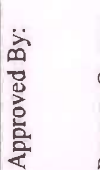
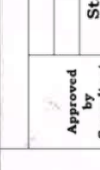
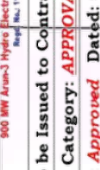


		PROJECT: ARUN 3 HEP (4x225 MW)		MANUFACTURING QUALITY ASSURANCE PLAN				MANUFACTURER: Bharat Heavy Electricals Limited, Bhopal			
ITEM DESCRIPTION		SUB-ITEM		QAP & REV		ISSUE DATE		FORMAT OF RECORD		REMARKS	
VERTICAL FRANCIS TURBINE		Hydraulic system for Governor, MIV & PPV		QA/HT/1097 Rev -01		23.05.2020		9		10	
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	AGENCY	M	C	S
1	2	3	4	5	6	7	8				11

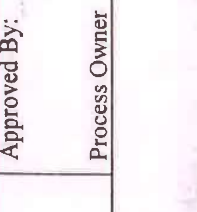
LEGENDS									
C	CONTRACTOR (BHEL)	IR	INSPECTION REPORT	P	PERFORM				
CHP	CUSTOMER HOLD POINT	M	MANUFACTURER	S	SAPDC LTD.				
CR	CRITICAL	MA	MAJOR	TC	TEST CERTIFICATE				
CoC	CERTIFICATE OF CONFORMANCE	ME	MEASUREMENT	V	VERIFICATION OF RECORDS				
DRG	DRAWING	MN	MINOR	Vis	VISUAL CHECK				
HT	HEAT TREATMENT	NDT	NON DESTRUCTIVE TESTING	W	WITNESS (Customer Hold Point)				
NOTE: QAP SHALL BE READ IN CONJUNCTION WITH QUALITY ASSURANCE REQUIREMENT GIVEN AS PART OF TECHNICAL SPECIFICATION.									

A OPU												
1. SUMP TANK												
1.1 Incoming Material: Plates for sump tank												
1.1.1		Chemical Composition, Mechanical Properties, Dimensional & NDT Check		MA	Test	Sample	Sample	Relevant material standards as per approved Drawing	TC	P	V	V
1.2 In-process Inspection : Fabrication of sump tank and Final Inspection												
1.2.1		Post weld Stress Relieving (If applicable)		MN	TT Chart	100%	100%	ASME	TC	P	V	V
1.2.2		NDT		MA	DPT	100%	100%	-do-	TC	P	V	V
1.2.3		Final Dimensional Check		MA	ME	100%	100%	-do-	TC	P	V	V
1.2.4		Hydraulic Pressure test (as per standard practice)		MA	Test	100%	100%	-do-	TC	P	V	V
2. Oil Leakage Unit												
2.1		Dimensional check, Layout & BOM Check and Operational & Functional Check		MN	Test	100%	100%	Drawing	TC	P	V	V
3. Piston Accumulator												
3.1 Incoming Material												

Prepared By: 		Reviewed By: 		Approved By: 	
FORM NO: F-060-02, ISSUE 2.0, REV. 01, DATE: 30/06/2016 Page 1 of 5		Quality Assurance & Inspection Deptt. Date: 30/06/2016 By: 		Approved by: 	
To be Issued to Contractor Category: APPROVAL Status: Approved Dated: 05.06.2020 By: 		Approved by: 		Recommended: 	
Approved by: 		Approved by: 		Approved by: 	

		PROJECT: ARUN 3 HEP (4×225 MW)		MANUFACTURING QUALITY ASSURANCE PLAN						MANUFACTURER: Bharat Heavy Electricals Limited, Bhopal		
ITEM DESCRIPTION		SUB-ITEM		QAP & REV		ISSUE DATE						
VERTICAL FRANCIS TURBINE		Hydraulic system for Governor, MIV & PPV		QA/HT/1097 Rev -01		23.05.2020						
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS		
					M/C	S			M	C	S	
1	2	3	4	5	6	7	8	9	10	11		

5.3	Test on every cylinder (as per relevant standard) and pressure test	MA	Test	100%	100%	Drawing	TC	P	W	V
5.4	Routine tests of valves / fitting for cylinder.	MA	Test	100%	100%	-do-	TC	P	V	V
5.5	Certification of Nitrogen bottles, if any, from CCOE/ PESO / any national or international government agency	MA	Review	100%	100%	Drawing	TC	P	V	V
6.	Oil Pipes, Valves & Fittings									
6.1	Make, Model / Type, Visual & Dimensional check. Hydrostatic Pressure test.	MA	Test	Sample	Sample	Relevant material standards as per Drawing	TC	P	V	V
7.	Instrumentation & Relays									
7.1	Make, Model, Type, Calibration certificate & Functional test	MA	Test	100%	100%	Technical specification / drawing	TC / CoC	P	V	V
8.	Online contamination sensors for monitoring ISO/NAS cleanliness with local display and remote communication									
8.1	Make, Model, Type, Operational / Function test.	MA	Test	100%	100%	Technical specification / drawing	TC / CoC	P	V	V
9	Hydraulic filtration system									
9.1	Make, Model, Type, Operational / Function test	MA	Test	100%	100%	Technical specification / drawing	TC / CoC	P	V	V
10.	Hydraulic Oil									
10.1	Physical Properties	MA	Test	Sample	Sample	Technical specification / drawing	TC / CoC	P	V	V
11	Final Testing of completed assembly of Oil sump & its associated piping & devices, Oil Pump assembly									
11.1	Operational & functional Tests of Pumps and controls including Valves, pressure switches and accessories etc.	MA	Test	100%	100%	Technical specification / drawing	TC	P	W	W

Prepared By:	Reviewed By:	Approved By:	Process Owner
			
FORM NO: F-050-02-15 ISSUE 2.0 REV. 01, DATE: 30/06/2016 Page 3 of 5		Approved by Consultant Status: Approved Dated: 05.06.2020 Recommended Approved	

		PROJECT: ARUN 3 HEP (4x225 MW)		MANUFACTURING QUALITY ASSURANCE PLAN				MANUFACTURER: Bharat Heavy Electricals Limited, Bhopal			
ITEM DESCRIPTION		SUB-ITEM		QAP & REV		ISSUE DATE					
VERTICAL FRANCIS TURBINE		Hydraulic system for Governor, MIV & PPV		QA/HT/1097 Rev -01		23.05.2020					
COMPONENT & OPERATION		CHARACTERISTICS		CLASS		TYPE OF CHECK		QUANTUM OF CHECK		REFERENCE DOCUMENT	
						CHECK		M/C		S	
SR. NO.		3		4		5		6		7	
1		2		3		4		5		6	
										8	
										9	
										10	
										11	

11.2		Check for Visual, Dimensions & Capacity. Assembly shall be aligned & match-mark to ensure correct re- assembly and alignment		MA		Vis / ME		100%		100%		Technical specification / drawing		TC		P		W		W	
11.3		Pressure test of assembled system as per drawing. Verification of pressure relief valve setting.		MA		Vis / Test		100%		100%		Technical specification / drawing		TC		P		W		W	
12.		Hydraulic panel for MIV & PPV																			
12.1		Dimensional check for height width, depth and sheet thickness of panel.		MN		ME		100%		100%		Technical specification / drawing		TC		P		W		W	
12.2		Visual check as per OGA, drawing and verification of BOM		MN		Vis		100%		100%		-do-		TC		P		W		W	
12.3		Visual check for alignment of boards, operation of doors, locks, base grouting & gland plates.		MN		Vis		100%		100%		-do-		TC		P		W		W	
8.		Hydraulic Actuator Unit																			
1.		Valves : Main oil distributing valve, Servo valve, Automatic shutdown valve, Emergency Shutdown valve, Control Valves (cartridge, shuttle etc.), Flow Control Valve, Check valve / Isolating Valve, NRV.																			
1.1		Make, Model & Type		MN		Vis		100%		100%		Technical specification / drawing		TC		P		V		V	
1.2		Hydrostatic Pressure test, Operational & Functional test		MA		Test		100%		100%		-do-		TC		P		V		V	
2.		Instrumentation for Hydraulic Actuator Unit																			
2.1		Make, Model & Type, Functional test & calibration certificate.		MA		Test		100%		100%		Technical specification / drawing		TC / CoC		P		V		V	

Prepared By:		Reviewed By:		Approved By:		Process Owner	
							
FORM NO. 1/060002/ISSUE 2.0 REV. 01, DATE: 30/06/2016 Page 4 of 6		SAJVN Arun-3 Power Development Company Pvt. Ltd. (A wholly owned company of SJVN) 100, 101 & 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000		SAJVN Arun-3 Power Development Company Pvt. Ltd. (A wholly owned company of SJVN) 100, 101 & 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 89			

PROJECT: ARUN 3 HEP (4x225 MW)		MANUFACTURING QUALITY ASSURANCE PLAN						MANUFACTURER:			
ITEM DESCRIPTION		SUB-ITEM		QAP & REV		ISSUE DATE		Bharat Heavy Electricals Limited, Bhopal			
VERTICAL FRANCIS TURBINE		Hydraulic system for Governor, MIV & PPV		QA/HT/1097 Rev -01		23.05.2020					
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C S	REMARKS
					M/C	S					
1	2	3	4	5	6	7	8	9	10	11	

Final testing of Hydraulic Actuator Unit (As assembled as per drawing with all accessories)including Marshaling Box.											
3.1	Visual check as per OGA, drawing and verification of BOM	MN	Vls	100%	100%	Technical specification / drawing	TC	P	W	W	
3.2	Dimensional check Operational & Functional Check	MA	ME /Test	100%	100%	Technical specification / drawing	TC	P	W	W	

 SJVN Arun-3 Power Development Company Pvt. Ltd. (A wholly owned company of SJVN) 900 MW Arun-3 Hydel Project, Bhopal Reg. No. 1116648075		To be Issued to Contractor Approved by: <i>[Signature]</i> Consultant: <i>[Signature]</i> Status: Approved Dated: 05.06.2020 Reviewed: <i>[Signature]</i> Recommended: <i>[Signature]</i> Approved: <i>[Signature]</i>
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Prepared By:	Reviewed By:	Approved By:
<i>[Signature]</i>		Process Owner

FORM NO.: F-060-02, ISSUE: 2.0 REV. 01, DATE: 30/06/2016
Page 5 of 5



[Signature]
Unit/In. Officer