CHINA	DR		
		I				AFFLERBACH	GERMANY	DR		
49	FITTINGS(CS,SS & AS UPTO GR 22)	II				MAIN CONTRACTOR'S APPROVED SOURCES				
50	KNIFE EDGE GATE VALVES(Mill Outlet and Burner Inlet)	I				GALAXY CONTROLS PVT LTD	CHENNAI	A		Upto size 26'



# This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2		
Package:		Steam Generator Island Package					REV. NO. :	0			
Supplier:		BHEL			BHEL TRICHY			DATE:	04.04.2017		
Contract No.:		CS-9585-001-2		SUB-SYST		STEAM GENERATOR					
ITEM		Proposed sub-supplier									
S.No.		QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks	
		I				ORBINOX INDIA PVT.LTD.	COIMBATORE	A		Upto size 30"	
		I				BRAY CONTOLS (VAAS INDUSTRIES PVT.LTD.)	CHENNAI	A		Upto size 28"	
		I				JASH ENGG. LTD.	INDORE	A		UP TO SIZE 30	
		I				GENERAL ENGG.CONSORTIUM	BANGALORE	DR			
51	SCR SYSTEM									REFER SUB QR LIST; VENDORS FOR SCR SUB ITEMS TO BE TIED UP AFTER SUB QR CLEARANCE ; L2 VENDORS SHALL BE DISCUSSED AND TIED UP AFTER FINALISATION OF L1 VENDOR	
NOTE 1:	VENDORS UNDER A(ACEPTED CATEGORY) ARE APPROVED WITH OR WITHOUT CONDITIONS IN PAST. SIMILAR CONDITIONS AS THE CASE MAY BE FOR THE VENDORS SHALL BE APPLICABLE FOR THIS PROJECT AND TIED UP IN THE QUALITY PLAN.										
NOTE 2:	VENDORS UNDER DR (DETAILS REQUIRED) CATEGORY SHALL BE REQUIRED TO SUBMIT THE DETAILS IN NTPC QUESTIONNAIRE.										
NOTE 3:	FOR EQUIPMENTS LIKE AUXILIARY BOILERS/HOISTS/GATES DAMPERS/LUB OIL SYSTEM,DOSING SSKID, G.FEEDERS THE MAJOR BOI SHALL BE AS PER NTPC APPD. LIST.										
NOTE 4:	ALL MOTORS REQUIRED FOR PUMP-MOTOR/FAN-MOTOR ASSY,APH,GRAVIMETERIC FEEDER,PULVERISER SHALL BE FROM NTPC APPD. VENDOR LIST.										
NOTE 5:	FOR MOTORISED/PNEUMATIC ACTUATED VALVES THE SUBSUPPLIERS FOR ACTUATORS SHALL BE AS PER NTPC APPD. LIST. REFER NTPC C&I LIST.										
NOTE 6:	RAW MATERIAL FOR 91 AND ABOVE GRADE MATERIAL FITTINGS TO BE FROM NTPC APPROVED SOURCES AS PER RAW MATERIAL VENDOR LIST.										

*Handwritten signature*

*Handwritten signature*

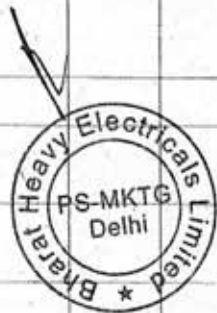


*Handwritten signature*

42

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
1	MILL					REFER SUB QR LIST				FORMAL ACCEPTANCE AFTER SUB OR CLERANCE
2	PLANETARY GEAR BOX					BHEL	HYDERABAD	A		SUBJECT TO CONDITIONS
						SIEMENS	GERMANY	A		
3	GRINDING ROLL					AIA ENGG.	NAGPUR	A		SUBJECT TO SIZE CONDITIONS
						AIA ENGG.	AHMEDABAD	A		
						MEGOTTEAUX	RAJKOT	A		
						SHREE BALAJI INDUSTRIAL PRODUCTS	JAIPUR	DR		
4	BULL RING SEGMENTS					AIA ENGG.	AHMEDABAD	A		
						MEGOTTEAUX	RAJKOT	A		
5	MILL HANDLING									MAIN BOIs eg. Hook, motors and C&I item from NTPC approved sources
						POWER BUILT	V V NAGAR	A		Upto 10 Tons
						UNIVERSAL HOIST FABRIK	THANE/ MUMBAI	A		upto 20T Conditions
						DYNAMECH CRANES	THANE MUMBAI	A		upto 20T Conditions
						ANUPAM INDUSTRIES	V V MAGAR	A		EOT Cranes upto 50 Tons



CR  
05.04.17  
(Chittaranjan Samal,  
BHEL/Hyd)

43

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						GRIP ENGINEERS	HYDERABAD	A		Electrical hoist with trolley, under slung crane up to 40 Ton
						ARESEL MHE PVT LTD	BANGALROE	A		upto 20T
						CONSOLIDATED HOIST	PUNE	A		upto 20T Conditions
						CONSOLIDATED HOIST	SATARA	A		EOT CRANES UPTO 40 TONS & HOISTS ABOVE 15 TONS
						CENTURY CRANES	PALWAL	A		UPRO 30 MT EOT CRANES
						REVA INDUSTRIES	FARIDABAD	A		Upto25MT/Elec.Hoist
						GLOBAL TECHNOLOGY	HYDERABAD	DR		
						LIFTING EQUIPMENTS PVT. LTD.	DELHI	DR		
						SHIVAPRA CRANES	HYDERABAD	DR		
6	DYNAMIC CLASSIFIER					BHEL	HYDERABAD	DR		
7	LUB OIL SYSTEM					LINCOLN HELIOS	BANGALORE	A		
						T A HYDRAULICS	HYDERABAD	A		
						CENLUB INDUSTRIES	FARIDABAD	A		
						UNIQUE ENGINEERING ENTERPRISE P LTD	HYDERABAD	A		
						SOUTHERN LUB	BANGALORE	A		



*[Handwritten signature]*

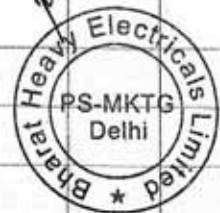
*[Handwritten signature]*

*[Handwritten signature]*

47

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						HYDAC	MUMBAI	DR		
						BHEL -HPEP	HYDERABAD	A		
8	RTD AND THERMOCOUPLE									DURING QP FINALISATION FROM C&M/ELECT LIST
9	SOLENOID VALVE									DURING QP FINALISATION FROM C&M/ELECT LIST
11	LIMIT SWITCH									DURING QP FINALISATION FROM C&M/ELECT LIST
12	SEPARATOR BODY					KCP	CHENNAI	A		
						SIMPLEX	BHILAI	A		
						NS ENGG.	HYDERABAD	A		
						ALSTOM PROJECTS INDIA LTD.	SHAHABAD	A		
						PREMIER ENGG. INDUSTRIES	JEEDIMETLA	A		
						SAI SARANG ENGINEERS	JEEDIMETLA	A		
						SWATHI INDUSTRIES	HYDERABAD	A		
						BHEL HPVP	VISAKHAPATNAM	A		
						GODREJ	MUMBAI	DR		
						BHEL CFU	JAGDISHPUR	DR		



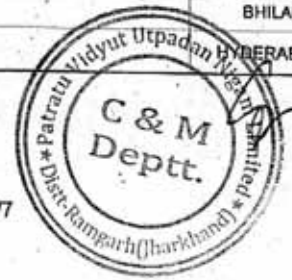
*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						ISGEC	YAMUNANAGAR	DR		
13	PGB HOUSING					KCP	CHENNAI	A		
						SIMPLEX	BHILAI	A		
						NS ENGG.	HYDERABAD	A		
						GODREJ	MUMBAI	DR		
						ISGEC	MUMBAI	DR		
						BROWN'S HITECH STRUCTURES BHEL ANC.	HYDERABAD	A		
						SRI SRI ENGINEERING WORKS	HYDERABAD	A		
						TRIOMECH ENGINEERING	HYDERABAD	A		
						SWATHI INDUSTRIES	HYDERABAD	A		
						ALSTOM PROJECTS INDIA LTD.	SHAHABAD	DR		
						BHEL-HPVP	VISAKHAPATNAM	DR		
						BHEL-CSU	JAGDISHPUR	DR		
14	AIR INLET HOUSING					ALSTOM PROJECTS INDIA LTD.	SHAHABAD	A		
						KCP	CHENNAI	A		
						NS ENGG.	HYDERABAD	A		
						SIMPLEX	BHILAI	A		
						SWATHI INDUSTRIES	HYDERABAD	A		



*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						PREMIER ENGG. INDUSTRIES	JEEDIMETLA	A		
						SAI SARANG ENGINEERS	JEEDIMETLA	A		
						BHEL-HPVP	VISHAKHAPATNAM	A		
						HYDERABAD METCHAM	HYDERABAD	DR		
						GODREJ	MUMBAI	DR		
						BHEL CFU	JAGDISHPUR	DR		
						ISGEC	MUMBAI	DR		
15	SEPARATOR TOP					ALSTOM PROJECTS INDIA LTD.	SHAHABAD	A		
						KCP	CHENNAI	A		
						NS ENGG.	HYDERABAD	A		
						SIMPLEX	BHILAI	A		
						YOGASREE	BANGALORE	A		
						PREMIER ENGG. INDUSTRIES	JEEDIMETLA	A		
						SAI SARANG ENGINEERS	JEEDIMETLA	A		
						BHEL-HPVP	VISHAKHAPATNAM	A		
						GODREJ	MUMBAI	DR		
						BHEL CFU	JAGDISHPUR	DR		
						HYDERABAD METCHEM	HYDERABAD	DR		
16	MILL DISCHARGE VALVE (FABRICATED BODY & MPO) CERAMIC LINED					BHEL EPD	BANGALORE	A		



47

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
17	MILL COUPLING	II				SIEMENS	GERMANY	A		
		II				WELLMAN WACOMA LTD.	KOLKATA	DR		
		II				RATHI TRANSPOWER	PUNE	DR		
18	KNIFE EDGE GATE VALVES	I				GALAXY CONTROLS PVT. LTD.	CHENNAI	A		UP TO SIZE 26".
		I				ORBINOX INDIA PVT. LTD.	COIMBATORE	A		UP TO SIZE 30".
		I				BRAY CONTROLS (EARLIER-VAAS INDUSTRIES PVT. LTD.)	CHENNAI	A		UP TO SIZE 28".
		I				JASH ENGG. LTD.	INDORE	A		UP TO SIZE 30
		I				GENERAL ENGG. CONSORTIUM	BANGALORE	DR		

*Handwritten signature*

*Handwritten signature*



*Handwritten signature*

*Handwritten signature*

48

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC (SG SCOPE)						REV. NO. :	0	
Supplier:		BHEL			BHEL, HYDERABAD			DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST MILLS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
LEGENDS :	AS PER BHEL TRICHY VENDOR LIST									
NOTES : AS GIVEN IN BHEL TRICHY VENDOR LIST										

*Handwritten signature*

*Handwritten signature*

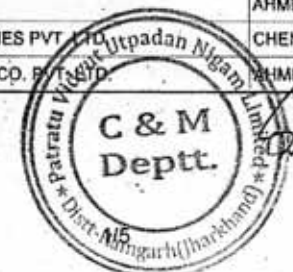
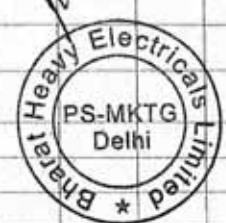


*Handwritten signature*

49

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

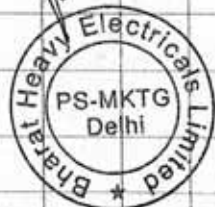
Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO.:	CS-9585-001-2	
Package:		EPC						REV. NO.:	0	
Supplier:		BHEL			BHEL RANIPET			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST BOILER AUXILIARIES & ESP					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
1	APH	I				REFER SUB QR LIST				VENDORS FOR MAIN STATIC AND ROTATING COMPONENTS SHALL BE TIED UP IN EXECUTION PLAN
2	STEAM COIL AIR PRE HEATER	III				MAIN CONTRACTOR'S APPROVED SOURCES				
3	AIR RECEIVER TANK	III				MAIN CONTRACTOR'S APPROVED SOURCES				
4	FD FAN	I				REFER SUB QR LIST				VENDORS FOR MAIN STATIC, ROTATING COMPONENTS, BLADES SHALL BE TIED UP IN EXECUTION PLAN
5	PA FAN	I				REFER SUB QR LIST				VENDORS FOR MAIN STATIC, ROTATING COMPONENTS, BLADES SHALL BE TIED UP IN EXECUTION PLAN
6	ID FAN	I				REFER SUB QR LIST				VENDORS FOR MAIN STATIC, ROTATING COMPONENTS, BLADES SHALL BE TIED UP IN EXECUTION PLAN
7	SEAL AIR FAN	I				CB DOCTOR & CO.	AHMEDABAD	A		
		I				BHEL	RANIPET	A		
		I				TLT INDIA	GUJARAT	A		
		I				ADREW YULE	KOLKATA	A		
		I				PATEL AIR TEMP	AHMEDABAD	A		
		I				ACCEL	AHMEDABAD	A		
		I				NADI TECHNOLOGIES PVT LTD	CHENNAI	DR		
		I				VACUNAIR ENGG. CO. PVT LTD	AHMEDABAD	DR		



*R. Arumachariam*  
14/17  
R. ARUMACHARIAM  
BHEL Ranipet

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC						REV. NO. :	0	
Supplier:		BHEL			BHEL RANIPET			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST BOILER AUXILIARIES & ESP					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Sched ule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
8	LUB OIL SYSTEM FOR FANS(ID,FD & PA)	I				PSI ENGG.	CHENNAI	A		
						CENLUB	FARIDABAD	A		
						LINCOLN HELIOS	BANGALORE	A		
						BHEL	RANIPET	A		
						SOUTHERN LUBRICATION	BANGALORE	A		
						TA HYDRAULICS	HYDERABAD	A		
						SPRAYING SYSTEM INDIA PVT. LTD.	BANGALORE	DR		
9	RIGIFLEX COUPLING FOR AXIAL FANS	III				MAIN CONTRACTOR'S APPROVED SOURCES				
10	COOLER FOR FAN LOS	III				MAIN CONTRACTOR'S APPROVED SOURCES				
11	SCREW PUMP FOR LOS	III				LEISSTRITZ	GERMANY	A		
						ALEKTON	CHENNAI	A		
						KRAL	AUSTRIA	A		
						TUSHACO(DELTA)	DAMAN	A		SUB. TO CONDITIONS
						DELTA PD PUMPS PVT. LTD.	MUMBAI	DR		
						UT PUMPS	FARIDABAD	DR		
12	EMITTING ELECTRODES FOR ESP	I				SIVA SPRINGS	MAADURAI	A		



*Handwritten signature*

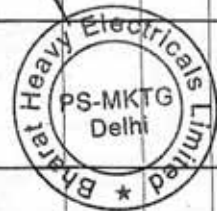
*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC						REV. NO. :	0	
Supplier:		BHEL			BHEL RANIPET			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST BOILER AUXILIARIES & ESP					
S.No.	ITEM	QP/Insp. CaL	QP No.	QP Sub-Sched ular	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						VENKATESWARA STEEL & SPRINGS(INDIA) PVT. LTD.	COIMBATORE	A		
						NAGAPPASPRINGS	RANIPET	A		
						KWALITY COILS	MADURAI	A		
						BEST COILS	RANIPET	A		
						VISHNU WIRE FORMS (P) LTD.	MADURAI	A		
13	COLLECTING ELECTRODE FOR ESP	I				BHEL	RANIPET	A		
14	ESP SUPPORT STRUCTURE (COLUMNS & ROOF BEAMS )	I				NTPC APPD SUBCONTRACTORS OF BHEL WITH BHEL MATERIAL				PROJECT SPECIFIC APPROVAL TO BE TAKEN BY BHEL FROM NTPC; VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION
15	ESP SUPPORT STRUCTURE ( COLUMNS & ROOF BEAMS MANUFACTURED FROM ROLLED SECTIONS ), CASING	III				BHEL APPD SUBCONTRACTORS WITH BHEL MATERIAL				VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION
16	COLLECTING/EMITTING ELECTRODE SUSPENSION ASSY.	III				BHEL APPD SUBCONTRACTORS WITH BHEL MATERIAL				



*Handwritten signature*

*Handwritten signature*

*Handwritten signature and date 24/17*

52

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC						REV. NO. :	0	
Supplier:		BHEL			BHEL RANIPET			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST BOILER AUXILIARIES & ESP					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
17	CE AND DE RAPPING MECHANISM	III				MAIN CONTRACTOR'S APPROVED SOURCES				
18	ELECTRICALLY OPERATED HOIST FOR ESP- UPTO 3 TON CAPACITY	III				MAIN CONTRACTOR'S APPROVED SOURCES				
19	GATES	I				NTPC APPD SUBCONTRACTORS OF BHEL WITH BHEL MATERIAL	RANIPET	A		
20	DAMPERS	I				NTPC APPD SUBCONTRACTORS OF BHEL WITH BHEL MATERIAL	RANIPET	A		
21	LRB MATERIALS	I				MINWOOL ROCK FIBRES LTD.	RAJNANDAON, BHILAI	A		
		I				LAPINUS ROCKWOOL LTD.	GWALIOR	A		
		I				LLOYDS INSULATION, CHENNAI	BHILAI	A		
		I				PUNJSTAR INSULATION	BHILAI	A		
		I				GOENKA ROCK WOOL	RAIPUR	A		
		I				THERMOCARE ROCKWOOL PVT. LTD. ES. LTD.	RAJNANDAON	A		
		I				SHREERAM EQUITECH	DURG	A		
		I				MINWOOL ROCK FIBRES LTD.	RAJNANDAON, BHILAI	A		
		I				ROCKWOOL INDIA LTD.	MEDAK-AP	A		
		I				DHANBAD ROCKWOOL INSULATION PVT. LTD.	DHANBAD	A		
		I				MINSULATE MFG. CO,	BAMSHEDPUR	A		
		I				POLYBOND PROJECTS LTD.	DURG	A		



53

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature and date 14/14*

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC						REV. NO. :	0	
Supplier:		BHEL			BHEL RANIPET			DATE:	04.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST BOILER AUXILIARIES & ESP					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Sched ule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						HI-TECH ROCK FIBRE LTD.	RAJNANDGOAN	A		
						ROCKWOOL INDUSTRIES	BHILAI	A		
22	VIS FOR FANS					GERB	BANGALORE	A		
NOTE 1:	VENDORS UNDER A (ACCEPTED CATEGORY) ARE APPROVED WITH OR WITHOUT CONDITIONS IN PAST. SIMILAR CONDITIONS AS THE CASE MAY BE FOR THE VENDORS SHALL BE APPLICABLE FOR THIS PROJECT AND TIED UP IN THE QUALITY.									
NOTE 2:	VENDORS UNDER DR (DETAILS REQUIRED) CATEGORY SHALL BE REQUIRED TO SUBMIT THE DETAILS IN NTPC QUESTIONNAIRE.									

*Handwritten signature*

*Handwritten signature*



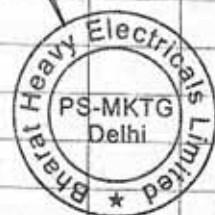
*Handwritten signature*

*Handwritten signature and date 14/4/17*

571

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRA U	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL						DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SUB-SYST			AGENCIES&ESP ERECTION AGENCIES		
Contract No.:					AGENCIES					
S.No.	ITEM	QP/Insp. CaL	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
1	BOILER & AUX. (PRESSURE PARTS, STRUCTURES, ROTATING EQUIPMENT)					DOWEL ERECTORS PVT. LTD.	CHENNAI	A		NOTE-1
						POWER MECH PROJECTS PVT. LTD.	VIJAYWADA	A		NOTE-1
						BRIDGE & ROOF	KOLKATA	A		NOTE-1
						KARPARA PROJECTS ENGG. PVT. LTD.	SURAT	A		NOTE-1
						IOTEP	MUMBAI	A		NOTE-1
						SUNIL HI-TECH ENGG.	NAGPUR	A		NOTE-1
						TATA PROJECTS LIMITED	HYDERABAD	A		NOTE-1
						TEXCEL ENGINEERS	CHENNAI	A		NOTE-1
						PCP INTERNATIONAL LTD.	CHANDIGARH	A		NOTE-1
						INDWELL CONSTN. LTD.	VIJAYWADA	A		NOTE-1
						EDAC ENGG. LTD.	CHENNAI	A		NOTE-1
						LARSEN & TUBRO LTD.	MUMBAI	A		NOTE-1
						BHAWANI ERECTORS	KARUNAGAPAL LY	A		NOTE-1
						ESSAR PROJECTS (I) LTD.	MUMBAI	A		NOTE-1
						GOLDEN EDGE ENGG. PVT. LTD.	NEW DELHI	A		NOTE-1
						BROTHER ENGINEER	CENNAI	DR		NOTE-1
						ICS ENGG.	CHENNAI	DR		NOTE-1
						POWER MAX	KOLKATA	DR		NOTE-1
						SWAMINA INTERNATIONALS PVT LTD.	NEW DELHI	DR		NOTE-1
2	POWER CYCLE PIPING					INDWELL CONSTN. LTD.	VIJAYWADA	A		NOTE-1



*Handwritten signature*

*Handwritten initials*

*G.V. Rajend. 12/04/17.*

55

# This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRAT U	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		Steam Generator Island Package						REV. NO. :	0	
Supplier:		BHEL						DATE:	05.04.2017	
Contract No.:		CS-9585-001-2			SG & AUX.-FQP & ERECTION SUB-SYST AGENCIES&ESP ERECTION AGENCIES					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						POWER MECH PROJECTS PVT. LTD	VIJAYWADA	A		NOTE-1
						TEXCEL ENGINEERS	CHENNAI	A		NOTE-1
						BRIDGE & ROOF	KOLKATA	A		NOTE-1
						KARPARA PROJECTS ENGG. PVT. LTD.	SURAT	A		NOTE-1
						SUNIL HI-TECH ENGG.	NAGPUR	A		NOTE-1
						IOTEP	MUMBAI	A		NOTE-1
						PCP INTERNATIONAL LTD.	CHANDIGARH	A		NOTE-1
						LARSEN & TUBRO LTD.	MUMBAI	A		NOTE-1
						EDAC ENGG. LTD.	CHENNAI	A		NOTE-1
						TATA PROJECTS LTD.	HYDERABAD	A		NOTE-1
						BHAWANI ERECTORS	KERALA	A		NOTE-1
						U B ENGG.	PUNE	DR		NOTE-1
						DOWEL ERECTORS	CHENNAI	A		NOTE-1
						GOLDEN EDGE ENGG.	NEW DELHI	A		NOTE-1
3	LP PIPING					NOTE-2				
4	HT MOTORS					NOTE-2				
5	COMPRESSED AIR SYSTEM					NOTE-2				
6	MILL REJECT HANDLING SYSTEM					NOTE-2				
7	PASSENGER CUM GOODS ELEVATOR					NOTE-2				



*Handwritten signature*

*Handwritten initials*

*Handwritten signature*

*G.V. Patil 12/04/17*

56

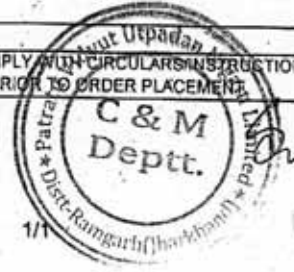
**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3x800	MW	LIST OF ITEMS REQUIRING FIELD QUALITY PLAN AND ERECTION SUBCONTRACTOR APPROVAL			DOC. NO. :	CS-9585-001-2		
Package:		Steam Generator Island Package						REV. NO. :	0		
Supplier:		BHEL						DATE:	05.04.17		
Contractor No.:		CS-9585-001-2			SUB-SYSTEM ESP ERECTION AGENCY						
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks	
1	ESP					BROTHERS ENGG. & ERECTORS	VIJAYAWADA	A		NOTE 1	
						POWER MECH PROJECTS	VIJAYAWADA	A			NOTE 1
						BRIDGE & ROOF	KOLKATA	A			NOTE 1
						BHAVANI ERECTORS PVT. LTD.	KERLA	A			NOTE 1
						L&T LTD.	MUMBAI	A			NOTE 1
						PCP INTERNATIONAL LTD.	CHANDIGARH	A			NOTE 1
						SUNIL HI-TECH	NAGPUR	A			NOTE 1
						DOWEL ERECTORS PVT. LTD.	CHENNAI	A			NOTE 1
						INDWELL CONSTR. LTD.	VIJAYAWADA	A			NOTE 1
						KARPARA PROJECTS ENGG.	SURAT	A			NOTE 1
						TEXCEL ENGINEERS PVT. LTD.	CHENNAI	A			NOTE 1
						TATA PROJECTS LTD.	HYDERABAD	A			NOTE 1
						IOTEP	MUMBAI	A			NOTE 1
						EDAC	CHENNAI	A			NOTE 1
						ZILLION	NEW DELHI	A			NOTE 1
						GOLDEN EDGE ENGG. PVT.LTD.	DELHI	A			NOTE-1
						P E ERECTORS	KOLKATA	A			NOTE-1
				UB ENGG.	PUNE	DR			NOTE-1		
EGENDS											
1	SYSTEM SUPPLIER / SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)										
A -	For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any. The same conditions shall be applicable here as well.										
DR -	For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.										
2	Notes										
Note - 1	Additional vendors may be considered as per MOM provision. rganizational , financial & technical aspects will be taken care by BHEL before award of the jobs to the sub contractors. Mobilisation of manpower, tools, tackles to suit the requirements of job schedule shall be tied up by BHEL in consultation with NTPC site before award for which the details of sub contractors shall be forwarded to respective GM /C (NTPC-SITE). I. M/s BHEL to ensure that the requirements of NTPC regarding the deployment of erection Agency in connection with the work schedule for the subject project and package is met.										
Note - 2	BHEL approved sub contractors for erection - would mean NTPC approval is not required										
NOTE 3:	BHEL WILL FOLLOW THEIR STANDARD PROCEDURE, CORPORATE GUIDELINES AND SHALL COMPLY WITH CIRCULARS INSTRUCTIONS ETC. ISSUED BY GOVT./RELEVANT STATUTORY BODIES WHILE TENDERING. HOWEVER FOR NEW VENDOR, BHEL SHALL TAKE APPROVAL FROM NTPC PRIOR TO ORDER PLACEMENT.										



*Handwritten signature*

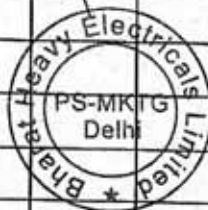
*Handwritten initials*



*G.V. Rajasekhar*  
12/04/17  
(G.V. RAJASEKHAR)  
(BHEL-PSNR)

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRAY U	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC/SG					REV. NO. :	0		
Supplier:		BHEL					DATE:	12.05.2015		
Contract No.:		CS-9585-001-2			SUB-SYST	BHEL PIPING CENTRE, CHENNAI				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
NOTE: FABRICATION OFFLOADING SHALL BE AS PER AGREED LIST BETWEEN NTPC & BHEL										
1	AUX PRDS UNIT (INCLUDING CONTROL VALVE)									VENDORS TIED UP BHEL PEM VENDOR LIST
2	LIGHTLY BONDED WOOL MATTRESS CONVENTIONAL									VENDORS AS PER BHEL TRICHY BOILER LIST
3	CONVENTIONAL VALVES OTHER THAN BHEL									VENDORS AS PER BHEL TRICHY BOILER LIST
4	HANGERS & SUPPORTS WITH SPRING ARRANGEMENT(INCLUDIN G CLH/VLH)					PIPE SUPPORTS	UK	A		
						LISEGA	GERMANY, CHINA	A		Lisega, China approval conditions as per NTPC approval letter
						CARPENTER & PATTERSON	UK	A		
						MANNESMANN	GERMANY	A		
						SANWA TAKI	JAPAN	A		
						BROWICK	UK	A		
						GILLARDINI	ITALY	A		
						ITT	GERMANY	A		
						MH	SPAIN	A		



*Ali*  
(NITIN KUMAR)  
PS-M  
BHEL

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRAY U	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC/SG					REV. NO. :	0		
Supplier:		BHEL					DATE:	12.05.2015		
Contract No.:		CS-9585-001-2		SUB-SYST	BHEL PIPING CENTRE, CHENNAI					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
5	HANGERS & SUPPORTS (RIGID TYPE) WITHOUT SPRING ARRANGEMENT	III				MAIN CONTRACT APPROVED VENDORS				
6	PIPING FABRICATION-P91 MATERIAL	I				BHEL	TRICHY	A		
7	PIPING FABRICATION (IBR)	I				BHEL	CHENNAI	A		
8	PIPING FABRICATION (NON-IBR)	I				BHEL	CHENNAI	A		
9	BUILT UP BEAMS/FABRICATED BEAMS-AUTO WELDING	I				AS PER BHEL-TRICHY LIST				
10	CONSTANT/VARIABLE LOAD HANGERS (BHEL MAKE)	I				BHEL	TRICHY	A		
11	TANKS AND VESSELS	I				BHEL CHENNAI	CHENNAI	A		
12	NON IBR PIPING / LP PIPING - PR. BELOW 10	III				BHEL APPROVED SOURCES				
13	STRUCTURE FABRICATION (ROLLED SECTION)	III				BHEL	CHENNAI	A		
14	DEAD WEIGHT CLH	III				BHEL	CHENNAI	A		
15	SHOP MANUFACTURED FITTINGS OF 91 GR.MATL	I				BHEL	TRICHY	A		
16	FLOW ELEMENTS - OTHER THAN BHEL	I								Refer BHEL, Trichy C&I list for Sub-vendors
17	AIR TRAPS	III								BHEL Approved Vendors
18	BEARINGS	III								BHEL Approved Vendors



59

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRAT U	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC/SG					REV. NO. :	0		
Supplier:		BHEL					DATE:	12.05.2015		
Contract No.:		CS-9585-001-2			SUB-SYST	BHEL PIPING CENTRE, CHENNAI				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
19	CHEMICAL DOSING TANK (HP/LP)	III								BHEL Approved Vendors
20	COOLING WATER VALVES	III								BHEL Approved Vendors
21	FITTINGS-P91/92	I				VENDORS AS PER BHEL TRICHY VENDORS LIST				
22	FITTINGS (CS,SS & AS UPTO GR22	II								PROCUREMENT FROM BHEL APPROVED VENDORS
23	FIXING COMPONENTS, SEALING COMPOUND FOR INSULATION	III								BHEL Approved Vendors
24	HANGER CONNECT COMP. (CLEVIS, EYENUT, TURNBUCKLE, TIEROD, WELD ON BRACKET ETC	III								BHEL Approved Vendors
25	INSULATION CLAMPS	III								BHEL Approved Vendors
26	LEVEL GAUGE GLASS ( FOR CBD, IBD, FLASH CHEM. DOSING TANKS	III								BHEL Approved Vendors
27	PLUG & BALL VALVES (COOLING WATER AND AIR LINES)	III								BHEL Approved Vendors
28	SIGHT FLOW INDICATORS	III								BHEL Approved Vendors
29	SNUIBERS (IMPORTED)	III								BHEL Approved Vendors
30	STEAM TRAPS	III								BHEL Approved Vendors



*[Handwritten signature]*

*[Handwritten signature]*

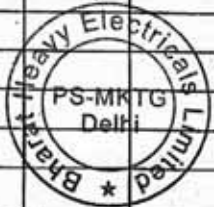
*[Handwritten signature]*

*[Handwritten signature]*

69

This is a Part of Technical Specification No. PE-TS-475-155-A001

Project:		PATRA U	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC/SG					REV. NO. :	0		
Supplier:		BHEL					DATE:	12.05.2015		
Contract No.:		CS-9585-001-2			SUB-SYST	BHEL PIPING CENTRE, CHENNAI				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
31	STEAM TRAPS THERMODYNAMIC TYPE	III								BHEL Approved Vendors
32	STRAINERS	III								BHEL Approved Vendors
33	COOLING WATER PUMP	III				SULZER INDIA	NAVI MUMBAI	A		
		III				KSB	PUNE	A		
		III				KIRLOSKAR	WADI	A		
		III				MATHER AND PLATT	PUNE	A		
		III				BECON WEIR	CHENNAI	A		
		III				SAM PUMPS	COIMBATORE	A		
		III				JYOTI	BARODA	A		
34	LP CHEMICAL DOSING SYSTEM	II				Power Piping	Trichy	A		
		II				V.K.Pumps	Mumbal	A		
		II				Milton Roy	Chennai	A		
		II				Techno Consultants	Mumbal	A		
		II				Positive Metering System	Nasik	A		
		II				PSI Engg System	Chennai	A		
		II				Matz Pump	Ahmedabad	DR		
		II				DEE DEVELOPMENT	HARYANA	DR		
35	LP CONDENSATE TRANSFER PUMP	I				ITT GOULD		A		
		I				FLOWSERVE		A		



**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRA U	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
Package:		EPC/SG					REV. NO. :	0		
Supplier:		BHEL					DATE:	12.05.2015		
Contract No.:		CS-9585-001-2			SUB-SYST	BHEL PIPING CENTRE, CHENNAI				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub- Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submisson schedule	Remarks
		I				CLYDE PUMPS	GHAZIABAD	A		
						SULZER	NAVI MUMBAI	A		
36	BUTTERFLY VALVES(upto 1400NB-PN10 & upto 300NB-PN16)					R&D Multiple	Valsad	A		
						Fouress Engg.	Bangalore	A		
						Weir BDK	Hubli	A		UPTO1050NB PN-15
						IL	Palghat	A		
						Intervolve	Pune	A		
						KBL	Kondhapuri	A		
						PENTAIR	Kondhapuri	A		UPTO 900NB PN-16
						FLOSERVE	Coimbatore	A		
						L&T		DR		
37	BOILER FEED PUMP(AUX.BOILER)	III								BHEL Approved Vendors

NOTES : A - APPROVED, DR - DETAIL REQUIRED, N - NOTED. REFER TRICHY BOILER LIST FOR OTHER NOTES.

*Handwritten signature*

*Handwritten signature*



*Handwritten signature*

62

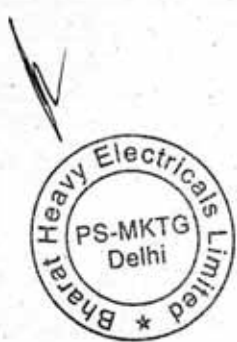
**This is a Part of Technical Specification No. PE-TS-475-155-A001**

Project:		PATRATU	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. CS-9585-001-2		
					AND SUB-SUPPLIER APPROVAL			REV. NO. 0		
Package:		EPC/SG					DATE: 12.05.2015			
Supplier:		BHEL								
Contract No.:		CS-9585-001-2			SUB-SYSTEM SCOPE					
	ITEM				Proposed sub-supplier					
S.No.		QP/Insp. Cat.	QP No.	QP Sub Schedule	QP approval schedule	Place	Sub-Suppliers approval status/ category	Sub-supplier Details submission on schedule	SQP Status	Remarks
	1 AUX PRDS UNIT (INCLUDING CONTROL VALVE)					INSTRUMENTATION LTD PALGHAT	A			Steam conditioning valve from Hora Germany & Desuperheater from Copes Vulcan
						PARCOL ITALY	A			
						HORA (HOLTER) GERMANY	A			
						MIL THRISSUR	A			WITH W&T GERMANY
						DAUME GERMANY	A			
						CCI SRICITY	DR			
						KOSO INDIA PVT. LTD. NASIK	DR			

NOTES AND LEGEND AS PER BHEL TRICHY VENDOR LIST

*Handwritten signature*

*Handwritten signature*

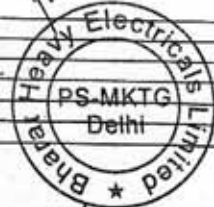


*Handwritten signature*  
(Nilesh Kamal)



AR

NTPC		PROJECT : PATRATU PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY			REF. NO : REVISION NO : 00 DATE : 16-05-17		
No.	Major Equipment	QP Inspection Category	QP No.	QP Sub mission on SCH	QP Appr oval SCH	Proposed Sub Supplier	Place	SS Appr oval Status	SS Data II Sub. SCH	SS Approval SCH	Remark
1	Slurry re-circulation Pumps	I									Refer Sub.QR List
2	Oxidation Blowers	I									Refer Sub.QR List
3	Wet Limestone Grinding Mill	I									Refer Sub.QR List
4	Slurry Pumps	I									Refer Sub.QR List
5	Agitators	I									Refer Sub.QR List
6	Vacuum Belt Filters	I									Refer Sub.QR List
9	Bucket Elevator	I				Indiana Conveyors Pvt.Ltd. Bevcon Wayors Pvt.Ltd	Jelori, Pune HYDERABAD	A DR			
10	Absorber Tank	I				BHEL	Ranipet	DR			
11	Atmospheric Tanks	III				Main Contractor approved sub contractor					
12	Structural Items (Columns, Beams & Bracings) Built up section					BHEL	Ranipet	DR			
		I				Jindal	Ghazalabad	A			UP TO 350NB ( Black & GI)
		III				TATA STEEL	Jamshedpur	A			UP TO 150 NB ( Black & GI)
		III				SAIL	Rourkela	A			
		I				Surya Rohini	Bahadurgarh	A			UP TO 400NB ( Black & GI)
		I				Welspan	Anjar	A			UP TO 400NB ( Black)



*Handwritten signature*

BHEL  
*Handwritten signature*  
(SASHI KUMAR)

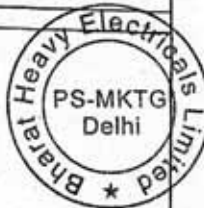
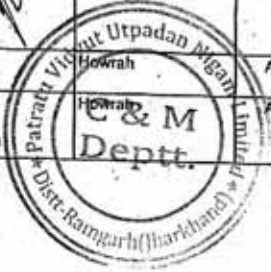
64

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

NTPC		PROJECT : PATRATU				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE			REF. NO : REVISION NO : 00 DATE : 16-05-17		
		PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2				VENDOR AS APPROVED BY					
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission on SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Data II Sub. SCH	SS Approval SCH	Remark
13	MS Pipes (ERW)	I				MSI	Raigad	A			
						Indus Tube	G. B. Nagar	A		200 to 500 NB (Black)	
						Jindal Industries	Hissar	A		UP TO 300 NB (Black & GI)	
						APL Apollo	Sikandrabad	A		UP TO 300 NB (Black & GI)	
						Dado Pipes	Sikandrabad	A		UP TO 300NB (Black)	
						ISMT	Ahmedabad	A		UP TO 300 NB (Black)	
14	Gates & Dampers	I				Ratnamani	Anjar / Chabral	A			
						JCO Gas Pipes	Chindwara	A			
						SAIL	Raurkella	A			
						Surya Global	Kutch	A			
15	LRB Insulation	I				Lloyd Insulation	Chennai	A			
						Rockwool Industries	Bhilai / Medak	A			
						Minwool Rock Fibres Ltd.	Rajnandgaon	A			
						Lapinus Rockwool Ltd.	Gwalior	A			
						Punjstar(PIFCO)	Bhilai	A			
						Goenka Rockwool	Raipur	A			
						Rockwool India Ltd.	Medak-AP	A			
						Thermocare Rockwool Pvt.Ltd.	Rajnandgaon	A			
						Minsulate Mfg.Co	Jamshedpur	A			
						Dhanbad Rockwool	Dhanbad	A			
						Hitech Rockwool Fibre	Rajnandgaon	A			
						Roxul Rockwool Insulation	Daheji(Bharuch)	A			
						16	Gates & Dampers	I			
Bachmann	Faridabad	A									
Fouress	Bengaluru	A									
BHEL	Ranipet	A									
Clyde Burgmann Bachmann	USA	A									
17	Valves for FGD application#	I				BHEL	Trichy	A		As per approval (Type/Class/Rating & Material)	
						Bankim Valves	Howrah	A		CI Gate/Check/Globe upto 600NB,PN16.	
						H.Sarkar & Co	Howrah	A		CI Gate/Check/Globe upto 700NB,PN16	

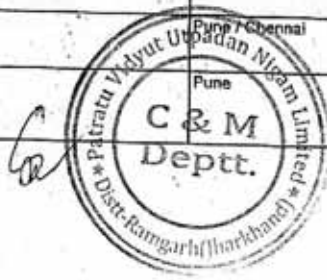
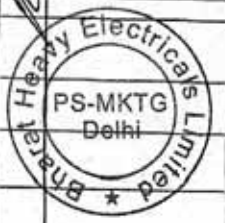
65

*Handwritten signatures and initials*



BHEL  
D... ..

NTPC		PROJECT : PATRATU				LIST OF ITEMS REQUIRING QP			REF. NO :		
		PACKAGE : EPC (FGD) Package				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		MAIN CONTRACTOR : M/s BHEL				VENDOR AS APPROVED BY			DATE : 16-05-17		
		CONTRACT NO : CS-9585-001-2									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submissi on SCH	QP Appr oval SCH	Proposed Sub Supplier	Place	SS Appr oval Status	SS Deta il Sub. SCH	SS Approval SCH	Remark
						Leader	Jalandhar	A		CI Gate/Check/Globe upto 300NB,PN10.SS upto 300NB & CS upto 300NB,Class 150, GM Valve upto 150NB	
						Weir BDK	Hubli	A		Gate/Globe/Check Valves upto300NB,Class300 for SS,CI&CS	
						KBL	Kondapuri	A		Gate/Globe/Check Valves upto 300NB,Class 300 for SS,CI&CS	
						A.V Valves	Agra	A		CI Gate/Globe/Check Valves upto 300NB,PN10	
						Tyco Valves / Pentair Valves	Halol(Gujarat)	A		For CS,CI&SS Butterfly Valve	
						L&T	Coimbatore	A		CS&AS-Low Pr. Valves-Gate/Globe/Check Valves upto 26",class600, High Pr. Upto20",2500class Forged Steel upto 1" 4500 class.	
						Weir BDK	Hubli	A		CS Ball Valves(upto 350NB-class150)	
						Leader	Jalandhar	A		Valve(upto350NB, class150)	
						Leader	Jalandhar	A		Forged Steel(CS) upto300NB, class150.	
						Fouress Engineering	Thane,Aurangabad	A		Forged Steel(CS)upto 300NB,Class150)	
						Weir BDK	Hubli	A		Diaphragm Valves	
						Advance Valve	Noida	A		CI Butterfly valves 1400 NB, PN 10; 300 NB PN16	
						Fouress Engineering	Bangalore	A		Knife Gate valves	
						Micro Finish	Hubli	A		Ball Valve 350 NB Class 150, upto 50 NB Class 800	
						Inter Valves	Pune	A		CI Butterfly valves 1400 NB, PN 10; 300 NB PN16	
						Xomos Sanmar	Pune / Chennai	A		Forged Steel Gate globe check valve upto 50 NB Class 800	
						Dembia	Pune	A		CI Butterfly valves 1400 NB, PN 10; 300 NB PN16	



BHEL  
Dul. Singh

99

*Handwritten signatures and initials.*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

NTPC		PROJECT : PATRATU PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY			REF. NO : REVISION NO : 00 DATE : 16-05-17		
No.	Major Equipment	QP Inspec tion Cate gory	QP No.	QP Sub missi on SCH	QP Appr oval SCH	Proposed Sub Supplier	Place	SS Appr oval Status	SS Data II Sub. SCH	SS Approval SCH	Remark
		I				Hawa Engineers	Ahmedabad	A		Forged Steel Gate globe check valve upto 50 NB Class 800	
18	Flap Gate, R&P Gate.	I				TKII	Pune	A			
		I				Mining&Material Handling	Kolkata	A			
		I				United Technomac	Pune	A			
		I				MBE	Kumardhubli	A			
		I				Prepec	Howrah	A			
		I				HMTC	Kolkata	A			
		I				Elecon	VV Nagar	A			
		I				Indiana Conveyor	Jejori, Pune	A			
		I						DR			
		I						DR			
		I						DR			
19	Water Pumps(process water)	I				Kiroskar Brothers	Pune	A			
		I				Sam Turbo	Coimbatore	A			
		I				Mather & Platt	Pune	A			
		I				KSB	Pune	A			
		I				Weir Minerals	Bangalore	A			
		I				WPIL	Kolkata/Ghaziabad	A			
		I				Kishore	Pune	A			
		I				Flow More	Ghaziabad	A			
20	Metallic Expansion Joints	I				Lonestar Industries	Chennai	A			
		I				Mechwell	Nasik	A			
		I				BHEL	Ranipet	A			
21	Non-Metallic Expansion Joints for Ducts	I				Keld Ellentoff	Chennai	A			
		I				Eagle Burgmann	Chennai/Denmark	A			
		I				HKR	Korea	A			
		I				Safetech	Spain	A			
		I				Bachmann Industries(India) Ltd.	New Delhi	DR			
		I				Elastomeric Engineers	Salem	DR			
		I				Urja Products Pvt.Ltd.	Ahmedabad	DR			



69

*Abul*

*hil*

*69*



*BHEL*  
*Saul. Gup*

NTPC		PROJECT : PATRATU				LIST OF ITEMS REQUIRING QP			REF. NO :		
		PACKAGE : EPC (FGD) Package				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		MAIN CONTRACTOR : M/s BHEL				VENDOR AS APPROVED BY			DATE : 16-05-17		
		CONTRACT NO : CS-3585-001-2									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Def II Sub. SCH	SS Approval SCH	Remark
22	Electrical Hoist	I				Hercules Hoist Ltd.	Mumbai	A		Electric Hoist upto 15MT	CAT - III upto 5 T capacity Hoist,
						Reva Industries	Faridabad	A		Upto 40MT	
						Consolidated Hoist	Satara / Pune	A		EOT Cranes upto 40MT and Hoists above 15MT	
						Lifting Equipment and Accessories	New Delhi	A		Hoists upto 5MT	
						Grip Engineering Pvt.Ltd	Faridabad	A		EOT upto 5MT & Hoist upto 20MT	
						Brady & Moris	Ahmedabad	A		Upto 10 Tons	
						Consolidated Hoist	Pune	A		Upto 35 Tons at Satara & Upto 15 Tons at Pune works	
						Tuobro Furguson India Pvt. Ltd	Kolkata	A		Upto 5 Tons	
						Grip Engineers	Faridabad	A		Upto 20 Tons	
						Tractel Tirfor India Pvt. Ltd	Palwal	A		Upto 15 Tons	
						Universal Hoist Fabrik	Thane	A		Upto 20 Tons	
						Mangla Hoist	Greater Noida	A		Upto 10 Tons	
						Reva Industries	Faridabad	A		Upto 25 Tons	
						Eddy Cranes	Pune	A		Upto 14 Tons	
						Alpha Services	Bhiwadi	A		Upto 15 Tons	
						Century Crane Engineers	Balabhgarh	A		Upto 25 Tons	
						Grip Engineers	Hyderabad	A		Upto 40 Tons	
Amsel MHE Pvt.Ltd.	Bangalore	A		Hoist upto 15MT, EOT upto 10MT							
Century Crane Engineers	Balabhgarh	A		Upto 15 Tons							
Tractel Tirfor India Pvt. Ltd	Kalyani	A		Upto 20 Tons							



*Handwritten signature*

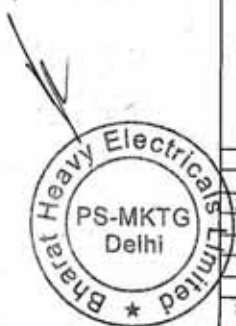
*Handwritten signature*



BHEL  
*Handwritten signature*



NTPC		PROJECT : PATRATU			LIST OF ITEMS REQUIRING QP			REF. NO :			
		PACKAGE : EPC (FGD) Package			APPROVAL & ACCEPTABLE			REVISION NO : 00			
		MAIN CONTRACTOR : M/s BHEL			VENDOR AS APPROVED BY			DATE : 16-05-17			
		CONTRACT NO : CS-9585-001-2									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submissi on SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Deta II Sub. SCH	SS Approval SCH	Remark
28	Air receiver	I				Abacus Heat Transfer	Faridabad	A			
						KBL	Konchapuri	A			
						Diamond Fabricators	Pune	A			
						Integrated Engineers	Mumbai	A			
						United Engineering Works	Nasik	A			
						Parkaire	Delhi	A			
						Temasmo Vesselex	Noida	A			
						GEM	Coimbatore	A			
						Vee Sons	Trichy	DR			
						Patel All temp Ltd	Ahmedabad	DR			
						G B Industries	Trichy	DR			
						Par Energy Infra Pvt Ltd	Hyderabad	DR			
						Janta Engineering & Company	Faridabad	DR			
						Sri Rang Industries	Coimbatore	DR			
C Doctor	Ahmedabad	DR									
29	Structural Steel Rolled /Plate Sections(CS)	S				SAIL		A			
						Ispat Industries		A			
						Lloyds Steel		A			
						JSW		A			
						RINL		A			
30	Structural Steel - Pipes IS 1161	III				Main Contractor approved sources					
31	S S plates	S				JSL Stainless		A			Upto 20 mm thick
						Indussteel Loire		A			Liner SS 304
						Indussteel Belgium		A			GR -304,309,310,316
						Columbus Steel (Acrinox)		A			GR -304,309,310,316
						SAIL		A			GR -304,309,310,316



BHEL  
Bharat Heavy Electricals Limited

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

<b>NTPC</b>		PROJECT : PATRATU				LIST OF ITEMS REQUIRING QP			REF. NO :		
		PACKAGE : EPC (FGD) Package				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		MAIN CONTRACTOR : M/s BHEL				VENDOR AS APPROVED BY			DATE : 16-05-17		
		CONTRACT NO : CS-9585-001-2									
No.	Major Equipment	QP Inspection Category	QP No.	QP Submissi on SCH	QP Appr oval SCH	Proposed Sub Supplier	Place	SS Approv al Status	SS Deta ll Sub. SCH	SS Approval SCH	Remark
32	Insulation Cladding	III				Nalco	India	A			
		III				Hindalco	India	A			
		III				Jindal	India	A			
<b>LEGENDS</b>											
<b>SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)</b>											
A - For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any.											
DR - For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.											
* For the items not appearing in the preaward list, bidder and NTPC will mutually discussed in future.											
<b>QP/INSPN CATEGORY:</b>											
CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.											
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.											
CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.											
<b>UNITS/ WORKS :</b> Place of manufacturing Place of Main Supplier of multi units/works.											
* - Engr. clearance is also required being a Sub-QP. \$- Review of Mill TC for RAW Material to be done by NTPC and shall be included in the QP of corresponding equipment.											



*Handwritten signature*

*Handwritten signature*



BHEL  
*Handwritten signature*

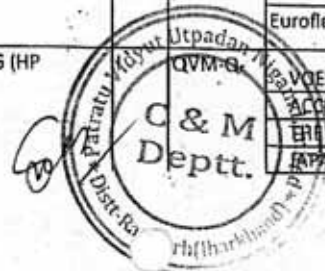
**This is a Part of Technical Specification No. PE-TS-475-155-A001**

NTPC	PROJECT: PATRATU 3X800 MW		LIST OF ITEMS REQUIRING QUALITY PLAN AND			REF NO. :	
	PACKAGE: TG		SUBCONTRACTOR APPROVAL SUB SYSTEM: ST& AUX			REV NO.:	
CONTRACTOR: BHEL HARIDWAR						DATE: 05.04.2017	
CONTRACT NO.:							
Sl No.	Item	QP Insp. Cat.	NTPC QP No. QVE-Q	Vendor/ Manufacturer Name	Place	SC_AP PL_ST ATUS	Remarks
1	HP OUTER CASING CASTING (EXHAUST)	I	QVM-Q-	JAPAN CASTING AND FORGING	JAPAN	A	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP)
				THE JAPAN STEEL WORKS LTD.	JAPAN	A	
				LITOSTROJ STEEL LTD.	SLOVENIA	DR	
				STAR WIRE (INDIA) LTD.	INDIA	DR	
				ACCIAIERIA FONDERIA CIVIDALE	ITALY	A	
				VOESTALPINE GIESSEREI LINZ	AUSTRIA	A	
				SANDE STAHLGUSS GMBH	GERMANY	A	
				CFFP, BHEL	Haridwar	A	
				HANWA CO. LTD. (MANUFACTURER: UBE STEELS, JAPAN)	JAPAN	DR	
2	HP OUTER CASING CASTING (INLET)	I	QVM-Q-	ACCIAIERIA FONDERIA CIVIDALE	ITALY	A*	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP) A* as per approval conditions
				THE JAPAN STEEL WORKS LTD.	JAPAN	A	
				JAPAN CASTING AND FORGING	JAPAN	A	
				VOESTALPINE GIESSEREI LINZ	AUSTRIA	A	
				CFFP, BHEL	Haridwar	DR	
3	EXHAUST HP OUTER CASING M/C	I	QVM-Q-	HEEP	Haridwar	A	
4	INLET HP OUTER CASING M/C			Rosl And Duso	Italy	A	
				MCE (New name BILFINGER MASCHINENBAU GMBH )	Austria	A	
				Bruno Presezi	Italy	A	
5	HP INNER CASING CASTING	I	QVM-Q-	Nugo Romano	Italy	A	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP) A* :Approved for wt. upto 20.5T
				VOESTALPINE GIESSEREI LINZ	AUSTRIA	A	
				ACCIAIERIA FONDERIA CIVIDALE	ITALY	A*	
				THE JAPAN STEEL WORKS LTD.	JAPAN	A	
				JAPAN CASTING AND FORGING	JAPAN	A	
				HANWA CO. LTD. (MANUFACTURER: UBE STEELS, JAPAN)	JAPAN	DR	
				SANDE STAHLGUSS GMBH	GERMANY	A*	
				SIEMENS AG	GERMANY	DR	
				ISGEC HEAVY ENGINEERING LTD	MUZZAFANAGAR	DR	
				LITOSTROJ STEEL LTD.	SLOVENIA	DR	
6	HP INNER CASING M/C	I	QVM-Q-	STAR WIRE (INDIA) LTD.	Ballabgarh	DR	
				CFFP, BHEL	Haridwar	A	
				HEEP, BHEL	Haridwar	A	



*(SK Chauhan)*  
050417  
BHEL/Haridwar

				Rosl And Duso	Italy	A	
				MCE (New name BILFINGER MASCHINENBAU GMBH )	Austria	A	
				Bruno Presezzi	Italy	A	
				Nugo Romano	Italy	A	
7	HP TURBINE SHAFT FORGING 9-10% Cr	II	QVM-Q-	SAARSCHMIEDE GMBH	Germany	A	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP)
				SCHMIEDEWERKE GRODITZ GMBH	Germany	DR	
				JAPAN CASTING AND FORGING	Japan	A	
				THE JAPAN STEEL WORKS LTD.	Japan	A	
				SDF, Terni	ITALY	A	
				BOHLER EDELSTAHL GMBH & CO. KG	AUSTRIA	DR	
				UMP TRADING S.A. (SUPPLY THRU ENERGOMASH, UKRAINE)	SWITZERLAND	DR	
8	HP TURBINE SHAFT M/C	I	QVM-Q-	- HEEP	Hardwar	A	
				- Rossl And Duso	Italy	A	
				-Bruno Presezzi	Italy	A	
				-Nugo Romano	Italy	A	
				-Siemens AG	Germany	A	
9	HP TURBINE ROTOR	I	QVM-Q-	HEEP	Haridwar	A	
10	HP STATIONARY & MOVING BLADES BAR STOCK	II	QVM-Q-	Böhler	Austria	A	NO SEPARATE VENDOR QP A*: ONLY FOR HW10687 & HW10786
				Walzwerke	Germany	A	
				Metal Ravne	Slovenia	A	
				Starwire	Ballabgarh	A	
				Kalyani Carpenter	Pune	A*	
				BGH	GERMANY	A	
11	HP STATIONARY & MOVING BLADES (M/C)	II	QVM-Q-	Leistriz	Germany	A	
				EnergletechnikEinsal	Germany	A	
				Wuxi Turbine Blade	China	A	
				Officine Meccaniche Zema	Italy	A	
				Wiromet	Poland	A	
				CMSNC Di Menegazzi	Italy	DR	
				HEEP	Hardwar	A	
				Praewest Praezisionswerkstaett	Germany	DR	
				Siemens Ltd	India	DR	
				Euroflex Transmissions (India) Pvt. Ltd.	Hyderabad	DR	
				VOESTALPINE GIESSEREI LINZ	AUSTRIA	A	
12	ESV & CV CASING CASTING (HP VALVES) MAT 9-10% Cr		QVM-Q-	ACCIAIERIA FONDERIA CIVIDALE	ITALY	A	QP APPROVAL REQD. FOR STARWIRE, ISGEC and CFFP ONLY
				JAPAN STEEL WORKS LTD.	JAPAN	A	
				JAPAN CASTING AND FORGING	JAPAN	A	



72

20

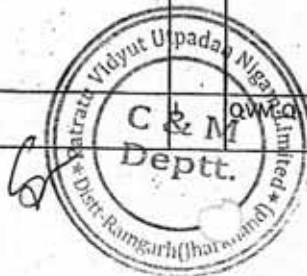
*Signature*  
05.04.17

				HANWA CO. LTD. (MANUFACTURER: UBE STEELS, JAPAN)	JAPAN	DR	
				SANDE STAHLGUSS GMBH	GERMANY	A	
				LITOSTROJ STEEL LTD.	SLOWENIA	DR	
				STAR WIRE (INDIA) LTD.	BALLABHAGARH	A	
				CFFP, BHEL	Haridwar	A	
13	ESV & CV CASING (HP VALVES) M/C	I	QVM-Q-	-HEEP + NTPC approved sub-vendors	Haridwar	A	
				-Energy Machines	Ahemdabad	A	
14	CASTING FOR DIFFUSER / HP VALVE COVER / OVERLOAD VALVE CASING	II	QVM-Q-	INOSSMAN FONDERIE ACCIAIO MANI	ITALY	A	(QP APPROVAL REQD. FOR STARWIRE, ISGEC and CFFP ONLY)
				VOESTALPINE GIESSEREI TRAISEN	AUSTRIA	A	
				EMIRATES TECHNO CASTING FZE	SHARJAH	DR	
				LUCCHINI RS S.P.A.	ITALY	DR	
				THE JAPAN STEEL WORKS LTD.	JAPAN	A	
				JAPAN CASTING AND FORGING	JAPAN	A	
				SCHMOLZ + BICKENBACH GUSS GMBH	GERMANY	DR	
				STAHLGUSS SAAR GMBH	GERMANY	DR	
				GODDWIN STEEL CASTINGS LTD.	UK	DR	
				PEEKAY STEEL CASTINGS PVT LTD	CALICUT	DR	
				ISGEC HEAVY ENGINEERING LTD	MUZZAFANAGAR	A	
				LITOSTROJ STEEL LTD.	SLOWENIA	A	
				STAR WIRE (INDIA) LTD.	BALLABHAGARH	A	
				CFFP, BHEL	Haridwar	A	
15	HP VALVE ASSEMBLY	I	QVM-Q-	- HEEP	Haridwar	A	
16	HP JOINT BOLTS	I	QVM-Q-	- HEEP + NTPC approved sub-vendors #	Haridwar	A	#REFER NOTE 3
17	HP TURBINE ASSLY	I	QVM-Q-	-HEEP	Haridwar	A	
18	STEAM INLET / BREECH BLOCK / INLET CONNECTION / OVERLOAD CONNECTION / VALVE COVER / ALL RINGS & FORGINGS MAT 9-10%Cr	II	QVM-Q-	STARWIRE	Ballabhgarh	A	QP APPROVAL REQD. FOR CFFP ONLY AND FOR OTHERS BHEL APPROVED QAP TO BE FOLLOWED
				KISAAN STEEL	GHAZIABAD	DR	
				CHW FORGE	GHAZIABAD	A	
				GOODLUCK ENGINEERING	GHAZIABAD	DR	
				CFFP, BHEL	Haridwar	A	
				MIDHANI	HYDERABAD	A	
				BAY FORGE	Chennai	A	
				FORGITAL	ITALY	A	
				BOHLER	AUSTRIA	A	
19	FORGING FOR THREADED RING / SHAFT SEAL RING / RING / EXTRACTION INSERT / FLANGE MAT 1Cr 1Mo	II	QVM-Q-	MACKEL ISPAT AND FORGINGS LTD	INDIA	DR	QP APPROVAL REQD. FOR CFFP ONLY AND FOR OTHERS BHEL APPROVED QAP TO BE FOLLOWED
				STAR WIRE (INDIA) LTD.	Ballabhgarh	A	
				KISAAN STEELS (PVT.) LTD.	GHAZIABAD	A	
				CHW FORGE (P) LTD	GHAZIABAD	A	
				GOOD LUCK ENGINEERING CO.	GHAZIABAD	A	
				GHAZIABAD FORGINGS PVT LTD	GHAZIABAD	DR	
				R. D. FORGE	GHAZIABAD	DR	
				CFFP, BHEL	Haridwar	A	



*Signature*  
05.04.17

				VISHNU FORGE	Bangalore	A		
				RING FORGINGS PVT LTD	Bangalore	DR		
				GHAZIABAD ISPAT UDYOG LTD.	GHAZIABAD	DR		
				VIKRANT FORGE LIMITED	KOLKATA	DR		
				BAY-FORGE LIMITED	Chennai	A		
				FORGITAL ITALY S.P.A.	ITALY	A		
20	IP OUTER CASING CASTING (NODULAR CASTING)	II	QVM-Q-	HANWA CO. LTD. (MANUFACTURER: UBE STEELS, JAPAN)	JAPAN	DR	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP)	
				FRIEDRICH WILHELM-HUETTE EISEN(BUDERGUSS)	GERMANY	A		
				ERGOCAST GUSS GMBH	GERMANY	A		
				SPEZIALGUSS WETZLAR GMBH	GERMANY	A		
				ACCIAIERIA FONDERIA CIVIDALE	ITALY	A		
				DALIAN HUARUI HEAVY INDUSTRY	CHINA	A		
				ISGEC HEAVY ENGINEERING LTD	Mujaffarnagar	DR		
				KOCEL MACHINERY CO. LTD	CHINA	DR		
								VENDOR QP REQUIRED ONLY FOR M/s ISGEC
21	IP OUTER CASING M/C	I	QVM-Q-	- HEEP	Hardwar	A		
				- Rossi And Duso	Italy	A		
				-MCE (New name BILFINGER MASCHINENBAU GMBH )	Austria	A		
				-Bruno Presezzi	Italy	A		
				-Nugo Romano	Italy	A		
22	IP INNER CASING CASTING (9% Cr)	I	QVM-Q-	ACCIAIERIA FONDERIA CIVIDALE	ITALY	DR	NO SEPARATE VENDOR QP EXCEPT FOR CFFP	
				THE JAPAN STEEL WORKS LTD.	JAPAN	A		
				JAPAN CASTING AND FORGING	JAPAN	A		
				SIEMENS AG	GERMANY	DR		
				VOESTALPINE GIESSEREI LINZ	AUSTRIA	A		
				ISGEC HEAVY ENGINEERING LTD	MUJAFFARNAGAR	DR		
				CFFP,BHEL	Hardwar	A		
23	IP INNER CASING M/C	I	QVM-Q-	HEEP	Hardwar	A		
				Rossi And Duso	Italy	A		
				MCE	Austria	A		
				(New name: BILFINGER MASCHINENBAU GMBH )				
				Bruno Presezzi	Italy	A		
				Nugo Romano	Italy	A		
24	IP ROTOR FORGING 9-10% Cr	II	QVM-Q-	SDF .TERNI	Germany	A	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP)	
				JAPAN CASTING AND FORGING,JAPAN	Italy	A		
				SAARSCHMIEDE GMBH, GERMANY	Japan	A		
				THE JAPAN STEEL WORKS LTD.,	JAPAN	A		
25	IP TURBINE SHAFT M/C	I	QVM-Q-	- HEEP	Hardwar	A		
				- Rossi And Duso	Italy	A		
				-Bruno Presezzi	Italy	A		
				-Nugo Romano	Italy	A		
				-Siemens AG	Germany	A		
26	IP TURBINE ROTOR		QVM-Q-	Siemens AG Energy Sector	GERMANY	A		
				HEEP	Haridwar	A		



20

This is a Part of Technical Specification No. PE-TS-475-155-A001

27	IP STATIONARY & MOVING BLADES BAR STOCK	II	QVM-Q-	Böhler	Austria	A	NO SEPARATE VENDOR QP A*: ONLY FOR HW10687 & HW10786
				Walzwerke	Germany	A	
				Metal Ravne	Slovenia	A	
				Starwire	Ballabgarh	A	
				Kalyani Carpenter BGH	Pune	A*	
28	IP STATIONARY & MOVING BLADES (M/C)	II	QVM-Q-	Leistriz-Nürnberg	Germany	A	
				EnergietechnikEinsal	Germany	A	
				Wuxi Turbine Blade	China	A	
				Officine Meccaniche Zema	Italy	A	
				Wiromet	Poland	A	
				CMSNC Di Menegazzi	Italy	DR	
				Praewest Praezisionswerkstaett	Germany	DR	
				HEEP	Hardwar	A	
				Siemens Ltd	India	DR	
				Euroflex Transmissions (India) Pvt. Ltd.	Hyderabad	DR	
				29	IV CV VALVE CASING (MAT) 9-10 %Cr	I	
ACCIAIERIA FONDERIA CIVIDALE	ITALY	A					
LUCCHINI RS S.P.A.	ITALY	DR					
THE JAPAN STEEL WORKS LTD.	JAPAN	A					
JAPAN CASTING AND FORGING	JAPAN	A					
HANWA CO. LTD. (MANUFACTURER: UBE STEELS, JAPAN)	JAPAN	DR					
SCHMOLZ + BICKENBACH GUSS GMBH	GERMANY	DR					
STAHLGUSS SAAR GMBH	GERMANY	DR					
ISGEC HEAVY ENGINEERING LTD	MUJAFFARNAGAR	A					
LITOSTROJ STEEL LTD.	Slovenia	DR					
STAR WIRE (INDIA) LTD. CFFP, BHEL	Ballabgarh	A					
30	IV CV CASING M/C	I	QVM-Q-	- HEEP	Haridwar	A	
				- Energy Machines	Ahmedabad	A	
				- Siemens AG Energy Sector	Germany	A	
31	IV CV VALVE ASSEMBLY	I	QVM-Q-	- HEEP	Hardwar	A	
32	IP JOINT BOLTS	I	QVM-Q-	- HEEP + NTPC approved sub-vendors #	Hardwar	A	# REFER NOTE 3
33	IP TURBINE ASSLY	I	QVM-Q-	- Siemens AG Energy Sector	Germany	A	
				HEEP	HARIDWAR	A	
34	IP SHAFT SEALING RING			- HEEP + NTPC approved sub-vendors #	Hardwar	A	# REFER NOTE 3
35	LP TURBINE SHAFT FORGING	II	QVM-Q-	UMP TRADING S.A. (SUPPLY THRU ENERCOMASH, UKRAINE)	SWITZERLAND	DR	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP)
				SDF TERNI	Italy	A	
				THE JAPAN STEEL WORKS LTD., JAPAN	Japan	A	
				JAPAN CASTING AND FORGING, JAPAN	Japan	A	
				SAARSCHMIEDE GMBH, GERMANY	GERMANY	A	
				CHINA FIRST HEAVY INDUSTRIES, CHINA	CHINA	DR	
SC DOOSAN IMGB SA, ROMANIA	ROMANIA	DR					



76



PO

*Signature*  
05.04.17

				CHINA NATIONAL ERZHONG GROUP, CHINA	CHINA	DR	
				SHANGHAI HEAVY MACHINERY PLANT, CHINA	CHINA	DR	
36	LP TURBINE SHAFT M/C	I	QVM-Q-	- HEEP	Hardwar	A	
				- Rossi And Duso	Italy	A	
				- Nugo Romano	Italy	A	
				- Siemens AG	Germany	A	
37	LP TURBINE ROTOR	I	QVM-Q-	HEEP	Haridwar	A	
38	LP INNER CASING FABRICATION	I	QVM-Q-	- HEEP + NTPC approved sub-vendors#	Haridwar	A	# REFER NOTE 3
39	LP INNER CASING M/C	I	QVM-Q-	- HEEP + NTPC approved sub-vendors#	Haridwar	A	# REFER NOTE 3
40	LP INNER CASING ASSLY	I	QVM-Q-	- HEEP	Haridwar	A	
41	CASING UPPER PART, CASING SIDE WALL (L&R), FRONT WALL (TS&GS)	I	QVM-Q-	- HEEP + NTPC approved sub-vendors#	Haridwar	A	# REFER NOTE 3
42	GUIDE BLADE CARRIER (1L & 1R)	I	QVM-Q-	- HEEP + NTPC approved sub-vendors#	Hardwar	A	# REFER NOTE 3
43	LPT COMPENSATORS	I	QVM-Q-	BOA Bellows and expansion joints	Germany	A	
				Flexatherm expanllow Pvt.Ltd.	VADODRA	A	
				SHANGHAI YONGXIN CORRUGATE PIPE CO LTD	CHINA	A	
				Lonestar Industries	Chennai	A	
				NANTONG SHUGUANG EXPANSION JOINT	CHINA	DR	
				Belman A/S	Denmark	DR	
				Siemens Umited	India	DR	
44	COMPENSATOR PIPING (LP CROSS OVER PIPE, LP EXTRACTION PIPING A1, A2, A3, LP SHAFT SEAL COMPENSATOR, LPT COMPENSATOR FOR CASING	I	QVM-Q-	HATEC HAAG- TECHNISCHER HANDEL	Germany	A	
				LONESTAR INDUSTRIES	India	A	
				SHANGHAI YONGXIN CORRUGATE PIPE CO LTD	CHINA	A	
				UNITECH MACHINES LTD	India	DR	
45	LP STATIONARY/ MOVING BLADE BARS	II	QVM-Q-	- Böhler	Austria	A	NO SEPARATE VENDOR QP A*: ONLY FOR HW10687 & HW10786
				- Walzwerke	Germany	A	
				- Metal Ravne	Slovenia	A	
				-Starwire	Ballabhgarh	A	
				- Kalyani Carpenter	Pune	A*	
				BGH	GERMANY	A	
46	LP ROTOR & CASINGS BLADES FROM BAR (M/C)	I	QVM-Q-	- Leistriz-Nürnberg	Germany	A	
				- Energietechnik Einsal	Germany	A	
				- Wuxi Turbine Blade	China	A	
				Officine Meccaniche Zema	Italy	A	
				Wromet	Poland	A	
				CMCNC Di Menegazzi	Italy	DR	
				HEEP	Hardwar	A	
47	LP CAST BLADES (CASTED)	I	QVM-Q-	- Consolidated Precision Product	Belgium	A	



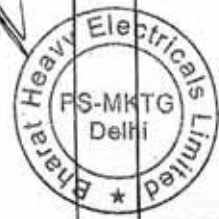
77



20

Handwritten signature and date: 05.04.17

				- PTC	Mehsana	A	
				- IPCL	Bhavnagar	A	
				- PCI Ltd	India	DR	
48	LP BLADES (HOLLOW)	I	QVM-Q-	- Binder	Switzerland	A	
				- Cave	Italy	DR	
				- Wuxi Turbine Blade	China	A	
				- Prime Hitech Engineering Ltd	India	A	
				- VRK Industries	India	DR	
49	LP FORGED BLADES (DROP)	II	QVM-Q-	- Wuxi	China	A	NO SEPARATE VENDOR QP (ALREADY COVERED IN NTPC APPROVED BHEL MQP)
				- C Blade	Italy	A	
				- Pietro Rosa	Italy	A	
				- Siemens Ltd	Gurgaon	DR	
				- Bohler	Austria	A	
50	LP FORGED BLADES (DROP) M/c	II	QVM-Q-	- Pietro Rosa	Italy	A	
				- Wuxi Turbine Blade	China	A	
				- C Blade	Italy	A	
				- Bohler	Austria	A	
				- Siemens Ltd	Gurgaon	DR	
51	LP ASSEMBLY	I	QVM-Q-	- BHEL	Hardwar	A	
52	COUPLING BOLTS & NUTS (HP/IP/LP)	I	QVM-Q-	- HEEP + NTPC approved sub-vendors #	Hardwar	A	# REFER NOTE 3
53	BRG. SHELL FOR JOURNAL BRG (Forging)	II	QVM-Q-	MACKEL ISPAT AND FORGINGS LTD	KOLKATA	DR	NO SEPARATE VENDOR QP EXCEPT FOR CFFP
				STAR WIRE (INDIA) LTD.	Ballabgarh	A	
				KISAAN STEELS (PVT.) LTD.	GHAZIABAD	A	
				CHW FORGE (P) LTD	GHAZIABAD	A	
				GOOD LUCK ENGINEERING CO.	GHAZIABAD	A	
				GHAZIABAD FORGINGS PVT LTD	GHAZIABAD	DR	
				R. D. FORGE	GHAZIABAD	DR	
					HARIDWAR	DR	
				CFFP, BHEL			
				VISHNU FORGE INDUSTRIES LTD.	Bangalore	A	
				RING FORGINGS PVT LTD	Bangalore	DR	
				GHAZIABAD ISPAT UDYOG LTD.	GHAZIABAD	DR	
				VIKRANT FORGE LIMITED	KOLKATA	DR	
				BAY-FORGE LIMITED	TAMIL NADU	A	
54	JOURNAL BEARING	II	QVM-Q-	DAEDONG METAL INDUSTRY CO. LTD	South Korea	DR	
				EURO BEARINGS SRL	Italy	A	
				GFM S.R.L. (SOCIO UNICO)	Italy	DR	
				JOHN CRANE BEARING TECHNOLOGY	Germany	A	
				OMEGA INDUSTRIES (P) LTD	Bhopal	A	
				SHENKE SLIDE BEARING CORPORATI	China	DR	
				SIEMENS LIMITED	India	DR	(Main supplier ; Siemens Germany)
				HEEP	HARIDWAR	A	
				TURBOLINK CO.LTD	Korea	DR	



78

Handwritten signature/initials.

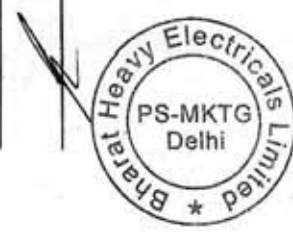
Handwritten signature and date: 03.04.17

Handwritten initials: NO

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

55	BEARING PEDESTAL WITH COVER (M/C)	I		- HEEP + NTPC approved sub-vendors	Hardwar	A	
56	EHA FOR TURBINE VALVES	II	QVM-Q-	- Bosch Rexroth AG - Horst Thiele Maschinenbau	Germany Germany	A DR	
57	HPSU FOR EHA	II	QVM-Q-	- Bosch Rexroth	Germany*	A	*Supply from Bosch Rexroth Sanand Gujrat
				- Hydac	Germany	A	
				-Reineke Mess-und Regeltechnik	Germany	DR	
				-Keicher Engg	Germany	DR	
58	NON RETURN VALVE-CRH	I	QVM-Q-	- Sempell	Germany	A	
				- BHEL	Tiruchi	A	
59	AIR COOLED CONDENSOR (Sub-QR Item)	I	QVM-Q-	SPX, Dry Cooling	BELGIUM	A	
				Shuanliang,Eco-Energy System Co. Ltd. JIangsu	CHINA	A	
				Harbin Air Conditioning Co. Ltd	CHINA	A	
				Enexio Germany GmbH	GERMANY	A	
				Beijing Shouhang Resources Saving Co. Ltd	CHINA	A	
				SPIG SPA	ITALY	DR	
				Enexio Cooling Tower Technologies(India) Pvt Ltd	INDIA	DR	
				Paharpur Cooling Tower	INDIA	DR	
				Innospin AG	Switzerland	DR	
				Beijing Longyuan Cooling Technologies	CHINA	DR	
				Hamon Shriram Cottrell	INDIA	DR	
				Hamon Cooling System (Tianjin) Co., Ltd.	CHINA	DR	
				Luoyang LONGHUA Heat Transfer & Energy saving conser	CHINA	DR	
				HHI, China	CHINA	DR	
60	CONDENSOR AIR EVACUATION PACKAGE	I	QVM-Q-	Gardner Denver Nash Machinery	CHINA	A	
				Edwards Ltd	UK	A	
				Guangdong Foshan Pump Factory, Guangdong	CHINA	A	
61	LP HEATER TUBES	I	QVM-Q-	- Apex Tubes Pvt Ltd	India	A	
				Ratgamani	Ahmedabad& Kutch	A	
				NEOSISS LTD (OLD NAME: Vallourec Heat Exchanger Tubes Limited)	Hyderabad	A	
				- Renli B	Mumbai	A	

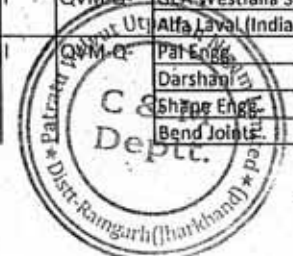
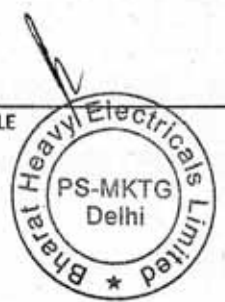
79



20

*Signature*  
050417

				- Ratandeep	Ahmedabad	A	
				MAXIM TUBES CO. LTD	GUJRAT	DR	
				- Heavy Metals	Ahmedabad	DR	
62	GSC TUBES	I	QVM-Q-	- Ratnamani	Ahmedabad & Kutch	A	
				NEOTISS LTD (OLD NAME: Vallourec Heat Exchanger Tubes Limited )	Hyderabad	A	
				- Remi	Mumbai	A	
				- Ratandeep	Ahmedabad	A	
				- Heavy Metals & Tubes	Ahmedabad	DR	
				- Apex Tubes Pvt Ltd	BEHROR	A	
				- Quality Stainless	HISAR	DR	
				- Bhandari Foils & Tubes	DEWAS, MP	DR	
				- Prakash Steelage	Mumbai	DR	
65	GLAND STEAM CONDENSER	I	QVM-Q-	- HEEP + NTPC approved sub-vendors#	Hardwar	A	# Refer Note 3
66	LP HEATER	I	QVM-Q-	- HEEP + NTPC approved sub-vendors#	Hardwar	A	# Refer Note 3
67	TURBINE INTEGRAL PIPING	I	QVM-Q-	BHEL Piping Centre	Chennai	A	A* means as per approval conditions
				Unitech	Saharanpur	A	
				Bend Joints	Bhopal	A	
				Pal Engg.	Yamunanagar	A	
				Dee Development	Faridabad	A	
				Flash Forge Pvt Ltd	Vishakhapatnam	DR	
				BABY ENGINEERING PVT LTD	TRICHY	DR	
				S & G ENGINEERS PVT LTD	Faridabad	DR	
				GUJRAT INFRA PIPES	BARODA	A*	
				Steel Craft Industries	Yamunanagar	DR	
68	OIL MODULE	II	QVM-Q-	Kelag	Switzerland	A	Centrifuge from Germany
				VDL Delmas	Germany	A	
				BARIC	UK	A	
				Hydac India Pvt Ltd	Navi Mumbai	DR	
				AEL	Germany	A	
				Flenco	Italy	A	
				Hydac	Germany	A	
				King Dynamics	Switzerland	A	
				SEA Westfalia Sperator	Bangalore	A	
				Alfa Laval (India)	Pune	A	
69	OIL PURIFICATION SYSTEM	I	QVM-Q-	Pal Engg.	Yamunanagar	A	
70	HANGERS & SUPPORT (Fabricated Type)	I	QVM-Q-	Darshani	Yamunanagar	A	
				Shree Engg.	Haridwar	A	
				Bend Joints	Bhopal	A	



*Signature*  
05.04.17

				Shape Engg.	Haridwar	A	
				Bend Joints	Bhopal	A	
				Spring Supports Mfg co.	HOWRAH	DR	
				Pipe Supports Co.	Hyderabad	DR	
				Hesterberg Gmbh & Co. Kg	Germany	DR	
				Fast Tech Engineers Pvt. Ltd.	India	DR	
				Bergen Pipe Supports India Pvt Ltd	Chittor, AP	A	
				AAA SUPPORTS PVT LTD	VADODRA	DR	
				Unison Etech	Korea	DR	
71	LP BYPASS SYSTEM	II	QVM-Q-	- CONTROL COMPONENT INDIA PRIVATE LTD.	SRICITY, AP INDIA	A	SUB QR ITEM
				- Bomafa	Germany	A	
				- Welland & Tuxhorn	Germany	A	
				- Parcol S.P.A	Italy	DR	
72	THERMAL INSULATION MATERIAL FOR TURBINE	III	QVM-Q-	Heinrich Tapp Gmbh	Germany	A	
		III		Eugen Arnold Gmbh	Germany	A	
		I		Lloyds Insulations (India) Ltd	India	DR	
73	THERMAL INSULATION MATERIAL FOR TIP	I	QVM-Q-	Lloyds Insulation	India	A	
		I		SHREE ENGINEERS	INDORE	DR	
		I		Indo Bell Insulation (Applicator)	India	DR	
74	VARIABLE LOAD SPRING CAGES	I	QVM-Q-	- Spring Support	Kolkata	A	
		III		- Liseqa	Germany	A	
		II		- Dee Development	India	DR	
		II		- Pipe Supports Co	Hyderabad	DR	
		I		- Bergen Pipe Supports India Pvt Ltd	Chittor, AP	A	
		II		AAA SUPPORTS PVT LTD	VADODRA	DR	
		II		-Unison Etech	Korea	DR	
75	GLAND STEAM EXHAUSTER WITH MOTOR	I	QVM-Q-	Air MOVEMNET AND CONTROL SYSTEMS	India	DR	
				SK System PVT LTD	India	A	
				DUSTECH ENGINEERS PVT LTD		DR	
				CB Doctor	India	A	
79	HP U-SEAL (NIMONIC) RING FORGING	III	QVM-Q-	SMT EXPORT (M/S FRISA FORJADOS, MEXICO)	INDIA	DR	
				MIDHANI	INDIA	A	
				WARTON IMPORT (M/S SHANGHAI TENGHUI, CHINA)	China	DR	
				FORGITAL	Italy	A	
80	STELUTED/COATED FINISH MACHINED VALVE SEAT / VALVE CONE / VALVE SPINDLE / DIFFUSER	I	QVM-Q-	Sal Surface coating	India	A	QP APPROVAL REQD. FOR INDIAN VENDORS ONLY
		III		Kenametal Stellite GMBH	Germany	A	
		III		Stellba AG	Germany	A	
		I		ATS Techno Pvt. Ltd.	Ahmedabad	A	
		I		Associated Plasmatron Pvt.Ltd.,	THANE	A	
		I		ASM Thermal Spray,	Medak, Telangana	DR	

NOTE 1: IN ADDITION TO ABOVE SOURCES BHEL MAY PURCHASE ITEMS FROM SIEMENS, SIEMENS APPROVED SOURCES . BHEL TO SUBMIT DOCUMENTS IN SUPPORT OF SIEMENS APPROVED SOURCE.

NOTE 2: QP/INSPECTION CAT-I QP APPROVAL AND INSPECTION BY NTPC; QP/INSPECTION CAT-II QP APPROVAL BY NTPC, NO PHYSICAL INSPECTION BY NTPC. ACCEPTANCE BASED ON REVIEW OF CONTRACTOR INSPECTION REPORT/ ITC. : QP/INSPECTION CAT-III NO QP APL AND INSPECTION BY NTPC. ACCEPTANCE



Handwritten signature and date: 05.04.17

This is a Part of Technical Specification No. PE-TS-475-155-A001

BASED ON REVIEW OF COC BY BHEL.

NOTE 3: MQP APPROVED FOR BHEL HARIDWAR SHALL BE USED ON SUB-VENDOR'S WORKS. FABRICATION AND MACHINING VENDORS FOR BHEL TURBINE COMPONENTS AS PER ANNEXURE XXX

*Handwritten initials*

*Handwritten initials*

*Handwritten signature and date: 05.04.17*



SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

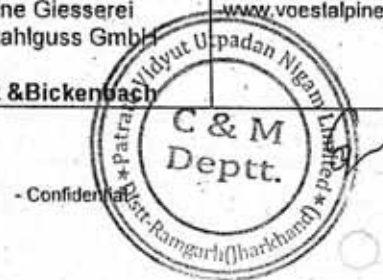
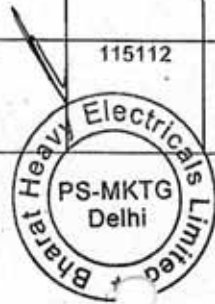
15.1 Sub Suppliers Steam Turbine

Items and their potential Sub Supplier's

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
1	HP OUTER CASING CASTING EXHAUST	II	111130	Voestalpine Giesserei Lucchini Sande Stahlguss GmbH Gröditz Stahlguss Schmolz und Bickenbach	www.voestalpine.com/foundry_linz Austria Italy Germany Germany Germany	A A* A A A*
2	HP OUTER CASING CASTING INLET	II	111122	Voestalpine Giesserei Sande Stahlguss GmbH	www.voestalpine.com/foundry_linz Austria Germany	A DR
3	HP OUTER CASING EXHAUST M/C	I	111360	Siemens AG EnergySector MCE Voest Horst Jung Leipert Ludwig Lehner Hans Richter GmbH	Germany Austria Germany Germany Germany Germany	A A A* A A* A*
4	HP OUTER CASING INLET M/C	I	111355	Siemens AG EnergySector MCE Voest Horst Jung Leipert	Germany Austria Germany Germany	A A A* A
5	HP INNER CASING CASTING	II	115112	Voestalpine Giesserei Sande Stahlguss GmbH Lucchini Schmolz & Bickenbach	www.voestalpine.com/foundry_linz Austria Germany Italy Germany	A A DR DR

83

Siemens Power & Gas



*SK Chauhan*  
*Bhilai, Raichand*

*Siemens AG*  
*Tim Aguin*  
*Tully*

**SIEMENS**

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks	
6	HP INNER CASING M/C LP stationary casings only	I	115310	Siemens AG Energy Sector Siemens AG Energy Sector MCE Voest Horst Jung Leipert Hans Richter GmbH	GermanyUS A Austria Germany Germany Germany	A DR A A* A A*	
7	HP TURBINE SHAFT FORGING	II	121101	Saarschmiede S.d.F.Terni JSW (Japan steel works JCFC (Japan Casting&Forging Corp.) Schmiedewerke Gröditz	www.saarschmiede.com www.fucineterni.it www.jsw.co.jp www.jcfc.jp www.stahl-groeditz.de	Germany Italy Japan Japan Germany	A A A A A*
8	HP TURBINE SHAFT M/C	II I	121390	Siemens AG Energy Sector Siemens AG Energy Sector	Germany USA	A DR	
9	HP TURBINE ROTOR	I	121390	Siemens AG Energy Sector Siemens AG Energy Sector	Germany USA	A DR	
10	HP/ IP STATIONARY & MOVING BLADES BAR STOCK	II	131100	Böhler Einsal Metalravne	Austria Germany Slovenia	A A A*	

84

Siemens Power & Gas



- Confidential -



Page: 2 of 13

Appendix B, Page 84 of 278

RO

SIEMENS

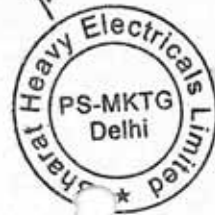
BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
11	HP/ IP STATIONARY & MOVING BLADES (M/C)	II	131300	SET Leistriz-Nürnberg Energietechnik Einsal	Hungary Germany Germany	A A A
		I			www.turblade.com	
12	ESV & CV CASING (HP VALVES) MAT IVCV (IP VALVES) Casing	II	141111	Sande Stahlguss Voestalpine Giesserei	Germany Austria	A A
		I			www.voestalpine.com/foundry_linz	
	ESV & CV CASING (HP VALVES) M/C IVCV Casing (IP VALVES) M/c	I	141340	Siemens Energy Sector	Germany	A
13	HP VALVE ASSEMBLY IVCV Valve Assembly	I	145401	Siemens AG Energy Sector	Germany	A
14	HP JOINT BOLTS	I	165220	Stahlberg GmbH	Germany	A
15	HP TURBINE ASSLY	I	199420	Siemens AG Energy Sector	Germany	A
15A	HP U SEAL	II	148353	Siemens AG Energy Sector Rosswag Kind & Co Deloro Metal Ravne	Germany Germany Germany Germany Slovenia	N (for all)
					www.edelstahl-rosswag.de www.kind-o.de/kc_2010/index.html www.stellite.de	

85

Siemens Power & Gas



*Signature*

*Signature*

SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
15B	BREACH NUT	III	188300	Siemens AG Energy Sector Rosswag Kind & Co KST Stellba Deloro Metal Ravne	Germany Germany Germany Germany Switzerland Germany Slovenia	N (for all)
15C	HP SUPPORT & THRUST RING	III	188300	Siemens AG Energy Sector Rosswag Kind & Co KST Stellba Deloro Metal Ravne	Germany Germany Germany Germany Switzerland Germany Slovenia	N (for all)
15D	HP INLET INSERT CASTING & HP EXHAUST FLANGE	II	188300	Siemens AG Energy Sector Rosswag Kind & Co KST Stellba Deloro Metal Ravne	Germany Germany Germany Germany Switzerland German Slovenia	N (for all)
15E	SEALING RING	III	162302	Siemens AG Energy Sector Rosswag Kind & Co KST Stellba Deloro Metal Ravne	Germany Germany Germany Germany Switzerland Germany Slovenia	N (for all)



*Handwritten signatures and initials.*

96

Siemens Power & Gas

# This is a Part of Technical Specification No. PE-TS-475-155-A001

**SIEMENS**

**BHEL / NTPC Limited**  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
15F	HP SHAFT SEALING RING	III	162304	Siemens AG Energy Sector Rosswag Kind & Co KST Stellba Metal Ravne	Germany Germany Germany Germany Switzerland Slovenia	N (for all)
16	IP OUTER CASING CASTING	II	111110	Buderus Guss Siempelkamp Heidenheimer Giesserei Friedrich Wilhelm Hütte Cividale Ergocast	Germany Germany Germany Germany Italy Germany	A A A A A A
17	IP OUTER CASING M/C	II	111345	MCE-MAP Siemens AG Energy Sector G.M.W. Präzisions GmbH Leipert	www.mce-map.com Austria Germany Germany Germany	A (for all)
18	IP INNER CASING CASTING	II	112100	Voestalpine Giesserei Sande Stahlguss	Austria Germany	A DR
19	IP INNER CASING M/C	II	112330	MCE-MAP Siemens AG EnergySector Horst Jung Leipert Ludwig Lehner Hans Richter GmbH	www.mce-map.com Austria Germany Germany Germany Germany Germany	A A A* A A* A*

ts

Siemens Power & Gas



*See*

Page: 5 of 14

*20*

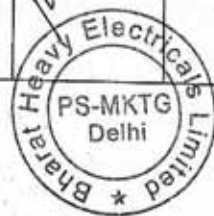
SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer			
Ref. No.	Section	Title	
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	
			Rev. No. Date
			00 Oct.2016

The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
20	IP ROTOR FORGING	II	121101	Saarschmiede S.d.F.Terni Doosan JSW (Japan steel works) JCFC (Japan Casting&Forging Corp.) Schmiedewerke Gröditz Doosan IMGB Buderus Edelstahl Pilsen Steel	Germany Italy Korea Japan Japan  Germany Romania Germany Czech Rep.	A A DR A A  DR DR DR DR
21	IP TURBINE SHAFT MC	I	121390	Siemens AG Energy Sector Franco Tosi PG-P1 Charlotte	Germany Italy USA	A A DR
22	IP TURBINE ROTOR	I	121390	Siemens AG Energy Sector PG-P1 Charlotte	Germany USA	A DR
27	IP JOINT BOLTS	I		Stahlberg Zapp Mechanical	Germany Poland	A A
28	IP TURBINE ASSLY	II	199410	Siemens AG Energy Sector	Germany	A
28A	IP THREADED RING	III	148341 oder 148351 gepanzert	Siemens AG Energy Sector Rosswag Kind & Co Stellba Deloro Metal Ravne	Germany Germany Germany Switzerland Germany Slovenia	N (for all)



88

Siemens Power & Gas

*Handwritten signatures and initials.*

SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
28B	IP ANGLE SEALING RING	III	148344	Siemens AG Energy Sector Rosswag Kind & Co Stellba Delorox Metal Ravne	Germany Germany Germany Switzerland Germany Slovenia	N (for all)
28C	IP INLET CONNECTIONS IP INLET INSERT	II	188300	Siemens AG Energy Sector Rosswag Kind & Co Stellba Deloro Metal Ravne	Germany Germany Germany Switzerland Germany Slovenia	N (for all)
28D	IP SHAFT SEALING	III	162304	Siemens AG Energy Sector Rosswag Kind & Co Stellba Deloro Ubruek Metal Ravne Cress	Germany Germany Germany Switzerland Germany Netherlands Slovenia	N (for all)
29	LP TURBINE SHAFT FORGING	II	121151	Saarschmiede S.d.F.Terni Doosan JSW (Japan steel works JCFC (Japan Casting&Forging Corp.) Schmiedewerke Groditz Doosan IMCB	Germany Italy Korea Japan Japan  Germania Romania	A A DR A A  DR DR



Handwritten signatures and initials.

89

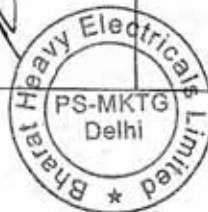
SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks	
30	LP TURBINE SHAFT M/C	II I	121370	Siemens AG Energy Sector Siemens AG Energy Sector	Germany USA	A DR	
31	LP TURBINE ROTOR	I	121370	Siemens AG Energy Sector Siemens AG Energy Sector	Germany USA	A DR	
32	LP INNER CASING-I Casted Design	I	115130	Buderus Guss Siempelkamp Heidenheimer Giesserei Torgelow Eisengiesserei	Germany Germany Germany Germany	A A A A	
	LP INNER CASING-I Fabricated Design	I	115130	PT Siemens Indonesia T+S Prämab Popeci Dalian Heavy Bor-Pol Zhoule	www.technologie-plus-service.de www.praemab-burg.de      http://shzhoule.com/en	Indonesia Germany Germany Romania China Poland China	A A A A* DR A DR
	LP INNER CASING- (M/C)	I	113365	Siemens AG Horst Jung GmbH MCE-MAP Siemens AG Energy Sector Rothenpieler Leipert	www.horst-jung.com www.mce-map.com	Germany Germany Austria Germany Germany Germany	A A* A A A A
34	LP INNER CASING- 1&2 ASSLY	I	199405	Siemens AG Energy Sector	Germany	A	
35	LP OUTER CASING (FRONT WALL, GIRDER, UPPER PART)	I	111220	Prämab T&S (Technologie+Service) PT Siemens Indonesia BOR-POL Ltd.	www.praemab-burg.de www.technologie-plus-service.de	Germany Germany Indonesia Poland	A A A A

Siemens Power & Gas



*Handwritten signature*

SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
36	GUIDE BLADE CARRIER (GUIDE BLADE RINGS)	I	161201	SET PTSI Coupe Foundries Ergocast Akdas Ningbo Riyue Foundry	Hungary Indonesia Great Britain Germany Turkey China	A A A A DR DR
37	LPT COMPENSATORS FOR CAP	II I	TLV 1501	Eickhoff Ha-Tec	<a href="http://www.iag-gmbh.de">www.iag-gmbh.de</a> <a href="http://www.hatecgmbh.de">www.hatecgmbh.de</a>	Germany Germany A A*
38	LP CROSS OVER PIPE	I	TLV 0805	T&S (Technologie+Service) Eickhoff EHR (Essener Hochdruck Rohrleitungsbau) Ha-Tec	<a href="http://www.technologie-plus-service.de">www.technologie-plus-service.de</a> <a href="http://www.iag-gmbh.de">www.iag-gmbh.de</a> <a href="http://www.essener-hochdruck.de">www.essener-hochdruck.de</a>	Germany Germany Germany A A A
39	LP STATIONARY/ MOVING BLADES FROM BAR	II	131120	Böhler Einsal Metalravne WTB	Germany Austria Germany Slovenia China	A N N N DR
	LP STATIONARY BLADES FROM BAR (M/C)	I	132300	SET Leistriz-Nürnberg Präwest Energietechnik Einsal ZEMA WTB	<a href="http://www.turbblade.com">www.turbblade.com</a>	Hungary Germany Germany Germany Italy China A A A A A A
40	LP CAST BLADES (CASTED)	II	131300	Zollern ESCO	Germany Belgium	A A
41	LP BLADES (HOLLOW)	II	131260	Binder	Switzerland	A

Siemens Power & Gas



*Handwritten signature*

SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2018
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
42	LP MOVING BLADES FROM BARS			Metal Raven Böhler Einsal	Slovenia Germany Germany	A A A
43	LP FORGED BLADES (DROP)	II	132150	WTB Böhler Leistriz Remscheid Sumitomo Pietro Rosa C-Blade Leistriz ATC	www.turblade.com www.bohler-edelstahl.com www.leistriz.com China Austria Germany Japan Italy Italy USA	A A A A A A A
			132373	WTB Böhler Leistriz Remscheid Sumitomo Pietro Rosa C-Blade Leistriz ATC FHI MIC Hong Yuan Forgging	www.turblade.com www.bohler-edelstahl.com www.leistriz.com China Austria Germany Japan Italy Italy USA Germany Germany China	A A A A A A A A* A* DR



92

SIEMENS

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks	
43	LP FORGED BLADES (DROP) M/c	II	132370	Pietro Rosa	Italy	A	
				Sumitomo	Japan	A	
				WTB	China	A	
				Menegazzi	Italy	A	
				Leistriz ATC	USA	A	
				Böhler	Austria	A	
				Leistriz Remscheid	Germany	A	
				C-Blade	Italy	A	
				FHI	Germany	A*	
				MIC	Germany	A*	
		I	132371	Pietro Rosa	Italy	A	
				Sumitomo	Japan	A	
				WTB	China	A	
				Menegazzi	Italy	A*	
				Leistriz ATC	USA	A	
				Böhler	Austria	A	
				Leistriz Remscheid	Germany	A	
				C-Blade	Italy	A	
				FHI	Germany	A*	
				MIC	Germany	A*	
	LP SHAFT SEALING RING	III	162304	Siemens AG Energy Sector Rosswag Kind & Co Stellba Deloro Ubruek Cross	www.edelstahl-rosswag.de www.kind-co.de/kc_2010/index.html www.stellba.ch/cms/index.php?lang=de www.stellite.de www.ubroek.nl	Germany Germany Switzerland Germany Netherlands	N (for.all)



**This is a Part of Technical Specification No. PE-TS-475-155-A001**

**SIEMENS**

BHEL / NTPC Limited  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
44	COUPLING BOLTS & NUTS (HP/IP/LP)	I	TLV	Stahlberg (solid bolts) Pilgrim (from Barh)	Germany	A A
45	BRG. SHELL FOR JOURNAL BRG (Forging)	II	TLV 2660 TLV	Eurobearings John Crane Bearing Technology Waukesha	www.eurobearings.com Italy Germany	N (for all)
46	BEARING SHELL & THRUST PAD M/C	II	TLV 2660 TLV	Eurobearings John Crane Bearing Technology Waukesha	www.eurobearings.com Italy Germany	N (for all)
47A	BEARING PEDESTAL WITH COVER (Casting)	II	TLV	BuderusGuss Ergocast Coupe Foundries Akdas Ningbo RiyueFoundry Siemens Eroemuetecnika Schuler Guss	www.guss.buderus.de Germany Germany Great Britain Turkey China Hungary Germany	N N N N N N
47B	BEARING PEDESTAL WITH COVER (M/C)			Siemens EroemuetecnikaKFT AGL Eurobearings	Hungary Germany Italia	N N
48	ELECTRO HYDRAULIC ACTUATOR (STEAM VALVES)	II	TLV 2100	Bosch Rexroth AG Thiele GmbH	www.boschrexroth.com www.thiele-hydraulik.de Germany Germany	A A*
	SERVOMOTOR & VALVE FOR CRH-NRV	II	TLV2005/ TLV2007 TLV 200	Sempel AG Weir Valves and Controls USA Inc.	www.sempell.com www.weirvalve.com Germany US	A A

QV

Siemens Power & Gas



*Handwritten signature*

**SIEMENS**

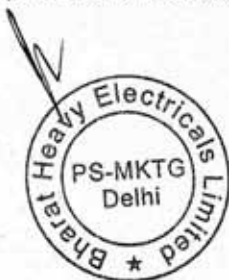
**BHEL / NTPC Limited**  
Patratu Stage I, 3x800 MW, SST5-6000 USC, India

Technical Offer				
Ref. No.	Section	Title	Rev. No.	Date
IN1141; Var.A.2.3.4; PG SU PRO EUS, CW.	15.1.0	Sub-Supplier-Steam-Turbine	00	Oct.2016
The information given in this section is not subject to verification and non fulfillment of it or incorrectness/incompleteness of such information is not subject to any kind of rights or remedies of the Customer whatsoever.				

SI No.	Item	Inspection Category	Siemens QP No.	Sub Supplier Name	Place	Remarks
69	THERMAL INSULATION	II		Tapp Isolation	Germany	N
70	PRESSED LP DIFFUSOR			Zhoule Bor-Pol	China Poland	DR A

Remarks

- A: Approved
- A\*: vendor experience with m/s Siemens Germany to be furnished for similar or higher rating turbine. In case of casting & forging new suppliers, the creep data to be furnished for review along with vendor experience.
- N: The m/s Siemens proposed vendor is accepted by NTPC based on m/s Siemens experience with the vendor for similar and higher rating items
- DR: vendor details including experience to be furnished

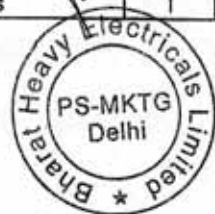


—————

95


**This is a Part of Technical Specification No. PE-TS-475-155-A001**

SUB VENDOR LIST FOR TG VALVES((TRICHY)						
PROJECT: PATRATU STPS (3 X 800 MW)						
PACKAGE: EPC						
CONTRACT NO: 9585-001-02						
Sno	Item Description	QP CAT	Proposed Sub Supplier	Place	BARH-Approval status / Cat	Remarks
1	HP BY PASS SYSTEM (SUB-QR ITEM)	I	BHEL	Trichy	DR	
		I	CCI	Sweden / Switzerland	A	
		I	Sempell AG	Germany	A	
		I	Hora	Germany	A	
		I	Welland & Tuxhorn	Germany	DR	
		I	Bopp & Reuther	Germany	A	
2	ACTUATORS	REFER C&I LIST ENCLOSED TO THE LOA/NOA				
3	CONVENTIONAL VALVES GATE GLOBE & NRV - ALL CLASS RATINGS	I	BHEL	Trichy	A	
		I	Meiwa (TOA)	Japan	A	TOA valves are offered thro M/S Meiwa
		I	Velan	Canada	A	
		I	Kokusai (OKANO)	Japan	A	OKANO valves are offered thro M/S Kokusai
		I	Babcock power Espana	Spain	A	
		I	Flow serve (Edward Valve)	USA	DR	Edward Valves are offered thro M/S Flowserve
		I	CRIS	France	DR	
		I	TYCO (Ramondi, Dewrance)	Chennai	A	(Ramondi & Dewrance are now with M/S Tyco)AS PER NTPC APPROVED RATING & SIZE
		I	Xomax Sanmar	Virallimalai	A	AS PER NTPC APPROVED RATING & SIZE
		I	L&T (Audco)	Chennai,Coimbatore	A	AS PER NTPC APPROVED RATING & SIZE
I	Leader Valves	Jalandar	A	AS PER NTPC APPROVED RATING & SIZE		
I	Fouress	Aurangabad	A	AS PER NTPC APPROVED RATING & SIZE		
I	Niton Valve	Mumbai,Aurangabad	A	AS PER NTPC APPROVED RATING & SIZE		
4	CRH-7,8,9 - DEAERATOR PEGGING VALVES	I	BHEL	Trichy	A	
		I	Babcock power Espana	Spain	A	
		I	Petrol Valve	Italy	A	
		I	L&T (Audco)	Chennai	DR	
		I	Leader	Jalandar	DR	
		I	Niton Valve	Mumbal	DR	
5	Extraction QCNRV's & CRHNRV's	I	BHEL	Trichy	DR	
6	Angle Valves / Angle Drain Valves	I	BHEL	Trichy	DR	



*Atadaw  
Amit Yadaw  
Mgt. / PS-MKTG.  
BHEL*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	<b>LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL</b>					Ref No.: 9585-001-02				
		<b>SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator</b>					Revision No.: 00				
							Date: 05.04.2017				
SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	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	REMARKS

1	BFP-PUMP CASING (OUTER) / BFP DISCHARGE COVER/ CASING COVER/ DISCHARGE NOZZLE	I	QVM-Q-301			PYUNG SAN METAL	KOREA	N			
		I				UMETOKU CO., LTD.,	JAPAN	N			
		I				MURABAYASHI	JAPAN	N			
		I				CFFP,	HARDWAR	N			
		I				RING MILL SPA,	ITALY	N			
		I				FOMAS	ITALY	N			
		I				HYUNJIN MATERIALS	JAPAN	N			
		I				HYUNJIN MATERIALS	KOREA	N			
		I				MYSKO	KOREA	N			
2	BFP PUMP CASING (INNER)	I	QVM-Q-301			HIMET	KOREA	N			
		I				WON KANG Material	KOREA	N			
		I				KOMATSU CASTEX	JAPAN	N			
		I				SIMPLEX CASTING Ltd	BHILAI	N			
		I				VOIST ALPINE	AUSTRIA	N			
		I				UP STEEL	MUZAFFAR NAGAR	N			
3	BFP SHAFT	I	QVM-Q-301			UMETOKU CO, LTD	JAPAN	N			
		I				DAIDO STEEL	JAPAN	N			
		I				KUSAKAWA TEKKOU	JAPAN	N			
		I				CFFP	HARDWAR	N			
		I				NISHO IWAI	JAPAN	N			
		I				FOMAS	ITALY	N			
		I				FORGIA RAPIDA	ITALY	N			
		I				MURABAYASHI(MIYAZ AKI TEKKOU)	JAPAN	N			
4	BFP BALANCE DRUM SPRING DISC	I	QVM-Q-301			FIRTH VICKERS		N			
		I				TAYLOR FORGING		N			

97

ENGINEERING DIV / QAI-NTPC,NOIDA




Page 1 of 20



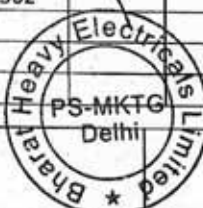

BHEL

*Chhataranjan Sank*  
BHEL HYD  
05.04.17

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	<b>LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL</b>	Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017
	<b>SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator</b>		

SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	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	REMARKS
		I				FIRTH RIXON RINGS LTD(FORMERLY AURORA FORGINGS)	UK	N			
5	BFP IMPELLERS/DIFFUSERS	I	QVM-Q-301			BHEL	HYDERABAD	N			
		I				YPC LTD.,	KOREA	N			
		I				EBARA METAL	JAPAN	N			
		I				Jingsung ( formerly komatsu)	JAPAN	N			
6	BFP SUCTION BRANCH/RING SECTION/SUCTION	I	QVM-Q-301			UP STEEL	MUZAFFARNAGAR	N			
		I				WEIR PUMPS LTD	UK	N			
		I				HINDUSTAN UDYOG LTD	KOLKATA	N			
		I				PTC	LUCKNOW	N			
7	BFP SPUN CAST / FORGED TUBES (IMPELLER & CASING WEAR RINGS) ***	I	QVM-Q-301			FIRTH VICKERS	UK	N			
		I				PAHLADRAI STEEL FORGINGS	KANPUR	N			
		I				FIRTH RIXON RINGS LTD(FORMERLY AURORA FORGINGS)	UK	N			
		I				RELY METPRO	S AFRICA	N			
		I				TAYLOR FORGING	UK	N			
8	BOILER FEED PUMP	I	QVM-Q-301			MHI	JAPAN	A			SUB-QR ITEM
		I	QVM-Q-301			BHEL	HYDERABAD	DR			SUB-QR ITEM
9	BP PUMP CASING	I	QVM-Q-302			HIMET	KOREA	N			
		I				EBARA METAL	JAPAN	N			
		I				KOMATSU CASTEX	JAPAN	N			
		I				WON KANG Material	KOREA	N			

ENGINEERING DIV / QAI-NTPC,NOIDA			BHEL
----------------------------------	---	---	------


48

Po

Sen

CHL BHEL HYD

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	<b>LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL</b>	Ref No.: 9585-001-02
		<b>SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator</b>	Revision No.: 00
			Date: 05.04.2017


SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	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	REMARKS
						SIMPLEX CASTING LTD	BHILAI	N			
						VOIST ALPINE,	AUSTRIA	N			
						UP STEEL	MUZAFFAR NAGAR	N			
						SUNG-SHIN M-TECH	KOREA	N			
						ISGEC	MUZAFFAR NAGAR	N			
						SUNG-SHIN M-TECH	KOREA	N			
						SIMPLEX CASTING	BHILAI/RAIPUR	N			
10	BP IMPELLER		QVM-Q-302			YPC LTD.,	JAPAN	N			
						*EBARA METAL	JAPAN	N			
						Jingsung ( formely komatsu)	JAPAN	N			
11	BP SHAFT (FORGING)		QVM-Q-302			MURABAYASHI (MIYAZAKI TEKKOU)	JAPAN	N			
						UMETOKU CO., LTD.	JAPAN	N			
						DIADO STEEL	JAPAN	N			
						KUSAKAWA TEKKOU	JAPAN	N			
						FOMAS	ITALY	N			
						VISHNU FORGE	BANGALORE	N			
						NISSOIWAI	JAPAN	N			
						FORGIA RAPIDA	ITALY	N			
						KUSAKAWA IRON WORKS	JAPAN	N			
12	BP WEAR RINGS(FORGED TUBES)		QVM-Q-302			FIRTH VICKERS	UK	N			
						PAHLADRAI STEEL FORGINGS	KANPUR	N			
						FIRTH RIXON RINGS LTD(FORMERLY	UK	N			



*Chh*  
BHEL HYD

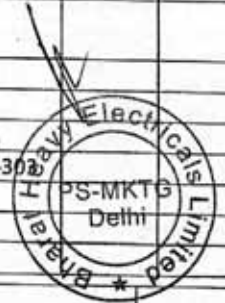
66

20

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017				
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
						AURORA FORGINGS)					
13	BOOSTER PUMP(TD)	I	QVM-Q-302			RELY METPRO	S AFRICA	N			
						MHI	JAPAN	A			
14	CEP PUMP CASING	I	QVM-Q-303			BHEL	HYDERABAD	A			MHI DESIGN
						FIRTH VICKERS		N			
						WAKATSUKI					
						KOUSAKUSYO	JAPAN	N			
						ABB-ABL-LTD	SHAHBAD	N			
						SIMPLEX	BHILAI	N			
						UPPAL FERROCAST	HYDERABAD	N			
						HYUSONG IND	KOREA	N			
						KIMURA CASTINGS	JAPAN	N			
						EBARA METAL	JAPAN	N			
						FUJIMOTO	JAPAN	N			
						CHUZOU					
15	BELL MOUTH (SUCTION BELL)	I	QVM-Q-303			HYOSUNG INDUSTREIS CO.	KOREA	N			
						KIMURA CASTING	JAPAN	N			
						EBARA METAL	JAPAN	N			
						WAKATSUKI					
						KOUSAKUSYO	JAPAN	N			
						ABB-ABL-LTD	SHAHBAD	N			
						SIMPLEX	BHILAI	N			
16	STAGE (DELIVERY) BOWL.	I	QVM-Q-303			UPPAL FERROCAST	HYDERABAD	N			
						HIMET	KOREA	N			
						WON KANG Mat.	KOREA	N			
						EBARA METAL	JAPAN	N			
						ABB-ABL-LTD	SHAHBAD	N			


ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL



Handwritten signature and initials: PHEL-HYD

This is a Part of Technical Specification No. PE-TS-475-155-A001


	Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00 Date: 05.04.2017
---	---	--	--

SN	ITEM	QP/INS-PN-CAT*	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
		I				SIMPLEX	BHILAI	N			
		I				UPPAL FERROCAST	HYDERABAD	N			
						SUNG-SHIN M-TECH	KOREA	N			
						YPC LTD	KORA	N			
17	CEP IMPELLR	I	QVM-Q-303			YPC LTD.,	JAPAN	N			
		I				JINGSUNG (formerly komatsu)	JAPAN	N			
		I				EBARA METAL	JAPAN	N			
		I				KOMASTSU METAL ENGG.	JAPAN	N			
18	CEP SHAFT (FORGING)	I	QVM-Q-303			UMETOKU CO. LTD.,	JAPAN	N			
		I				MURABAYASHI	JAPAN	N			
		I				SANDVIK	SWEDEN	N			
		I				VISHNU FORGE	BANGALORE	A			
		I				CFFP	HARDWAR	N			
		I				FORGIA RAPIDA	ITALY	N			
		I				FOMAS	ITALY	N			
19	CEP WEAR RINGS	I	QVM-Q-303			FIRTH VICKERS	UK	N			
						PAHLADRAI STEEL FORGINGS	KANPUR	N			
						FIRTH RIXON RINGS LTD (FORMERLY AURORA FORGINGS)	UK	N			
						RELY METPRO	S AFRICA	N			
20	CONDENSATE EXTRACTION PUMP	I	QVM-Q-303			TAYLOR FORGING	UK	N			
						MHI	JAPAN	A			SUB-QR ITEM
21	JOURNAL BEARING(BFP	III				BHEL	HYDERABAD	DR			SUB-QR ITEM
						YAMATO METAL	JAPAN	N			



Appendix B, Page 101 of 278

*Handwritten signature*  
BHEL HYD


 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017			
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
	AND BP)	III				KONGO COLMET MFG. CO. LTD.	JAPAN	N			
		III				OSAKA ASAHI METAL MFG. CO. LTD.,	JAPAN	N			
		III				GLYCO METAL LTD.	UK	N			
		III				COLHERENE	UK	N			
		III				MITCHEL,	UK	N			
		III				WAUKESHAH (GLACIER)	UK	N			
		I				MITCHEL	BANGALORE	DR			
						DAE DONG METAL IND.	KOREA	DR			
22	JOURNAL BEARING CUM THRUST BEARING FOR CEP	III				HARADA (JAPAN)	JAPAN	N			
		III				KINGSBURY	USA	N			
		III				MITCHEL	UK	N			
		III				WAUKESHAH (GLACIER)	UK	N			
		I				MITCHEL INDIA	BANGLORE	DR			
23	HYDRAULIC COUPLING	I	QVM-Q-304			VOITH	GERMANY	A			
		I				VOITH	HYDERABAD	DR			
24	CONNECTING COUPLING between Motor & HC BFP BP & CEP.	I	QVM-Q-305			SEISA	JAPAN	N			
		I				DIADO PRECISION INDUSTRIES	JAPAN	N			
		I				NIPPON PILLAR	JAPAN	N			
		I				EAGLE INDUSTRY	JAPAN	N			
		I				FLEXIBOX,	UK	N			
		I				EUROFLEX TRANSMISSION,	HYDERABAD				

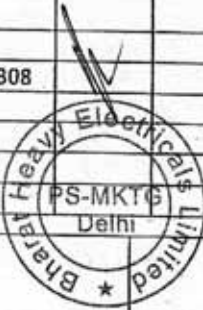


162


Appendix B, Page 102 of 278

Handwritten signature and text: BHEL HYD

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00 Date: 05.04.2017				
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
		I				EUROFLEX LTD.	UK	N			
		I				BIBBY TRANSMISSION (TURBOFLEX)	UK	N			
25	SUCTION STRAINERS FOR CEP, BP & BFP	I	QVM-Q-307			GUJRAT OTTOFIT	AHMEDABAD	A			
		I				MULTITEX	DELHI/NOIDA	A			
26	THRUST BEARING (BFP, BP & CEP)	III				DAIDO METAL	JAPAN	N			
		III				ROLLS ROYCE MARINE JAPAN (MITCHEL BRGS)	UK	N			
		III				WAUKESHAN (GLACIER)	UK	N			
		III				KINGSBURY	USA	N			
		III				MITCHELL BRGS	UK	N			
		I				MITCHEL BRGS	BANGLORE	DR			
						DAE DONG METAL IND.	KOREA	DR			
27	MECHANICAL SEALS (BFP, BP & CEP)	III				NIPPON PILLAR	JAPAN	N			
		III				FLOWSERVE	USA	N			
		III				FLOW SERVE SANMAR	CHENNAI	N			FOR BP & CEP ONLY
		III				EAGLE BURMANN INDIA	MUMBAI	N			-DO-
28	TURBINE OUTER CASING & STOP VALVE BODY CASING	I	QVM-Q-308			EAGLE BURUGMAN	JAPAN/GERMANY	N			
		I				VOIST ALPINE	AUSTRIA	A			
		I				SANDE-STAH	GERMANY	A			
		I				CFFP,	HARDWAR	A			
		I				UP STEELS	MUJAFARNAGAR	A			
		I				STAR WIRES	BALLABGARH	A			




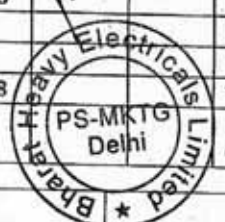
CHL BHEL HYD

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00 Date: 05.04.2017				
SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	QP SUB- MISSIO N SCHU LE	QP APPL SCHIE DU LE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S/ CAT	SS DETAIL SUB- SCHU DU LE	SC APPL SCHIE DU LE	REMARKS
						KOLHAPUR STEELS	KOLHAPUR	DR			
						JSC ENERGOMASH	UKRAIN	DR			
29	INTERMEDIATE PIECE VALVE COVER & CHAMBER	I	QVM-Q-308			SANDE-STAHL	GERMANY	A			
						VOIST ALPINE	AUSTRIA	A			
						CFFP	HARDWAR	A			
						UP STEELS	MUZAFFARNAGAR	A			
						STARWIRE	BALLABGARH	A			
						KOLHAPUR STEELS	KOLHAPUR	A			
						PRAKASH SPECTRO	VIJAYAWADA	DR			
30	GUIDE BLADE CARRIER	I	QVM-Q-308			VOIST ALPINE	AUSTRIA	A			
						SANDE STAHLGUSS GMBH,	GERMANY	A			
						STAR WIRES	BALLABGARH	A			
						KOLHAPUR STEEL	KOLHAPUR	A			
						KCP	CHENNAI	A			
						PRAKASH SPECTRO	VIJAYAWADA	DR			
						UP STEELS	MUJAFARNAGAR	A			
31	STEAM CHAMBER	I	QVM-Q-308			VOIST ALPINE	AUSTRIA	A			
						CFFP	HARDWAR	A			
						KOLHAPUR STEEL	KOLHAPUR	DR			
						SANDESTAHI	GERMANY	A			
						UP STEELS	MUJAFARNAGAR	A			
						LITOSTROJ STEEL	GERMANY	A			
32	ROTOR FORGINGS (TURBINE)	I	QVM-Q-308			CFFP	HARDWAR	A			
						SAAR SCHMIED	GERMANY	A			
						SDF	ITALY	A			




*CRH*  
BHEL HYD

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00 Date: 05.04.2017				
SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	QP SUB- MISSIO N SCHED ULE	QP APPL SCHIE DULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S/ CAT	SS DETAIL SUB- SCHEDU LE	SC APPL SCHEDU LE	REMARKS
33	PRECISION BLADE FORGINGS		QVM-Q-308			EDELSTAHLWERKE	GERMANY	A			
						GROEDITZ	GERMANY	DR			
						PILSON STEEL (VHS,SKODA)	CZECKSLOVAKIA	A			
						JCFC	JAPAN	A			
						JSC ENERGOMASH	UKRAIN	DR			
						JSW	JAPAN	A			
						KOBE STEEL	JAPAN	A			
						CRUIST FORGE	FRANCE	A			
						PETRO ROSA	GERMANY	A			
						FINE FORGE	HYDERABAD	A			
34	BAR STOCK FOR BLADES		QVM-Q-308			C BLADE	ITALY	A			
						WUXI	CHINA	A			AS PER NTPC APPROVAL CONDITIONS
						AZAD ENGG	HYDERABAD	A			FOR MACHINING ONLY
						WALZWERK EINSL	GERMANY	A			
						BOEHLER	AUSTRIA	A			
35	DRAWN PROFILE FOR GUIDE BLADES (DRIVE TURBINE)		QVM-Q-308			BGH	GERMANY	A			
						BREITENFIELD	AUSTRALIA	A			
						STARWIRE	BALLABHGARH	A			
						FIIV	ITALY	A			
36	GEAR BOX		QVM-Q-308			LEISTRITZ	GERMANY	A			
						BOEHLER	AUSTRIA	A			
						TRIVENI ENGG	MYSORE	A			
						FLENDER					
						GRAFFENSTADEN	FRANCE				



Handwritten signature and text: CRW BHEL HYD


**This is a Part of Technical Specification No. PE-TS-475-155-A001**

 Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL						Ref No.: 9585-001-02			
		SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator						Revision No.: 00			
								Date: 05.04.2017			
SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	QP SUB- MISSIO N SCHIE DULE	QP APPL SCHE DULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S / CAT	SS DETAIL SUB- SCHIE DULE	SC APPL SCHIE DULE	REMARKS
37	DRIVE TURBINE	I	QVM-Q-308			LUFKIN	USA/FRANCE	AH			
		I				RENK TACKE GMBH	GERMANY	AH			
		I				WALCHANDNAGAR	PUNE	AH			
		I				WINENERGY	CHENNAI	DR			
38	CONNECTING COUPLING (GEAR TYPE) CONNECTING COUPLING (MEMBRANE)	I	QVM-Q-308			BHEL	HYDERABAD	A			
		I				RENK TACKE GMBH	GERMANY	A			
		I				LUFKIN	USA/FRANCE	A			
		I				FLENDER	GERMANY	A			
		I				WALCHANDNAGAR	WALCHANDNAGAR	A			
		I				EUROFLEX LTD.,	HYDERABAD	A			
		I				JOHN CRANE	UK	A			
39	AUX. CONTROL VALVE BODY & COVER	I	QVM-Q-309			AMERDRIVES	USA	A			
		I				RATHI TURBOFLEX	PUNE	A			
		I				CFFP	HARDWAR	A			
		I				KOLHAPUR STEELS	KOLHAPUR	A			
40	LUBE OIL CENTRIFUGAL PUMP	I	QVM-Q-310			UP STEELS	MUJAFARNAGAR	A			
		II				STAR WIRES	BALLABGARH	A			
		II				PRAKASH SPECTRO	VUAYAWADA	DR			
41	LUBE OIL PUMP (SCREW PUMP)	II	QVM-Q-311			KSB	PUNE	A			
		II				KIRLSOKAR EBARA	KIRLOSARWADI	A			
		II				SULZER	MUMBAI	A			
		II				ALLWEILER	GERMANY	A			
42	DISCONNECTING COUPLING	II	QVM-Q-312			TUSHACO PUMP	DAMAN	A			
		II				LEISTRITZ	GERMANY	A			
43	CENTRIFUGE	I	QVM-Q-313			IMOPUMP	USA	A			
						AMER DRIVES	USA	A			
						ALFALAVAL	PUNE/SWEDEN	A			




*Handwritten signature and initials*

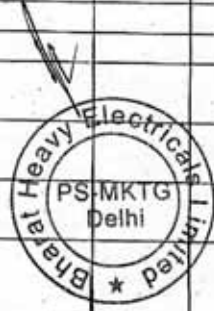
747

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017			
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
44	JOP	I				WEST FALIA INDIA	BANGALORE	A			
		II				TUSHACO PUMP	DAMAN	A			
		II				DYNAMIC TECHNOLOGIES	BANGALORE	DR			
		II				ALLWEILER	GERMANY	A			
45	FOUNDATION FRAME FOR BFP, BP & DRIVE TURBINE & MOTOR	I			BHEL	HYDERABAD	A				
46	LUBE OIL SYSTEM	I			BHEL	HYDERABAD	A				
47	OIL COOLERS	I			BHEL	HYDERABAD	A				
48	TUBE SHEET FORGING ( HP HEATER )	I				M/s RINGMILL S.P.A.,	ITALY	A			
		I				M/s FORGIATURA MORANDINI SRL,	ITALY	A			
		I				M/s FORGE MONCHIERI S.R.L.	ITALY	A			
		I				M/s TAEWOONG COMPANY LIIMITED	KOREA	A			
		I				M/s BAY-FORGE LIMITED,	CHENNAI	DR			
		I				M/s CFFP	HARDWAR	A			
		I				M/s GOLDEN IRON & STEEL WKS.	DELHI	A			
49	STEEL FORGING (OTHER THAN H.P HEATER TUBE SHEETS )	II				M/s THE PUNJAB STEEL WORKS,	DELHI	A			
		II				M/s ACME FORGINGS PVT LTD.,	RAJKOT	A			
		II				M/s CHAUDHRY HAMMER WORKS (P)	GHAZIABAD	A			
		II									



Handwritten signature and text: BHEL HYD

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017			
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
		II				LTD.					
		II				M/s GHAZIABAD ISPAT UDYOG LTD.,	GHAZIABAD	A			
		II				METAL FORGING	DELHI	DR			
		II				SANGHVI FORGING & ENGINEERING	BARODA	DR			
		II				C.D.Industries	GHAZIABAD	DR			
		II				KISSAN DIE-TECH	GHAZIABAD	DR			
		II				CHW Forge Private Limited	GHAZIABAD	DR			
50	HEMI HEAD	I				M/s VOEST ALPINE GIESSEREI LINZ GMBH,LTD.,	GERMANY	A			
		I				M/s EDMONTON EXCHANGER & MFG.LTD.,	CANADA	A			
		I				M/s DILLING-GTS VENTES,	GERMANY	A			
		I				M/s CEREC,	FRANCE	A			
		I				M/s CEREC,	VADODARA	DR			
		I				M/s KONIG & CO. GMBH,	GERMANY	A			
		I				M/s ANTONIUS VESSEL HEADS B.V.,	FRANCE	DR			
		I				M/s RICHARDSON & CRUDDAS (1972) LTD.,	MUMBAI	A			
		I				M/s J BOWN & CO.(DUKINFIELD) LIMITED	U.K				




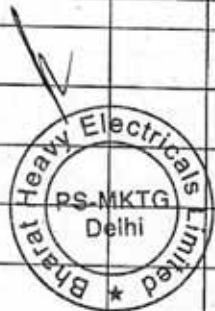
ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL

CRP BHEL-HYD

102

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017			
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
						STEEL FORCE	BELGIUM	DR			
						MAHENDRA DISHED ENDS	THANE	DR			
						ICEM ENGINEERING PVT LTD	THANE	DR			
						GEUM CHANG HEAD CO	KOREA	DR			
51	DISHED ENDS	I				M/s DYNAMIC DISH INDIA (PVT) LTD.,	HYDERABAD	DR			
		I				M/s METAL ENGINEERS,	HYDERABAD	A			
		I				M/s SATYA FABRICATORS PVT LTD.,	HYDERABAD	A			
		I				MAHENDRA DISH ENDS	THANE	DR			
		I				M/s CEREC,	FRANCE	A			
		I				M/s CEREC,	VADODARA	DR			
		I				M/s THE ANUP ENGINEERING LTD	INDIA	A			
		I				M/s KONIG & CO. GMBH,	GERMANY	A			
		I				M/s ICEM ENGEENING COMPANY LTD.	THANE	DR			
52	SMALL FORGING	II				M/s GOLDEN IRON & STEEL WKS.	DELHI	A			
		II				M/s THE PUNJAB STEEL WORKS,	DELHI				
		II				M/s ACME FORGINGS	RAJKOT				




ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL

*Handwritten signature and initials*  
BHEL HYD

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017			
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
		II				PVT LTD.,					
		II				M/s CHAUDHRY HAMMER WORKS (P) LTD.	GHAZIABAD	A			
		II				M/s GHAZIABAD ISPAT UDYOG LTD.,	GHAZIABAD	A			
		II				METAL FORGING	DELHI	DR			
		II				SANGHVI FORGING & ENGINEERING	BARODA	DR			
		II				C.D.Industries	GHAZIABAD	DR			
		II				KISSAN DIE-TECH	GHAZIABAD	DR			
		II				CHW Forge Private Limited	GHAZIABAD	DR			
53	STAINLESS STEEL TUBE (STRAIGHT) WELDED	I				M/s. Neotiss Limited (formerly VALLOUREC HEAT EXCHANGER TUBES LTD.,)	HYDERABAD	A			FOR LP HEATER ONLY
		I				M/s RATNADEEP METAL&TUBES P.LTD	AHMEDABAD	A			FOR LP HEATER ONLY
		I				M/s RATNAMANI METALS & TUBES LTD.,	AHMEDABAD/ KUTCH	A			
		I				M/s HEAVY METAL & TUBES LIMITED,	AHMEDABAD	A			
		I				M/s REMI	TARAPUR	A			FOR LP HEATER ONLY
		I				M/s PLYMOUTH TUBE COMPANY,	USA	A			
54	STAINLESS STEEL TUBE ( U TUBE) WELDED (ABOVE 17	I				M/s RATNAMANI METALS & TUBES	AHMEDABAD/ KUTCH	A			




ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL

*Handwritten signature*  
BHEL HYD

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02 Revision No.: 00  Date: 05.04.2017				
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
	BWG)					LTD., M/s. Neotiss Limited (formerly VALLOUREC HEAT EXCHANGER TUBES LTD.,)	Patancheru, Hyderabad	DR			
		/				M/s. REMI	Tarapur	DR			
		/				M/s. Shinhan Metal	South Korea	DR			
		/				M/s PLYMOUTH TUBE COMPANY,	USA	A			
55	STAINLESS STEEL TUBE ( U TUBE) WELDED (UP TO 17 BWG)	/				M/s RATNAMANI METALS & TUBES LTD.,	AHMEDABAD/ KUTCH	A			
		/				M/s PLYMOUTH TUBE COMPANY,	USA	A			
		/				M/s VALLOUREC HEAT EXCHANGER TUBES LTD. (FORMERLY CST VALINOX)	HYDERABAD	A			
		/				REMI	TARAPUR	DR			
		/				SHINHAN	KOREA	DR			
56	SAFETY RELIEF VALVE (TUBE SIDE AND SHELL SIDE)	/				M/s TYCO	USA	A			
		/				M/s DRESSER	USA	A			
		/				M/FAINGER LESSER	GERMANY	A			
		/				BHEL-HPBP-TRICHY	TRICHY	DR			
		/				PENTAIR VALVES & CONTROLS	VADODARA	DR			
		/				KSB MIL CONTROL LIMITED	CHENNAI				



Handwritten initials: RSD, CHW, BHEL HYD



Project : PATRATU STPP(3X800MW)  
Package : EPC  
Contractor : BHEL, Hyderabad  
Contract No.:

LIST OF ITEMS REQUIRING QUALITY PLAN AND  
SUBCONTRACTOR APPROVAL

Ref No.: 9585-001-02

Revision No.: 00

SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP)  
Drain Cooler and Deaerator

Date: 05.04.2017

SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	QP SUBMISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
		I				ASIAN INDUSTRIAL VALVES AND INSTRUMENTS	CHENNAI	DR			
57	LP HEATER	I				BHEL	HYDERBAD	A			
58	HP HEATER	I				BHEL	HYDERBAD	DR			SUB-QR ITEM
		I				SPX	USA	A			SUB-QR ITEM
		I				BHI	SOUTH KOREA	A			SUB-QR ITEM
		I				TEI	USA	A			SUB-QR ITEM
		I				SHANGHAI	CHINA	A			SUB-QR ITEM
		I				HOLTEC	USA	A			SUB-QR ITEM
59	DRAIN COOLER	I				BHEL	HYDERBAD	A			SUB-QR ITEM
60	VALVES GATE, GLOBE, CHECK ½ TO 10" (UPTO 2500 CL)	II				TOA VALVES	JAPAN	A			
		II				DEUTSCHE BABCOCK	GERMANY	A			
		II				DRESSER	USA	A			
		I				BHEL	TRICHY	A			
		I				FLOSTEER ENGINEERS PVT. LTD.,	AHMEDABAD	DR			
		I				JOSHUAMPALA ENGINEERING PRIVATE LI	SATARA	DR			
		I				SKILT FABRICATORS PVT.LTD,	MUMBAI	DR			
		I				VALVE TECH INDUSTRIES	NAVI MUMBAI	DR			
		I				CHEMTECH INDUSTRIAL VALVES	THANE	DR			
61	VALVES (GATE, GLOBE, NRV) ½ TO 10" FOR LP	I				L&T	CHENNAI/COIMBATORE				



ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL

112

Handwritten signature and date: 12/4/17 BHEL HYD

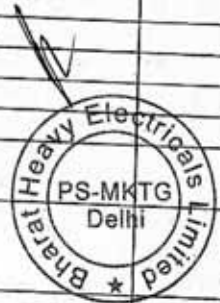


Project : PATRATU STPP(3X800MW)  
Package : EPC  
Contractor : BHEL, Hyderabad  
Contract No.:

LIST OF ITEMS REQUIRING QUALITY PLAN AND  
SUBCONTRACTOR APPROVAL  
SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP)  
Drain Cooler and Deaerator

Ref No.: 9585-001-02  
Revision No.: 00  
Date: 05.04.2017

SN	ITEM	QP/INS-PN-CAT*	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHE DULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S / CAT	SS DETAIL SUB-SCHEDU LE	SC APPL SCHEDU LE	REMARKS
	APPLICATIONS					BHEL	TRICHY	A			
						FOURESS	AURANGABAD	A			
						WEIR BDK	HUBLI	A			Up to 2"x800H Upto 10x600H
						FLOSTEER ENGINEERS PVT. LTD.,	AHMEDABAD	DR			Up to 2"x800H Upto 10x600H
						JOSHUAMPALA ENGINEERING PRIVATE LI	SATARA	DR			
						SKILT FABRICATORS PVT.LTD,	MUMBAI	DR			
						VALVE TECH INDUSTRIES	NAVI MUMBAI	DR			
						CHEMTECH INDUSTRIAL VALVES	THANE	DR			
62	CCS GLOBE VALVES UPTO 300 NB AND 150 CLASS					KBL	KONDAPURI	A			
						FOURESS ENGG	AURANGABAD	A			
						WEIR BDK	HUBLI	A			
						KSB	COIMBATORE	A			
						LEADER ENGG	JALLANDHAR	A			
						SKILT	MUMBAI	DR			
						BHEL	TRICHY	A			
						FLOSTEER ENGINEERS PVT. LTD.,	AHMEDABAD	DR			
						JOSHUAMPALA ENGINEERING PRIVATE LI	SATARA	DR			
						VALVE TECH	NAVI MUMBAI	DR			



ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL

Appendix B, Page 113 of 278

113

Handwritten signatures and initials



Project : PATRATU STPP(3X800MW)  
Package : EPC  
Contractor : BHEL, Hyderabad  
Contract No.:

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL

Ref No.: 9585-001-02

Revision No.: 00

SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP)  
Drain Cooler and Deaerator

Date: 05.04.2017

SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	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	REMARKS
		I				INDUSTRIES					
		I				CHEMTECH	THANE	DR			
63	DEARATOR	I				INDUSTRIAL VALVES					
	# FABRICATOR BASED ON BHEL HYD DESIGN					BHEL	HYDERABAD	A			
						#BHEL	VISHAKAPATNAM	DR			SUB-QR ITEM
						#VRK	HYDERABAD	DR			
						#Thandav Lakshmi Engineering works	VISHAKAPATNAM	DR			
						# Jay Engg	Trichy	DR			
						# Sai Sarag	Hyderabad	DR			
						# Premier Engg	Hyderabad	DR			
64	DEARATOR SPRAY VALVES	III				NEWTERA (COCHRANE ENVIRONMENTAL SYSTEM (CRANE))	USA	A			
		III				STERLING	USA	A			
		I				KCD	USA	DR			
		I				VALUE TREK ENGINEERS	HYDERABAD	DR			
		I				VUJAYA TOOLING ENGINEERS	HYDERABAD	DR			
65	DEARATOR TRAY ASSEMBLY	III				NEWTERA (COCHRANE ENVIRONMENTAL SYSTEM (CRANE))	USA	A			
		III				STERLING	USA	A			
		I				KCD	USA	DR			
		I				VRK INDUSTRIES	HYDERABAD	DR			
		I				PREMIER ENGG	HYDERABAD	DR			




ENGINEERING DIV / QAI-NTPC,NOIDA

BHEL

114



Handwritten signature and date: 10/11/17

	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	<b>LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL</b>	Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017
	<b>SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator</b>		

SN	ITEM	QP/ INS- PN CAT *	QP No. xxxx-110	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	REMARKS
		I				VALUE TREK	HYDERABAD	DR			
		I				Pavan Engg	Hyderabad	DR			
66	LT MOTORS UPTO 200 KW(REFER NOTE-1)	I				VIJAY TOOLING	HYDERABAD	DR			
		I				BHARAT BIJLEE	MUMBAI	A			UPTO 160KW
		I				KEC	BANGALORE/ HUBLI*	A			* UPTO 90 KW
		I				MARATHON	KOLKATA	A			
		I				CGL	AHMEDNAGAR	A			
		I				ABB	FARIDABAD*/ BANGALORE	A			* UPTO 55 KW
		I				LAXMI HYDRAULICS	SOLAPUR	A			* UPTO 120 KW
67	SAFETY RELIEF VALVE	I				SIEMENS INDIA	INDIA	DR			
						BHEL,	TIRICHY	A			
						PENTAIR VALVES & CONTROLS	VADODARA	DR			
						KSB MIL CONTROL LIMITED	CHENNAI	DR			
						ASIAN INDUSTRIAL VALVES AND INSTRUMENTS	CHENNAI	DR			

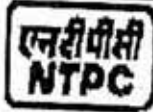
A- Proposed vendor is acceptable to NTPC, N: BHEL/ MHI approved vendors indicated as "N" are accepted in NOTED category by NTPC for this project based on BHEL/MHI experience with the vendor for the items & DR - "Details required" for NTPC review.

**2 QP/INSPECTION CATEGORY:**  
 CAT - I : For those items the Quality Plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC.  
 CAT - II : For those items the Quality Plans are approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents as per QP.  
 CAT-III : For those items main supplier approves Quality Plan. The final acceptance by NTPC shall on the basis of Certificate of Conformance by main supplier.

ENGINEERING DIV / QAI-NTPC,NOIDA		Page 19 of 20		BHEL
----------------------------------	---	---------------	---	------

Appendix B, Page 115 of 278

REL 442

 Project : PATRATU STPP(3X800MW) Package : EPC 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.: 9585-001-02			
								Revision No.: 00			
				Date: 05.04.2017							
SN	ITEM	QP/INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS

NOTE 1: a) Less than 30 KW

Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:  
 It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets.

b) 30 KW and above

Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test inspection report as per IS 325 by main contractor along with COC of the manufacturer & the contractor confirming as follows:  
 « It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets.  
 FOR HT MOTORS REFER SEPARATE VENDOR LIST FINALIZED FOR BHEL BHOPAL.

NOTE 2 : IF BOOSTER PUMPS SHAFT AND CEP SHAFT ARE MADE FROM ROLLED BARS THEN VENDORS SHALL BE AS PER BHEL APPROVED VENDOR LIST.

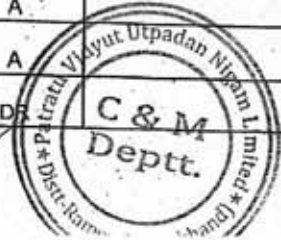
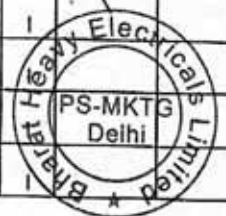
NOTE 3 : FOR VALVES OF SIZE ½ INCH AND BELOW SHALL BE PROCURED FROM BHEL APPROVED SOURCES.



ENGINEERING DIV / QAI-NTPC,NOIDA	Page 20 of 20	
----------------------------------	---------------	--

This is a Part of Technical Specification No. PE-TS-475-155-A001

SI. NO.	ITEM	QP_CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STA TUS/ CAT	REMARK
PROJECT: : PATRATU EPC (3X)		LIST OF ITEMS REQUIRING QUALITY PLAN		PACKAGE:	EPC			
CONTRACTOR: BHEL-PEM		SUB-PKG.:						
CONTRACT NO.: 9585-001-2		REV. NO.		00				
		DATE:		12.04.2017				
1.00	LUBE OIL PUMP	I			MATZ ENGINEERS Della PD Pumps Pvt.Ltd.	AHEMDABAD Vapi	A DR	
		I			Del Pd Pumps & Gears	Surandenagar,Gujarat	DR	
		I			TUSHACO PUMPS	DAMAN	A	
2.00	SELF CLEANING STRAINER	I			MULTITEX GEA BGR ENERGY SYSTEM	NOIDA CHENNAI	A A	
		I			FILTRATION ENGINEERS (I) PVT. BHEL APPROVED SOURCES	MUMBAI	DR	Approved upto 800 NB size VENDOR APPROVAL BY NTPC NOT ENVISAGED.
3.00	GM VALVES (UPTO 100 NB)	III			Qinhuangdao North Metal Hose Co. Ltd., FLEXICON BELLOWS & HOSES	CHINA	DR	
4.00	METELIC BELLOWS	I			LONESTAR INDUS. MB METTALIC BELLOWS (I) P LTD	CHENNAI	A*	A* AS PER APPROVAL CONDITIONS
		I			METTALIC BELLOWS (I) P LTD	CHENNAI	A*	A* AS PER APPROVAL CONDITIONS
		I			FLEXATHERM EXPANLLOW PVT.	VADODARA	DR	
		I			BD ENGINEERING TEDDINTON ENGINEERED	AHMEDABAD UK	DR DR	
5.00	THERMAL INSULATION (ROCKWOOL MATTRESSES/ P-	I			Minsulate Manufacturing Co.	Jamshedpur	DR	
		I			GOENKA Rockwool LLOYD INSULATION (I) LTD	RAIPUR BHILAI,JAMSHEDPUR, AURANGABAD	A A	
		I			ROCKWOOL INDIA THERMOCARE	MEDAK , AP	A	
		I			ROCKWOOL INDIA	RAJNANDGAON	DR	



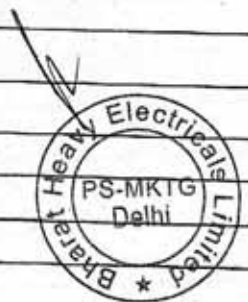
*Nilesh Kamal*  
NILESH  
KAMAL  
BHEL-PEM

PO

117

This is a Part of Technical Specification No. PE-TS-475-155-A001

NTPC		PROJECT: : PATRATU EPC (3X)			LIST OF ITEMS REQUIRING QUALITY PLAN		PACKAGE: EPC	
		CONTRACTOR: BHEL-PEM					SUB-PKG.:	
		CONTRACT NO.: 9585-001-2					REV. NO. 00	
							DATE: 12.04.2017	
SI. NO.	ITEM	QP_CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STA TUS/ CAT	REMARK
					SHREERAM EQUITECH PRIVATE	DURG	DR	
					Polybond Insulation Private Limited,	BHILAI	DR	
					Dhanbad Rockwool Insulation Pvt.Ltd.	Dhanbad	DR	
					Hitec Rockfibre Pvt.Ltd.	RAJNANDGAON	Dr	
6.00	BALL VALVES (NON FIRE SAFE TYPE)				MICROFINISH VALVES	HUBLI	A	UPTO 400NB, #300
					VAAS AUTOMATION	CHENNAI	DR	
					BELGAUM AQUA VALVES PVT. LTD.	BELGAUN	A	50 NB CLASS 800 200NB CLASS 150
					A.V. VALVES LTD	AGRA	DR	
					ATAM VALVES PVT. LTD.	JALANDHAR	DR	
					VALTECH INDUSTRIES	MUMBAI	DR	
					M/S GM ENGINEERING	RAJKOT	DR	
					INTERVALVE (INDIA) LTD.	PUNE	DR	
					DEMBLA VALVES LTD.	THANE	DR	
					UNIFLOW	CHENNAI	DR	
					WEIR BDK	HUBLI	A	UPTO 400 NBX150#
					LEADER	JALANDHAR	A	UPTO50MM-CLASS800, CCS- 50TO100MM-CLASS 150
					NILON VALVES PRIVATE LTD	AHMEDABAD	DR	
					HAWA VALVES (IDIA) PVT. LTD.	NAVI MUMBAI	DR	
					HAWA ENGINEERS	AHMEDABAD	DR	
					CRESCENT VALVES	AHMEDABAD	DR	
					MICON VALVES	MUMBAI	DR	
					MEVADA ENGINEERING	MUMBAI	DR	



Handwritten signatures and initials: 24/04/2017, PS

118

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

SI. NO.	ITEM	QP_CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STA TUS/ CAT	REMARK
PROJECT: : PATRATU EPC (3X)		LIST OF ITEMS REQUIRING QUALITY PLAN		PACKAGE: EPC				
CONTRACTOR: BHEL-PEM						SUB-PKG.:		
CONTRACT NO.: 9585-001-2						REV. NO. 00		
						DATE: 12.04.2017		
7.00	STEAM TRAPS	III			DELVAL FLOW CONTROLS BHEL APPROVED SOURCES	SATARA	DR	VENDOR APPROVAL BY NTPC NOT ENVISAGED.
8.00	AIR TRAPS	III			BHEL APPROVED SOURCES			VENDOR APPROVAL BY NTPC NOT ENVISAGED.
9.00	BUTTERFLY VALVES (STEAM SERVICES)	I			FOURESS ENGG. NENGFA WEIYE TIELING VALVE JOINT STOCK CO. LTD.	BANGALORE	A	UPTO 2600NB
		I			IL	CHINA	DR	
		I			SHENJIANG VALVES CO.	PALGHAT	A	UPTO 2200NB
10.00	AIR RELEASE VALVES	III			BHEL APPROVED SOURCES	CHINA	DR	
11.00	CHEMICAL DOSING (LP)	I			TECHNO CONSULTANT	MUMBAI	A	BHEL APPROVED SOURCES
		I			SWELLORE	AHEMDABAD	A	
		I			VK PUMPS	NASHIK	A	
		I			POWER PIPING COMPANY	Trichy	A	
		I			PSI	CHENNAI	A	

119



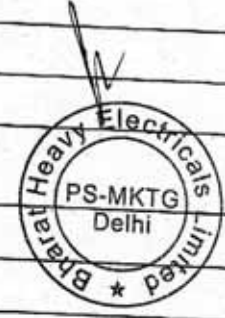
*Handwritten signature*



*Handwritten mark*

This is a Part of Technical Specification No. PE-TS-475-155-A001

NTPC	PROJECT: : PATRATU EPC (3X)			LIST OF ITEMS REQUIRING QUALITY PLAN	PACKAGE:	EPC		
	CONTRACTOR: BHEL-PEM				SUB-PKG.:			
	CONTRACT NO.: 9585-001-2				REV. NO.	00		
					DATE:	12.04.2017		
SI. NO.	ITEM	QP_CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STA TUS/ CAT	REMARK
		I			ENPRO INDUSTRIES PVT.LTD.	PUNE	DR	
		I			ROCKWIN FLOWMETER INDIA PVT LTD	GHAZIABAD	DR	
		I			POSITIVE METERING PUMPS (I) PVT. LTD.	NASIK	A	
		I			TECNO STRENGTH PVT.LT.	HYDERABAD	DR	
		I			MR SYSTEMS	HOWRAH	DR	
12.00	COLTCS(Not Applicable)							
13.00	SPRING LOADED BYPASS VALVE	I			WEIR VALVES & CONTROLS UK LTD.	U.K.	A	UP TO NB 450, 2000#
		I			SEMPELL GmbH	GERMANY	A	UP TO NB 450, 2260#
		I			STRACK GmbH,	GERMANY	A	UP TO NB 450, 4500#
14.00	ALUMINIUM SHEET /COILS	III			BHEL -Trichy Valves	Trichy	DR	
		III			NATIONAL ALUMINIUM COMPANY LTD.	BHUBNESHWAR	N	
		III			BHARAT ALUMINIUM COMPANY LTD	DELHI	N	
		III			HINDALCO INDUSTRIES LTD	MUMBAI	N	
		III			Jindal Aluminium	Bangalore	DR	
15.00	THERMAL INSULATION CERAMIC FIBRE	III			CHONGGING LANREN ALUMINIUM CO. LTD.	CHINA	DR	
		I			LLOYD INSULATIONS (INDIA) LTD.	NALAGARH BADDI	DR	
		I			Simond Fibre Tech Ltd.	Rajkot	DR	
		I			Sri Ceramic Fibre Pvt.Ltd.	Indore	DR	
		I			UNIFRAX INDIA	LAKHTAR	DR	

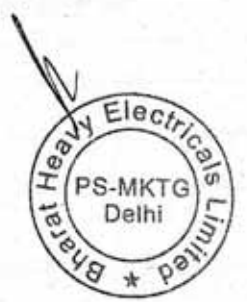


120

*Handwritten signature*

*Handwritten signature*

PROJECT: PATRATU (3 X 800 MW)		SUB-PACKAGE: EPC		SUB-PACKAGE:		LIST AND STATUS OF ITEM REQUIRING QP AND SUB-SUPPLIER APPROVAL		NTPC DOC NO: CS-9585-001-2	
SUB-PACKAGE: EPC		SUB-PACKAGE:		SUB-PACKAGE:		SUB SYSTEM: ERECTION CONTRACTORS		REV. NO. 0	
MAIN SUPPLIER: BHEL		SUB-PACKAGE:		SUB-PACKAGE:		SUB SYSTEM: ERECTION CONTRACTORS		DATE 12.04.2017	
CONTRACT NO.: CS-9585-001-2		SUB-PACKAGE:		SUB-PACKAGE:		SUB SYSTEM: ERECTION CONTRACTORS		ANNEXURE	
S.R. NO.	ITEM	GAP / BNP. CAT	GAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS	REMARKS		
1	TG & AUX INCLUDING GENERATOR			LARSEN & TOUBRO	MUMBAI	A	NOTE-1		
				POWER MECH	VIJAYWADA	A	NOTE-1		
				INDWELL CONSTRUCTIONS LTD	VIJAYWADA	A	NOTE-1		
				BROTHERS ENGINEERS	CHENNAI	A	NOTE-1		
				PE ERECTORE	KOLKATA	A	NOTE-1		
				ALSTOM POWER INDIA LTD	DELHI	A	NOTE-1		
				TATA PROJECTS LTD	HYDERABAD	A	NOTE-1		
				UNIVERSAL ERECTORS	MUMBAI	A	NOTE-1		
				BSES LTD	MUMBAI	A	NOTE-1		
				ENGINEOUS ERECTORS	CHENNAI	A	NOTE-1		
				SPIC GEL	CHENNAI	A	NOTE-1		
				VABSUN ERECTORS	HYDERABAD	A	NOTE-1		
				DPC ENGINEERING PROJECTS	CHENNAI	DR	NOTE-1		
				RELIANCE INFRASTRUCTURE	MUMBAI	DR	NOTE-1		
				SUNIL HI TECH	NAGPUR	DR	NOTE-1		
				VASAVI POWER SERVICES LTD	HYDERABAD	A	NOTE-1		
				TEXCEL	CHENNAI	DR	NOTE-1		
				MACWELL CONSTRUCTIONS	VIJAYWADA	A	NOTE-1		
				UNIVERSAL ERECTORS	AHMEDABAD	DR	NOTE-1		
				EDAC ENGINEERS	CHENNAI	DR	NOTE-1		
				KARPARA PROJECT ENGG	SURAT	DR	NOTE-1		
				PCP INTERNATIONAL	CHANDIGARH	DR	NOTE-1		
				UB ENGINEERING	PUNE	DR	NOTE-1		
MECH ENGINEERS & ERECTORS	TELANGANA	DR	NOTE-1						
ALPHA	JAMNIPALI	DR	NOTE-1						
2	GENERATOR & AUXILIARIES			ESSAR PROJECTS (I) LTD.	MUMBAI	DR	NOTE-1		
				SAME AS SL. NO. 1					



Handwritten signature: G.V. Ramesh... 12/04/17

SR. NO.	ITEM	QAP / RESP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS	REMARKS
3	C&I OF ST & TG			NOTE-2			
4	HP PIPING			NOTE-2			
5	LP PIPING			NOTE-2			
6	BOILER FEED PUMP			NOTE-2			
7	HEATERS, DEAERATORS			NOTE-2			
8	CEP			NOTE-2			
9	HT MOTORS			NOTE-2			
10	CRANES-EOT & MISC			NOTE-2			
11	PASSANGER CUM GOODS ELEVATOR			NOTE-2			
12	TANKS & VESSELS CABLING			NOTE-2			
13	DC SYSTEM 220/24 V - BATTERY			NOTE-2			
14	BATTERY CHARGER			NOTE-2			
15	HYDROGEN GENERATION PLANT			NOTE-2			

250

NOTE-1: Additional sub-contractors may be considered as per MOM provision. Organizational, financial and technical aspects will be taken care by BHEL before award of the jobs to the sub-contractors. Mobilisation of manpower, tools, tackles to suit the requirements of the job schedule shall be tied up by BHEL in consultation with NTPC site before award for which the details of sub-contractors shall be forwarded to GM-Site.

NOTE-2: BHEL approved sub-contractors for erection - would mean NTPC approval not required. However, mobilisation of manpower, tools, tackles to suit the requirements of the job schedule shall be tied up by BHEL in consultation with NTPC site.


NOTE-3: BHEL will follow their standard procedure, corporate guidelines and shall comply with circulars/ instructions etc. Issued by Government/ relevant statutory bodies while tendering. However for new vendor, BHEL shall take approval from NTPC prior to order placement.



G.V. Rajasekhar 12/04/17  
(G.V. RAJASEKHAR)  
(BHEL-PSNR)

122

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

	PROJECT: PATRATU STPP (3X800MW))	<b>LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL</b>	ANNEXURE-	
	PACKAGE : EPC PACKAGE		DOC. No. CS-9585-001-2	
	SUPPLIER : BHEL		Revision No. : 00	
	CONT. NO.: CS-9585-001-2		DATE: 05/04/2017	
PAGE : 1 OF 7				

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
1	LOW PRESSURE PIPING L1 LEVEL VENDOR (REFER NOTE 2)	I		RAUNAQ INTERNATIONAL	FARIDABAD	A	Jatin
		I		BRIDGE & ROOF CO	KOLKATA	A	
		I		TECHNOELECTRIC ENGG	KOLKATA	A	
		I		TECHNO FAB ENGG	NEW DELHI	A	
		I		UNITECH MACHINES LTD	GURGAON	A	
		I		THERMOSYSTEMS	HYDERAABAD	A	
		I		IOTL	MUMBAI	A	
		I		BHEL PIPING CENTRE	CHENNAI	A	
		I		GMW	BARODA	A	
		I		VOLTAS	MUMBAI	DR	
2	AIR CONDITIONING SYSTEM L1 LEVEL VENDOR (REFER NOTE 1 & 2)	I		STERLING & WILSON	KOLKATA	A	Jatin
		I		ADVANCE VENTILATION	DELHI	A	
		<del>I</del>		<del>ROOTS COOLING SYSTEM</del>	<del>NOIDA</del>	<del>A</del>	
		I		GEMINI SHREEWAS (ENGRS) PVT LTD	CHENNAI	DR	
		I		INDUSTRIAL PROJECT & PRODUCTS LTD	BAWAL	DR	
		I		VOLTAS	MUMBAI	A	
		I		STERLING & WILSON	KOLKATA	A	
3	VENTILATION SYSTEM L1 LEVEL VENDOR (REFER NOTE 1 & 2)	<del>I</del>		<del>ROOTS COOLING SYSTEM</del>	<del>NOIDA</del>	<del>A</del>	Jatin
		I		SK SYSTEMS PVT LTD	DELHI	A	
		I		C DOCTOR	KOLKATA	A	
		I		HYDERABAD POLLUTION	HYDERABAD	A	
		I		ADVANCE VENTILATION	DELHI	A	
		I		PACK PLAST ENGG	KOTA	A	
		I					
		I					



FORMAT NO.: QS-01-QAI-P-01/F3-R0

123

*Handwritten signature*


*Handwritten signature*

*Handwritten signature*

*Jatin*

*Notified  
Kishor  
01-02-2017*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

 PROJECT: PATRATU STPP (3X800MW) PACKAGE : EPC PACKAGE SUPPLIER : BHEL CONT. NO.: CS-9585-001-2	<b>LIST OF ITEMS REQUIRING                  QUALITY PLAN AND SUB-SUPPLIER                  APPROVAL</b>		ANNEXURE-	
			DOC. No. CS-9585-001-2	
			Revision No. : 00	
			DATE: 05/04/2017	
			PAGE : 2 OF 7	

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
4	COMPRESSED AIR SYSTEM L1 LEVEL VENDOR (REFER NOTE 1& 2)	1		INDUSTRIAL PROJECT & PRODUCTS LTD	BAWAL	DR	
		1		TAP ENGINEERING	CHENNAI	DR	
		1		ELGI EQUIPMENTS	COIMBATORE	A	
		1		ATLAS COPCO	PUNE	A	
		1		INGERSOLL RAND	AHMEDABAD	A	
5	PLATE HEAT EXCHANGER	1		TRANTER INDIA	PUNE	A	HT PLATES & GASKETS FROM TRANTER, SWEDEN/USA. HT PLATES FROM HIKASA, JAPAN
		1		TRANTER INDIA	PUNE	A	ACCEPTABLE FOR INDIGENOUSLY PRESSED HT PLATE SIZE UPTO 2107 MM LENGTH X 940 MM WIDTH X 0.6MM THICKNESS OF SS316 MATERIAL. GASKET AS PER APPROVAL CONDITION.
		1		KELVION INDIA PVT LTD ( FORMLY GEA ECOFLEX INDIA)	PUNE	A	HT PLATES & GASKETS FROM GEA ECOFLEX, GERMANY
		1		KELVION INDIA PVT LTD ( FORMLY GEA ECOFLEX INDIA)	PUNE	A	ACCEPTABLE FOR INDIGENOUSLY PRESSED HT PLATE SIZE UPTO 1736 MM LENGTH X 745 MM WIDTH X 0.5MM THICKNESS. GASKETS AS PER APPROVAL CONDITION.
		1		ALPHA LAVAL		A	HT PLATES & GASKETS FROM ALPHA LAVAL, SWEDEN



*Handwritten signature*

124

FORMAT NO.: QS-01-QAI-P-01/F3-R0

ENGG. DIV./QA&I

**This is a Part of Technical Specification No. PE-TS-475-155-A001**



PROJECT: PATRATU STPP (3X800MW)  
 PACKAGE : EPC PACKAGE  
 SUPPLIER : BHEL  
 CONT. NO.: CS-9585-001-2

**LIST OF ITEMS REQUIRING  
 QUALITY PLAN AND SUB-SUPPLIER  
 APPROVAL**

ANNEXURE-  
 DOC. No. CS-9585-001-2  
 Revision No. : 00  
 DATE: 05/04/2017  
 PAGE : 3 OF 7

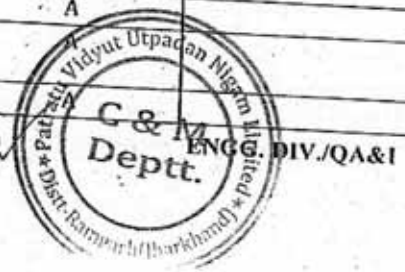
SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		I		ALPHA LAVAL	SATARA	A	ACCEPTABLE FOR INDIGENOUSLY PRESSED HT PLATES OF SIZE UPTO 2250MM LENGTH X 750MM WIDTH X 0.6MM THICKNESS.
		I		IDMC	ANAND	A	
		I		HISAKA	JAPAN	A	
		I		SONDEX INDIA	VADODARA	A	
6	HORIZONTAL CENTRIFUGAL PUMP (UP TO 1000 CUM/HR)	I		KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A	HT PLATES FROM SONDEX, DENMARK
		I		MATHER & PLATT	PUNE	A	
		I		MATHER & PLATT	KOLHAPUR	A	
		I		SAM TURBO	COIMBATORE	A	
		I		FLOWMORE	GHAZIABAD	A	
		I		FLOWMORE	GHAZIABAD	A	
		I		BEST AND CROMPTON	CHENNAI	A	
		I		JYOTI	VADODARA	A	
		I		WPIL	GHAZIABAD	A	
		I		KISHORE PUMPS	PUNE	A	
		I		KSB	PUNE	A	
		I		RAUNAQ INTERNATIONAL LTD	PARIDABAD	A	
		I		GMW	VADODRA	A	
7	FUEL OIL UNLOADING SYSTEM L1 LEVEL VENDOR (REFER NOTE 1 & 2)	I		UNITECH MACHINES LTD	GURGAON	A	UPTO 500M3/HR
		I		TECHNO ELECTRIC	KOLKATA	A	



*Handwritten signature/initials*

FORMAT NO.: QS-01-QAI-P-01/F3-R0

*Handwritten initials* 1/1



125-

**This is a Part of Technical Specification No. PE-TS-475-155-A001**



PROJECT: PATRATU STPP (3X800MW)  
 PACKAGE : EPC PACKAGE  
 SUPPLIER : BHEL  
 CONT. NO.: CS-9585-001-2

**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL**

ANNEXURE-  
 DOC. No. CS-9585-001-2  
 Revision No. : 00  
 DATE: 05/04/2017  
 PAGE : 4 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
8	COOLING TOWER- IDCT L1 LEVEL VENDOR (REFER NOTE 1 & 2)			ENGG			
		I		XICON INTERNATIONAL	THANE	DR	
		I		NEW FIRE ENGINEERS	NEW DELHI	DR	
		I		SHALCOT	NOIDA	A	
		I		THERMOSYSTEMS	HYDERABAD	A	
		I		L&T	CHENNAI	A	
		I		NBCC	NEW DELHI	A	
		I		GEA COOLING TOWER	CHENNAI	A	
		I		HAMMON SHRIRAM	UMBERGAON	A	
		I		PAHARPUR COOLING TOWERS	NEW DELHI	A	
		I		FANS AS	CZECK	A	
9	CW TREATMENT SYSTEM L1 LEVEL VENDOR (REFER NOTE 1 & 2)			PAL TECH COOLING TOWER	GURGAON	A	
		I		DRIPLEX	NEW DELHI	A	
		I		THERMAX	PUNE	A	
		I		ION EXCHANGE	MUMBAI	A	
		I		TRIVENI ENGG	NOIDA	A	
		I		VASU CHEMICALS	MUMBAI	DR	
		I		CHEMBOND	MUMBAI	DR	
10	CONDENSATE POLISHING PLANT L1 LEVEL VENDOR (REFER NOTE 1 & 2)			DRIPLEX	HARIDWAR	A	
		I		ION EXCHANGE	MUMBAI	A	
		I		BGR ENERGY	CHENNAI	A	
		I		THERMAX	PUNE	A	
11	(SUBMERSIBLE TYPE) 50 M3/HR, 20 MWC			KISHORE PUMPS	PUNE	A	
		I		KSB	PUNE	A	
		I		KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A	
		I		AQUA MACHINERY	AHMEDABAD	A	
		I		DARLING PUMPS	INDORE	A	



*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

721

FORMAT NO.: QS-01-QAI-P-01/F3-R0

*Handwritten mark*

*Handwritten: H.L. 1/1*

*Handwritten mark*

**This is a Part of Technical Specification No. PE-TS-475-155-A001**



PROJECT: PATRATU STPP (3X800MW)  
 PACKAGE : EPC PACKAGE  
 SUPPLIER : BHEL  
 CONT. NO.: CS-9585-001-2

**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL**

ANNEXURE-  
 DOC. No. CS-9585-001-2  
 Revision No. : 00  
 DATE: 05/04/2017  
 PAGE : 5 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		I		WPIL MBH	GHAZIABAD	A	
13	WATER PRE TREATMENT PLANT & LIQUID EFFLUENT TREATMENT PLANT L1 Level Vendor (Refer Note 1 & 2)	I		DRIPLEX	AHMEDABAD		
		I		TRIVENI	NEW DELHI	A	
		I		BRIDGE & ROOF	NOIDA	A	
		I		GEO MILLER	KOLKATA	A	
		I		MCNALLY BHARAT	NEW DELHI	A	
		I		VA TECH WABAG	KOLKATA	A	
		I		GANNON DUNKERLEY	PUNE	A	
		I		UEM INDIA	NEW DELHI	A	
		I		ION EXCHANGE	NOIDA	A	
		I		PARAMOUNT	MUMBAI	A	
		I		THERMAX	VADODARA	DR	
		I		PBI ASSOCIATES	PUNE	DR	
		I		SHRI RAM EPC	PUNE	DR	
		I		CLEAR WATER	CHENNAI	DR	
		I		AQUA DESIGN	NEW DELHI	DR	
		I		VEOLIA INDIA PVT LTD	CHENNAI	DR	
14	DM PLANT (CONVENTIONAL ION EXCHANGE BASED) L1 Level Vendor (Refer Note 1 & 2)	I		THERMAX	CHENNAI	DR	
		I		ION EXCHANGE	PUNE	A	
		I		DRIPLEX	MUMBAI	A	
		I		PARAMOUNT	NEW DELHI	A	
		I		AQUA DESIGN	VADODARA	DR	
		I		V A TECH WABAG	CHENNAI	DR	
		I		AQUA TECH SYSTEMS	PUNE	DR	
		I		DOSHION	PUNE	DR	
		I			AHMEDABAD	DR	

*referred*

*Jatin BHEL, PS*



*Hk 1/1*

ENGG. DIV./QA&I

FORMAT NO.: QS-01-QAI-P-01/F3-R0

122

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

 <b>PROJECT: PATRATU STPP (3X800MW)</b> <b>PACKAGE : EPC PACKAGE</b> <b>SUPPLIER : BHEL</b> <b>CONT. NO.: CS-9585-001-2</b>	<b>LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL</b>			<b>ANNEXURE-</b> DOC. No. CS-9585-001-2 Revision No. : 00 DATE: 05/04/2017				
				PAGE : 6 OF 7				
	SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS

				TRIVENI ENGG	NOIDA	DR	
15	DM PLANT (RO+MB PLANT) L1 Level Vendor (Refer Note 1 & 2)			WIPRO	MUMBAI	DR	
				TRIVENI	NOIDA	A	
				ION EXCHANGE	MUMBAI	A	
				DRIPLEX	NEW DELHI	A	
16	SEWAGE TREATMENT PLANT L1 Level Vendor (Refer Note 2)			VA TECH WABAG	PUNE	A	
				ION EXCHANGE	MUMBAI	A	
				TRIVENI	NOIDA	A	
				DRIPLEX	NEW DELHI	A	
				DECCAN	PUNE	A	
				THERMAX	PUNE	A	
				GEO MILLER	NEW DELHI	A	
17	CHLORINATION SYSTEM	TO BE PROPOSED AT LATER STAGE				A	

*Let's*

*RL*

*Hky.*



NOTE-1: Subject to Sub-QR clearance by Engg as per Technical Specification


NOTE 2: Comprehensive L-2 list of sub-vendors shall be finalized with the finally selected L-1 vendor but prior to order finalization on L-1 vendor by the Bidder.

FORMAT NO.: QS-01-QAI-P-01/F3-R0



ENGG. DIV./QA&I

**This is a Part of Technical Specification No. PE-TS-475-155-A001**

		PROJECT: PATRATU STPP (3X800MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL			ANNEXURE-	
		PACKAGE: EPC PACKAGE SUPPLIER: BHEL CONT. NO.: CS-9585-001-2					DOC. No. CS-9585-001-2 Revision No. : 00 DATE: 05/04/2017	
SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS	

- 1. SYSTEM SUPPLIER / SUB-SUPPLIER STATUS CATEGORY (SHALL BE FILLED BY NTPC).**  
 A – For those items proposed vendor accepted to NTPC. To be indicated with letter "A" in the list along with condition of approval, if any.  
 DR - for those items " Details Required " for NTPC review.  
 Noted: For those items accepted by NTPC without specific sub-vendor approval from NTPC and indicated as "NOTED" in the list.
- 2. INSPECTION CATEGORY:**  
 CAT I : For those items the quality plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC.  
 CAT II : For those items the quality plans are approved by NTPC. However no physical inspection will be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents as per QP.  
 CAT III: For those items Main Supplier approves quality plans. The final acceptance by NTPC shall be on the basis of certificate of conformance by Main Supplier.

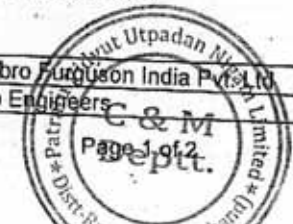
*Arachan*  
*(Kalyan NTPC)*  
*Himanshu*



*Jatin*  
 Main Contractor  
 ( *Jatin Crankhewat* )  
 BHEL, PSM

This is a Part of Technical Specification No. PE-TS-475-155-A001

PROJECT: PATRATU STPP (3 X 800 MW)		LIST AND STATUS OF ITEM REQUIRING QP AND SUB-SUPPLIER APPROVAL		NTPC DOC NO:		CS-9585-001- 2	
PACKAGE: EPC PACKAGE				REV. NO.		0	
MAIN SUPPLIER: BHEL				DATE		10-Apr-17	
CONTRACT NO.: CS-9585-001- 2				ANNEXURE			
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS	REMARKS
1	Mill Reject Handling System Level Vendor (Refer Note 1 & 2)	L1		Macawber Beekay	Delhi	A	
				Xiamen Longking	China	A	
				Shanghai Sinofin New Energy Investment Company	China	DR	
2	TG Hall EOT Cranes (Refer Note 1) & Lifting Beam			H V Equipments	Noida	A	
				Mukand	Thane	A/DR	Approved Upto 300 Tons
				WMI Konecranes	Pune	A/DR	Approved Upto 300 Tons
				Anupam Industries	V U Nagar	A/DR	Approved Upto 300 Tons
				Unique Industries Handlers	Nasik	A/DR	Approved Upto 300 Tons
				HEC	Ranchi	A/DR	Approved Upto 265 Tons
				Tuobro Furguson India Pvt. Ltd	Kolkata	A/DR	Approved Upto 25 Tons
3	Misc EOT Cranes (Sub-vendors indicated at SI no 2 are also acceptable)			FAFCO	Vadodara/Mumbai	A/DR	Vadodara works approved - upto 150 Tons, Mumbai - Upto 200 Tons
				Grip Engineers	Hyderabad	A/DR	Approved Upto 50 Tons
				Reva Industries	Faridabad	A/DR	Approved Upto 45 Tons
				Cranex	Sahibabad	A/DR	Approved Upto 35 Tons
				Electromech	Pune	DR	
				Rockwell Hoisto	Bahadurgarh	DR	
				Techno	Ahmedabad	DR	
				Mangla Hoist	Greater Noida	DR	
				Brady & Morris	Ahmedabad	DR	
				GMW	Vadodara	DR	
				Terex	Pune	DR	
				Meeka Machinery	Ahmedabad	DR	
				Safex	Ahmedabad	DR	
				Unicorn	Noida	DR	
				Henan Weihua	China	DR	
				Alpha Services	Bhiwadi	A/DR	Approved for Double Girder upto 40 Tons, Single Girder upto 15 Tons
				4	Misc Electric Hoists		
Brady & Morris	Ahmedabad	A/DR	Approved Upto 10 Tons				
Consolidated Hoist	Pune / Satara	A/DR	Approved Upto 35 Tons at Satara & Upto 15 Tons at Pune works				
Tuobro Furguson India Pvt. Ltd	Kolkata	A/DR	Approved Upto 5 Tons				
Grip Engineers	Faridabad	A/DR	Approved Upto 20 Tons				



*Handwritten signature/initials*

130

*Handwritten signature/initials*

5	Chain Pulley Block	I	Techno	Ahmedabad	DR	
		I	Tractel Tirfor India Pvt. Ltd	Palwal	A/DR	Approved Upto 15 Tons
		I	Rockwell Hoisto	Bahadurgarh	DR	
		I	Universal Hoisto Fabrik	Thane	A/DR	Approved Upto 20 Tons
		I	Global Technologies	Hyderabad	DR	
		I	Mangla Hoist	Greater Noida	A/DR	Approved Upto 10 Tons
		I	Safex	Ahmedabad	DR	
		I	Meeka Machinery	Ahmedabad	DR	
		I	Reva Industries	Faridabad	A/DR	Approved Upto 25 Tons
		I	Eddy Cranes	Pune	A/DR	Approved Upto 14 Tons
		I	Alpha Services	Bhiwadi	A/DR	Approved Upto 15 Tons
		I	Century Crane Engineers	Ballabhgarh	A/DR	Approved Upto 25 Tons
		I	Grip Engineers	Hyderabad	A/DR	Approved Upto 40 Tons
		I	Techno	Ahmedabad	DR	
		II	Brady & Morris	Ahmedabad	DR	
6	Fire Tender	I	Century Crane Engineers	Ballabhgarh	A/DR	Approved Upto 15 Tons
		II	Universal Hoisto Fabrik	Thane	DR	
		I	Tractel Tirfor India Pvt. Ltd	Kalyani	A/DR	Approved Upto 20 Tons
		I	Tuobro Furguson India Pvt. Ltd	Kolkata	DR	
		I	Wadia Bodybuilders	Ahmedabad	A	
		I	Ambala Coach	Ambala	A	
		I	Brijbasi Hi Tech	Mathura	DR	
		I	Vijay Fire	Umbergaon	A	

Note 1 : Subject to Sub-QR clearance by Engg as per Technical Specification

Note 2 : Comprehensive L-2 list of sub-vendors shall be finalized alongwith the finally selected L-1 vendor but prior to order finalization on L-1 vendor by the Bidder.

LEGENDS

1. SYSTEM SUPPLIER / SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A - For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any.  
DR - For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.

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

2. QP/INSPN CATEGORY:

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

CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.

131


*Amkush*



*Signature*



**This is a Part of Technical Specification No. PE-TS-475-155-A001**

 NTPC	PROJECT: PATRATU STPP (3 X 800 MW)		<b>LIST AND STATUS OF ITEM REQUIRING QP AND SUB-SUPPLIER APPROVAL</b>		NTPC DOC NO:		CS-9585-001- 2			
	PACKAGE: EPC PACKAGE				REV. NO.		0			
	MAIN SUPPLIER: BHEL				DATE		05-Apr-17			
CONTRACT NO.: CS-9585-001- 2				ANNEXURE						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS	REMARKS			
1	Coal Handling Plant L1 Level Vendor (Refer Note 1 & 2) & Limestone/ Gypsum Handling Plant L1 Vendor ( Refer Note2)	I		BHEL - ISG	Bangalore	A				
2	Ash Handling System L1 Level Vendor (Refer Note 1 & 2)	I		DCIPS	Kolkata					
				MBE	Kolkata	A				
				Macawber Beekay	Delhi	A				
				Mcgale Pneumatic	Nagpur	A				
				UCC	USA / India	DR				
				BHEL-ISG	Bangalore	DR				
				Indure	Delhi	DR				
2a	Dry Bottom Ash Handling System L1 Level Vendor (Refer Note 1 & 2)	I		Magaldi System	Italy	A				
				Clyde Bergman	India	DR				
				China Datang Technological & Engineering Co.	China	DR				
				Nari Futong Science and Technology Development Co. Ltd.	China	DR				

Note 1 : Subject to Sub-QR clearance by Engg as per Technical Specification

Note 2 : Comprehensive L-2 list of sub-vendors shall be finalized alongwith the finally selected L-1 vendor but prior to order finalization on L-1 vendor by the Bidder.

**LEGENDS**

1. SYSTEM SUPPLIER / SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any.  
DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.

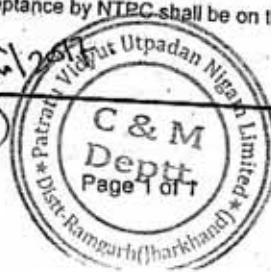
2. QP/INSPN CATEGORY:

CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.  
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.

*Antush*

*CINDRAJIT DEY*  
5th April 2017



*ANSHUL JAIN*  
5/4/17  
BHEL-154

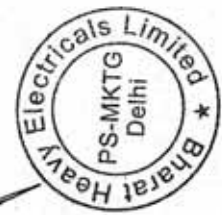




PROJECT : PATRATU STPP (3X800 MW) PACAKGE : EPC Sub Package: Elevators CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2		LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR CONTRACTOR : M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE: 24 <sup>th</sup> April 2017				
Sl. No.	ITEM	QP/INS CAT.	QP No:- 9585-001-QVE.	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
1)	ELEVATOR	I				ECE	GHAZIABAD	A		
		I				TECHNO	AHMEDABAD	A		
		I				OTIS	MUMBAI	A		
		I				KONE	CHENNAI	A		
		I				OMEGA	AHMEDABAD	A		
		I				SAMIL ELTEC	KOREA	A		
						JOHNSON	CHENNAI / NAGPUR	A		
						SCHINDLER	MUMBAI	DR		
								DR		

*[Handwritten Signature]*

*Jatin*  
24/04/17  
( JATIN GAHLAWAT )  
BHEL



NTPC	PROJECT: PATRATU 3X800 MW PACKAGE: TG		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL				REF NO.:	
	CONTRACTOR: BHEL HARIDWAR		SUB SYSTEM: TG & AUX				REV NO.:	
	CONTRACT NO.: 9595 001-110						DATE 05.04.17	
SI No.	Item	QP Insp.Cat.	NTPC QP No. QVE-Q.	Vendor/ Manufacturer Name	Place	SC_APP L_STAT US	Remarks	

1	STATOR FRAME FABRICATION	I		BHEL-HEEP	HARDWAR	A	
2	STATOR FRAME MACHINING	I		BHEL-HEEP	HARDWAR	A	
3	SPRING BASKET	I		BHEL-HEEP	HARDWAR	A	
4	CORE BAR	I		BHEL-HEEP	HARDWAR	A	
5	STATOR LAMINATION	I		BHEL-CSU	JAGDISHPUR	A	
6	FLUX TRAP	I		BHEL-HEEP	HARDWAR	A	STAMPINGS FROM CSU JAGDISHPUR
7	RIPPLE SPRING	II		KREMPAL GMBH	GERMANY	A	NO SEP QP
7	RIPPLE SPRING	*		SIEMENS LIMITED	INDIA	DR	
8	TENSION BOLT FOR STATOR CORE (INSULATED)	II		BHEL-HEEP	HARIDWAR	A	
9	STATOR CORE ASSLY	I		BHEL-HEEP	HARDWAR	A	
10	FLAT SPRINGS AND BASKET ASEMBLY	I		BHEL-HEEP	HARDWAR	A	
11	BUS BAR CONNECTION TUBES	II		LUVATA PORI	FINLAND	A	NO SEPARATE QP
11	BUS BAR CONNECTION TUBES	II		BUNT METAL	AUSTRIA	A	
11	BUS BAR CONNECTION TUBES	II		KME GERMANY GMBH & CO. KG	GERMANY	A	
11	BUS BAR CONNECTION TUBES	*		HAEGANG ALLOY CO. LTD.	KOREA	DR	
12	SOLID COPPER CONDUCTOR (FOR STATOR BAR)	I		PEARL INSULATIONS	BANGLORE	A	
12	SOLID COPPER CONDUCTOR (FOR STATOR BAR)	I		MAHENDRA INDUSTRIES	BANGLORE	A	



*Signature*  
05.04.17  
C.S.K (Charan)

*Signature*

NTPC		PROJECT: PATRATU 3X800 MW PACKAGE: TG CONTRACTOR: BHEL HARIDWAR CONTRACT NO.: 9595 001-110		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: TG & AUX			REF NO. :
SI No.	Item	QP Insp.Cat.	NTPC QP No. QVE-Q-	Vendor/ Manufacturer Name	Place	SC APP L_STAT US	Remarks
12	SOLID COPPER CONDUCTOR (FOR STATOR BAR)	II		VONROLL	SWITZERLAND	A	NO SEP QP
12	SOLID COPPER CONDUCTOR (FOR STATOR BAR)	II		GEBAUER & GRILLER	AUSTRIA	A	NO SEP QP
13	HOLLOW SS CONDUCTOR (STATOR BAR)	II		FINE TUBES LTD.	ENGLAND	A	NO SEP QP
13	HOLLOW SS CONDUCTOR (STATOR BAR)	II		SIEMENS AG	GERMANY	DR	
14	MICA SPLITTING INSULATING TAPE	II		ISOVOLTA (I) PVT. LTD.,	NASIK	A	NO SEP QP
14	MICA SPLITTING INSULATING TAPE	*		LAKSHMANAN ISOLA PVT LTD	BANGLORE	DR	
15	OVER HANG SUPPORT RING	II		ROECHLING ENGINEERING PLASTICS	GERMANY	A	NO SEP QP
15	OVER HANG SUPPORT RING	II		POWER & COMPOSITE TECHNOLOGIES	USA	A	NO SEP QP
15	OVER HANG SUPPORT RING	*		KOMPOZYTY SP.Z.O.O	POLAND	DR	
15	OVER HANG SUPPORT RING	*		NANTONG DAWNTINE ELECTRICAL	CHINA	DR	
16	STATOR SLOT WEDGE ( RAW MATERIAL)	II		PERMALI WALLACE PRIVATE	BHOPAL	A	NO SEP QP
16	STATOR SLOT WEDGE ( RAW MATERIAL)	II		MICAPLY	BHOPAL	A	NO SEP QP
16	STATOR SLOT WEDGE ( RAW MATERIAL)			LAMTUF PLASTICS LTD	HYDERABAD	DR	
16	STATOR SLOT WEDGE ( RAW MATERIAL)			THE BOMBAY BURMAH TRADING CORP	RUDRAPUR	DR	
17	WATER SUPPLY HOSE (INSULATED)			DR SCHNABEL GMBH & CO LIMBURG	GERMANY	A	NO SEP QP



*R. Sharma*  
05.04.17

NTPC		PROJECT: PATRATU 3X800 MW PACKAGE: TG CONTRACTOR: BHEL HARIDWAR CONTRACT NO.: 9695 001-110		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: TG & AUX		REF NO. : REV NO. : DATE 05.04.17	
SI No.	Item	QP Insp.Cat.	NTPC QP No. QVE-Q-	Vendor/ Manufacturer Name	Place	SC_APP L_STAT US	Remarks

17	WATER SUPPLY HOSE (INSULATED)	II		CRANE RESISTOFLEX	USA	A	NO SEP QP
17	WATER SUPPLY HOSE (INSULATED)	I		MIL INDUSTRIES LIMITED	CHENNAI	A	
18	FIELD LEAD CORE BAR	II		KME	GERMANY	DR	NO SEP QP
19	CONTACT BOLT (RAW MATERIAL)	II		SOCIETA METALLURGICA	ITALY	A	NO SEP QP
19	CONTACT BOLT (RAW MATERIAL)	II		BUNT METAL	AUSTRIA	A	NO SEP QP
19	CONTACT BOLT (RAW MATERIAL)	*		KME	GERMANY	DR	
20	HEADER FOR STATOR (ASSEMBLY)	I		BHEL-HEEP	HARDWAR	A	
21	ETS MATERIAL	II		THYSSEN KRUPP ELECTRICAL STEEL	NASIK	A	NO SEP QP
21	ETS MATERIAL	II		ARCELOR MITTAL INTERNATIONAL	LUXAMBOURG	A	NO SEP QP
21	ETS MATERIAL	II		THYSSENKRUPP MATERIAL TRADING	GERMANY	A	NO SEP QP
21	ETS MATERIAL	II		VOESTALPINE	AUSTRIA	DR	
21	ETS MATERIAL	II		ALLOVERZE	GERMANY	A	NO SEP QP
22	BAFFLE RING & BAFFLE RING CARRIER MACHINING	I		BHEL-HEEP	HARDWAR	A	
23	CORE PRESS RING	II		BHEL-HEEP	HARDWAR	A	NO SEP QP
24	HEADER TUBES	II		BHEL APPROVED SOURCE		A	NO SEP QP
25A	SS WATER BOX FOR STATOR BARS (TOP PART)	*		INVESTMENT & PRECISION	BHAVNAGAR (GUJARAT)	DR	
25A	SS WATER BOX FOR STATOR BARS (TOP PART)	II		ZOLLERN GMBH & CO	GERMANY	DR	NO SEP QP
25A	SS WATER BOX FOR STATOR BARS (TOP PART)	II		SIEMENS AG	GERMANY	A	NO SEP QP
25A	SS WATER BOX FOR STATOR BARS (TOP PART)	I		PTC		DR	

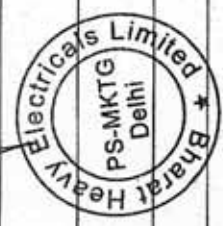


*Handwritten signature*  
05.04.17

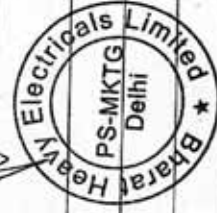
*Handwritten signature*  
R. Srivastava

NTPC	PROJECT: PATRATU 3X800 MW		LIST OF ITEMS REQUIRING QUALITY PLAN AND				REF NO. :
	PACKAGE: TG		SUBCONTRACTOR APPROVAL				REV NO.:
	CONTRACTOR: BHEL HARIDWAR		SUB SYSTEM: TG & AUX				DATE 05.04.17
SI No.	Item	QP Insp.Cat.	NTPC QP No. QVE-Q.	Vendor/ Manufacturer Name	Place	SC_APP L_STAT US	Remarks

25B	SS WATER BOX FOR STATOR BARS (BOTTOM PART)	II		WERNER GIETZNAUER	GERMANY	A	NO SEP QP
25B	SS WATER BOX FOR STATOR BARS (BOTTOM PART)	*		SIEMENS LIMITED	INDIA	DR	
25B	SS WATER BOX FOR STATOR BARS (BOTTOM PART)	II		SIEMENS AG	GERMANY	A	NO SEP QP
26	STATOR WINDING BAR	I		BHEL-HEEP	HARDWAR	A	
27	STATOR WINDING ASSEMBLY	I		BHEL-HEEP	HARDWAR	A	
28	GENERATOR SHAFT FORGING	II		BUDERUS EDELSTAHL	GERMANY	A	
28	GENERATOR SHAFT FORGING	II		JSW	JAPAN	A	
28	GENERATOR SHAFT FORGING	II		SAARSCHMIEDE	GERMANY	A	
28	GENERATOR SHAFT FORGING	II		JCFC	JAPAN	A	
28	GENERATOR SHAFT FORGING	II		CHINA FIRST HEAVY INDUSTRIES	CHINA	A	
28	GENERATOR SHAFT FORGING	*		CHINA NATIONAL ERZHONG GROUP	CHINA	DR	
28	GENERATOR SHAFT FORGING	*		UMP TRADING (Manufacturer: JSC ENERGO MASHPETSTAL UKRAINE)	SWITZERLAND	DR	
28	GENERATOR SHAFT FORGING	*		SHAANXI SENWELL	CHINA	DR	
28	GENERATOR SHAFT FORGING	*		SHEFFIELD FORGEMASTERS	UK	DR	
28	GENERATOR SHAFT FORGING	II		SDF-TURNI	ITALY	A	
28	GENERATOR SHAFT FORGING	*		S C DOOSAN	KOREA	DR	
29	GENERATOR SHAFT MACHINING	I		BHEL-HEEP	HARDWAR	A	
30	CURRENT CARRYING BOLTS FOR ROTOR	I		BHEL HEEP	HARDWAR	A	



NTPC	PROJECT: PATRATU 3X800 MW PACKAGE: TG CONTRACTOR: BHEL HARIDWAR CONTRACT NO.: 9595 001-110		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: TG & AUX			REF NO. :		
	SI No.	Item	QP Insp.Cat.	NTPC QP No. QVE-Q-	Vendor/ Manufacturer Name	Place	SC_APP L_STAT US	Remarks
31	ROTOR COIL FORMING		I		BHEL HEEP	HARDWAR	A	
32	ROTOR SLOT ANGLE		I		SAHNEY KIRKWOOD PVT. LTD.	NEW DELHI	A	
32	ROTOR SLOT ANGLE		II		ABB SWITZERLAND LTD.	SWITZERLAND	A	NO SEP QP
32	ROTOR SLOT ANGLE		II		VON ROLL ISOLA	FRANCE	A	NO SEP QP
32	ROTOR SLOT ANGLE		II		POWER & COMPOSITE TECHNOLOGIES	USA	DR	
33	FIELD LEAD CORE BAR MACHINING		I		BHEL-HEEP	HARDWAR	A	
34	RETAINING RING MACHINING		I		BHEL-HEEP	HARDWAR	A	
35	RETAINING RING		II		SAARSCHMEIDE	GERMANY	A	NO SEP QP
35	RETAINING RING		II		ENERGIETECHNIK	GERMANY	A	NO SEP QP
35	RETAINING RING		II		JSW	JAPAN	A	NO SEP QP
35	RETAINING RING		*		AUBERT & DUVAL	FRANCE	DR	
35	RETAINING RING		*		DEYANG WANXIN	CHINA	DR	
36	FAN BLADE FOR COMPRESSOR M/C		I		BHEL-HEEP	HARDWAR	A	
37	FAN BLADE FOR COMPRESSOR (RAW MATERIAL) HW10786 -X20Cr 13		I					Refer ST List for same grade material for blade bars
38	ROTOR WINDING ASSLY.(GEN.)		I		BHEL HEEP	HARDWAR	A	
39	GENERATOR ROTOR -FINAL		I		BHEL-HEEP	HARDWAR	A	
40	BEARING SHELL FORGING (GENERATOR)		I		BHEL-CFFP	HARDWAR	A	
41	BEARING COMPLETE (EXCITER)		*		SIEMENS LIMITED	INDIA	DR	
41	BEARING COMPLETE (EXCITER)		II		RENK AG	GERMANY	A	
41	BEARING COMPLETE (EXCITER)		II		ZOLLERN	BRAZIL	A	
41	BEARING COMPLETE (EXCITER)		II		EURO BEARINGS	ITALY	A	



*Handwritten signature and date: 05.04.17*

*Handwritten signature: R. Sharma*