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COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED . IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.		PROJECTS : PANKI 1x660MW CUSTOMER : M/s UPRVUNL CONSULTANT : M/s NTPC SPECIFICATION FOR 24V DC POWER SUPPLY SYSTEM		
		REVISION:00	CHECKED & APPROVED  RAJASEKAR K	PREPARED  Amit Kr Sharma

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		COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED . IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY. CONTENTS <table><tr><th>Sl. No.</th><th>Description</th><th>Reference.</th></tr><tr><td>1.</td><td>Scope of Supply</td><td>CE/416/ PANKI/24VDC/SOS</td></tr><tr><td>2.</td><td>Technical Requirement</td><td>CE/416/ PANKI/24VDC/TR</td></tr><tr><td>3.</td><td>Feeder List, load, Batt. Sizing Cable sizing calculation</td><td>CE/416/ PANKI/24VDC /FLC</td></tr><tr><td>4.</td><td>Type Test & Routine/Acceptance test requirement for Charger & Battery.</td><td>CE/416/ PANKI/24VDC/TT&RAT,</td></tr><tr><td>5.</td><td>Quality assurance details & Quality plan Format</td><td>CE/416/ PANKI/24VDC /QP</td></tr><tr><td>6.</td><td>Single Line Diagram for charger</td><td>CE/416/ PANKI/24VDC /SLD</td></tr><tr><td>7.</td><td>BILL OF MATERIAL- charger</td><td>CE/416/ PANKI/24VDC /BOM-C</td></tr></table>					Sl. No.	Description	Reference.	1.	Scope of Supply	CE/416/ PANKI/24VDC/SOS	2.	Technical Requirement	CE/416/ PANKI/24VDC/TR	3.	Feeder List, load, Batt. Sizing Cable sizing calculation	CE/416/ PANKI/24VDC /FLC	4.	Type Test & Routine/Acceptance test requirement for Charger & Battery.	CE/416/ PANKI/24VDC/TT&RAT,	5.	Quality assurance details & Quality plan Format	CE/416/ PANKI/24VDC /QP	6.	Single Line Diagram for charger	CE/416/ PANKI/24VDC /SLD	7.	BILL OF MATERIAL- charger	CE/416/ PANKI/24VDC /BOM-C
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		SCOPE OF SUPPLY		
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			PREPARED  Amit Kr Sharma	ISSUED 416 DATE : 25-Feb-21



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This specification for 24V DC system is common for Chargers and Battery equipments, which are being procured separately.

Each package (location) of 24V DC system shall comprise of the following.

Sl no	Item	Qty
1	1x100% capacity microprocessor controlled, intelligent, modular rectifier banks & controller (incoming for charger shall be through MCCB of suitable rating)	2 sets
2	1x 100 % battery (Ni-Cad type) with accessories for one hour duty cycle at 100% load	2 sets
3	DCDB with bus-coupler arrangement (DCDB and Charger Panel to be joined together with Busbar arrangement). For smaller charger, integral DCDB is acceptable	2 sets
4	Battery Health Management System for both sets of battery of a package including cables/hardware/software for connectivity to charger/DCS.	1 set
5	Battery Isolation comprising of MCCB mounted in charger panel	2 sets
6	Serial link with MODBUS protocol with 100 mtrs. cable for connecting to DCS. (Single connection is also acceptable provided it carries data to DCS of both Chargers/BHMS)	2 sets
7	Erection, supervision, commissioning & handing over of (a) Chargers/DCDB and BHMS and (b) of complete system after batteries have been commissioned by it's vendor	1 lot
8	Erection, supervision, commissioning & handing over of complete Battery system inclusive of necessary support to Charger vendor for commissioning the complete system	1 lot
9	Any software/hardware ,if applicable, to be provided to complete the system	1 set

Notes:

1. Sl.no. 2, 8 and 9 are in scope of supply for Battery vendor.
2. Sl no 1, 3, 4, 5, 6, 7 & 9 are in scope of supply for Charger vendors.
3. Please refer BOM for detailed requirements.
4. If individual BHMS is required for each battery bank individually, as per offered BHMS standard, then the same is also acceptable.

MANDATORY SPARES: Mandatory spares are to be calculated and quoted as per BOM. Summation of items of all package shall be considered while arriving quantity of mandatory spares. It means mandatory spares to be offered on overall basis and not for individual system. The qty. considered for each item per package needs to be brought out clearly.

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		2.0 GENERAL TERMS & CONDITIONS: 2.1 Vendors must provide BOM only in the format provided with this specification. Unit rates of each item in the BOM shall be provided.		
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		3.0 DOCUMENTS TO BE FURNISHED: 3.1 Following documents shall be furnished to BHEL as a minimum, apart from any other documents required to be submitted as called for elsewhere or as deemed necessary 3.2 Along with the Technical offer: For technical evaluation, vendor must send one (01) set of the following documents in hard copy, without which your offer is liable to be rejected. Charger Vendor: Unpriced BOM incl spares, SLD, catalog of rectifier, controller & BHMS, Clause-wise compliance of technical specification OR deviation list w.r.t specification. Battery vendor: Unpriced BOM, Battery sizing (as per IEEE or Equivalent Standard), Clause-wise compliance of technical specification OR deviation list w.r.t specification. In case deviation list or NIL deviation sheet is NOT found in offer, it will be deemed understood that there is NO deviation and later in case of ordering, no deviation will be accepted. <u>Incomplete offers (without all above documents) are liable for rejection.</u> 3.3 After placement of Purchase Order within 2 week: For BHEL/Consultant/Customer approval, Vendor must send one set of the following documents in hard copy & one (01) CD in soft copy, for each project. - All documents Sl. No 01 ~ 13 as above. - Interfacing diagram & cable type details used or suggested. - Quality Plan format enclosed as part of the specification. - Type test reports (if the same is not to be conducted for the project) 3.4 Before Inspection : For BHEL/Consultant/Customer approval, vendor must send one Set of the following documents in hard copy & one in soft copy. - Type test reports/Certificates as per specification/approved QP - Preliminary Instruction /O&M Manual 3.5 Along with the materials being dispatched: Vendor must send five (5) sets of the following “As Built & Approved” status documents four (4) in hard copies & one (1) in soft copy. - Instruction/O&M Manual - Bill of Material - Data Sheets - Technical literatures/Catalogs - Drawings GA/layout/wiring/interconnection/schematic, etc.		
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			PREPARED  Amit Kr Sharma	ISSUED 416 DATE : 25-Feb-21

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		24V DC power supply system		
COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.		1.0 GENERAL REQUIREMENTS This specification covers the requirement of a Microprocessor based, Intelligent ,Modular 24V DC Power Supply System comprising of microprocessor controlled, Intelligent, Modular rectifier banks, battery banks and DC distribution boards. The vendor shall be responsible for engineering and furnishing complete and operation system fully meeting the intent and requirement of this specification. All the equipment and sub-system offered shall be from reputed experienced manufacturers. All system, cabinet, enclosure and distribution boards shall be manufactured, assembled, wired and fully tested as a complete assembly as per requirements of this specification. The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, and IEC. NEC & IS. The 24 V DC equipment and the complete system shall have surge withstand capability (SWC) to meet the requirements of ANSI C37. 90a, IEEE Standard 472. The requirements of 24 V DC System are specified herein on system basis. The bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification and BHEL/Consultant/Customer approved drawings. All equipment and accessories required for completeness of this system shall be furnished by the Bidder within the quoted price whether these are specifically mentioned herein or not. All non interrupting components of 24 V DC system shall be capable of withstanding all available short circuit currents without damage. Additionally, all circuits interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage. 24 V DC provided with fuse free circuit breaker shall be preferred. However In case, it is the standard practice of manufacturer to use fast current limiting fuses at inverter output etc. to protect its power semiconductors devices, the same shall be acceptable. However, in AC distribution board either fuse-free circuit breakers shall be employed same shall be of HRC type only. In any case selective fuse(fuse free circuit breaker) coordination shall be provided by Bidder to ensure that only the fuse (fuse free circuit breaker) nearest to the fault will open and isolate the faulted circuit. Other branches of the distribution system will be unaffected and the fault will not cause more than one fuse to open . Further it will be the sole responsibility of the 24 V DC supplier to Engineer/design this system keeping in view the basic guideline as indicated elsewhere in specification like selectivity ratios etc. The selection and selective coordination of all the protecting devices including fuse free circuit breakers / fuses shall conform to the requirements of National Electric Code (NEC) 1984 and other applicable standards. The selectivity ratios of the fuses (fuse free breakers) shall be such that there is a sufficient margin between the total electric energy of the downstream fuse and the total melting energy of the 24 V DC upstream fuse. The selective ratio shall be as finalized during detailed engineering stage but the same shall be not less than 2:1 in any case		

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		Following general requirements shall be met for ensuring proper branch and circuit protection. I. The feeder fuse ampere rating and feeder conductor capacity must be at least 100% of the non continuous load plus 125% of the continuous load as calculated per Article 220 (220-10G) of NEC code - 1984. The feeder conductor must be protected by a fuse not greater than the conductor capacity. II. For circuit with transformers requirements for conductor protection articles 240 and 310 of NEC must be observed. If secondary fuse protection is not provided then the primary fuses must not be sized larger than 125% of the transformer primary full-load amperes. If secondary fuses are sized not greater than 125% of transformer secondary current, individual transformer fuses are not required in the primary provided the primary feeder fuses are not larger than 250% of the transformer rated primary current. General technical requirements to be complied 1 The charger equipment should have circuits to prevent malfunctioning of control panels & ensure protection of the same, in case of variations in the AC mains, which, among others include sudden voltage spikes in the input 3- phase AC supply, irregular waveform and phase imbalances. In such cases, the charger should respond in shortest possible time to trip itself and switch panel load to battery equipment. The response time of charger equipment for such responses shall be provided by the vendor for BHEL consideration. 2 The earthing scheme for the charger equipment and DCDB, including description of the ground terminals will be provided by the vendor. 3 The cable termination points in the DCDB should be sufficiently distanced to ensure flexibility to have a minor change (increase) in the cable size if site conditions require the same. 4 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Bidder shall be required to ensure supply of spare parts for life time of the plant. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence. 5 All components like diodes, SCRs, ICs, capacitors, resistors etc. Shall be properly chosen and de-rated such that failure rate is reduced to absolute minimum DETAILED PROJECT SPECIFIC TECHNICAL SPECIFICATION OF CHARGER AND BATTERY IS PROVIDED AS ANNEXURE-I TO THIS TECHNICAL SPECIFICATION			
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		COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED . IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY. FEEDER LIST, LOAD, BATTERY SIZING, CABLE SIZING CALCULATION		
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			PREPARED  Amit Kr Sharma ISSUED 416 DATE : 25-Feb-21	

SG/TG CHARGER Feeder Load						
FDR No.	NAME OF PANEL	PANEL NO.	LOAD CURRENT (Amp)	FEEDER RATING		CABLE SIZE (Sqmm Cu)
				MCB Rating (Amp)	FUSE Rating (Amp)	
1	FSSS MFT-1&3 (ECP)	CJF01	25	32	36	2C x 35
2	FSSS MFT-2&3 (ECP)	CJF02	25	32	36	2C x 35
3	FSSS MFT-2&3 (ECP)	CJF02	25	32	36	2C x 35
	FSSS MFT REPLAY-1 (RTP)	CJF03				
	FSSS MFT REPLAY-2 (RTP)	CJF04				
	FSSS MFT REPLAY-3 (RTP)	CJF05				
4	FSSS UNIT COMMON-A1 (ECP)	CJF06	15	20	25	2C x 16
5	FSSS UNIT COMMON-A2 (ECP)	CJF07	5	10	16	2C x 16
	FSSS UNIT COMMON-A RELAY (RTP)	CJF08				
	FSSS OIL AB, COAL A&B-1 RELAY (RTP)	CJF53				
6	FSSS OIL AB, COAL A&B-2 (ECP)	CJF54	25	32	36	2C x 35
7	FSSS OIL AB, COAL A&B-2 (ECP)	CJF54	8	10	16	2C x 16
8	FSSS OIL AB, COAL A&B-3 (ECP)	CJF55	8	10	16	2C x 16
9	FSSS OIL AB, COAL A&B-3 (ECP)	CJF55	8	10	16	2C x 16
10	FSSS OIL AB, COAL A&B-3 (ECP)	CJF55	4	6	10	2C x 16
	FSSS OIL AB, COAL A&B-4 RELAY (RTP)	CJF56				
	FSSS OIL AB, COAL C&D-1 RELAY (RTP)	CJF57				
11	FSSS OIL AB, COAL C&D-2 (ECP)	CJF58	25	32	36	2C x 35
12	FSSS OIL AB, COAL C&D-2 (ECP)	CJF58	8	10	16	2C x 16
13	FSSS OIL AB, COAL C&D-3 (ECP)	CJF59	8	10	16	2C x 16
14	FSSS OIL AB, COAL C&D-3 (ECP)	CJF59	8	10	16	2C x 16
	FSSS OIL AB, COAL C&D-4 RELAY (RTP)	CJF60				
	FSSS OIL EF, COAL E&F-1 RELAY (RTP)	CJF61				
15	FSSS OIL EF, COAL E&F-2 (ECP)	CJF62	25	32	36	2C x 35
16	FSSS OIL EF, COAL E&F-2 (ECP)	CJF62	8	10	16	2C x 16
17	FSSS OIL EF, COAL E&F-3 (ECP)	CJF63	8	10	16	2C x 16
18	FSSS OIL EF, COAL E&F-3 (ECP)	CJF63	8	10	16	2C x 16
	FSSS OIL EF, COAL E&F-4 RELAY (RTP)	CJF64				
	FSSS OIL GH, COAL G&H-1 RELAY (RTP)	CJF65				
19	FSSS OIL GH, COAL G&H-2 (ECP)	CJF66	25	32	36	2C x 35
20	FSSS OIL GH, COAL G&H-2 (ECP)	CJF66	8	10	16	2C x 35
21	FSSS OIL GH, COAL G&H-3 (ECP)	CJF67	8	10	16	2C x 16
22	FSSS OIL GH, COAL G&H-3 (ECP)	CJF67	8	10	16	2C x 16
	FSSS OIL GH, COAL G&H-4 RELAY (RTP)	CJF68				
23	FSSS MILL REJECT SYSTEM-1 (ECP)	CAF71	15	20	25	2C x 16
	FSSS MILL REJECT SYSTEM-2 (RTP)	CAF72				
24	FSSS MILL REJECT SYSTEM-3 (ECP)	CAF73	15	20	25	2C x 16
	FSSS MILL REJECT SYSTEM-4 (RTP)	CAF74				
25	SADC & UNIT COMMON-B1 (ECP)	CAF16	20	25	32	2C x 35
	APRDS & UNIT COMMON-B2 (ECP)	CAF17				
	SADC, APRDS & UNIT COMMON-B RELAY (RTP)	CAF18				
26	SBC WB CONTROLS-1 (ECP)	CAF63	25	32	36	2C x 35
	SBC WB CONTROLS-2 (ECP)	CAF64				
	SBC WB CONTROLS-3 (RTP)	CAF88				
	SBC WB CONTROLS-4 (RTP)	CAF89				
	SBC WB CONTROLS-5 (ECP)	CAF65				
27	SBC LR&AH CONTROLS-1 (ECP)	CAF66	15	20	25	2C x 16
	SBC LR&AH CONTROLS-2 (ECP)	CAF67				
	SBC LR&AH CONTROLS-3 (ECP)	CAF68				
	SBC LR&AH CONTROLS-4 (RTP)	CAF90				
28	MISC SG-1 (ECP)	CAF31	15	20	25	2C x 16
	MISC SG-2 (ECP)	CAF32				
	MISC SG-3 (ECP)	CAF33				
	MISC SG-RELAY (RTP)	CAF34				
29	MISC SG-4 (ECP)	CAF35	15	20	25	2C x 16
	MISC SG-5 (ECP)	CAF36				
	MISC SG-RELAY (RTP)	CAF37				

SG/TG CHARGER Feeder Load						
FDR No.	NAME OF PANEL	PANEL NO.	LOAD CURRENT (Amp)	FEEDER RATING		CABLE SIZE (Sqmm Cu)
				MCB Rating (Amp)	FUSE Rating (Amp)	
30	AIR COMPRESSOR SYSTEM-1` (ECP)	CAF43	15	20	25	2C x 16
	AIR COMPRESSOR SYSTEM-2` (RTP)	CAF70				
	AUX.BLR BMS (ECP)	CAF50				
	AUX.BLR RICP (ECP)	CAF51				
	AUX.BLR RELAY	CAF52				
31	ATRS1 (SGC TURB)	CCA01	25	32	36	2C x 35
	ATRS1 (SGC TURB)	CCA02				
	MARSHALLING FOR ATRS1 (SGC TURB)	CCA51				
	ATRS1 (SGC TURB)	CCA03				
32	ATRS2 (SGC OIL)	CCA04	20	25	32	2C x 35
	ATRS2 (SGC OIL)	CCA05				
	MARSHALLING FOR ATRS2 (SGC OIL)	CCA53				
33	MARSHALLING CABINET FOR SIEMENS SIGNAL I/F	CCA91	10	16	20	2C x 16
34	GAMP1	CCA07	20	25	32	2C x 35
	GAMP1	CCA08				
35	MARSHALLING FOR GAMP	CCA57				
36	GAMP2	CCA09	10	16	20	2C x 16
	COLTS &SCS	CCA10	10	16	20	2C x 16
	MARSHALLING	CCA60				
37	LOPS	CCA11	10	16	20	2C x 16
38	UNIFIED HMI INTERFACE	CCA20	15	20	25	2C x 16
	UNIFIED HMI INTERFACE	CCA30				
39	LPBP, GSPC CONTROLLER & LPBP PROTN CH-1	CJJ03	20	25	32	2C x 35
40	LPBP PROTN CH-2	CJJ04	10	16	20	2C x 16
	MARSHALLING	CJJ53				
41	ATRS3 (SGC COND.&EVAC)	CCA06	10	16	20	2C x 16
42	EHTC FOR BFPDT-A	CJJ20	10	16	20	2C x 16
	MARSHALLING	CJJ70				
43	SGC OIL & CLCS FOR BFPDT-A	CJJ21	20	25	32	2C x 35
	SGC OIL & CLCS FOR BFPDT-A	CJJ22				
44	SGC TURB & TP FOR BFPDT-A	CJJ23	20	25	32	2C x 35
	SGC TURB & TP FOR BFPDT-A	CJJ24				
	MARSHALLING	CJJ73				
45	EHTC FOR BFPDT-B	CJJ30	10	16	20	2C x 16
	MARSHALLING	CJJ80				
	SGC OIL & CLCS FOR BFPDT-B	CJJ31				
46	SGC OIL & CLCS FOR BFPDT-B	CJJ32	20	25	32	2C x 35
47	SGC TURB & TP FOR BFPDT-B	CJJ33	20	25	32	2C x 35
	SGC TURB & TP FOR BFPDT-B	CJJ34				
	MARSHALLING	CJJ83				
48	LMU & AUTO SYNCHRONISER	CJJ08	5	10	16	2C x 16
	TSI FOR BFPDT- A&B	CWW01				
	MARSHALLING	CWW51				
	TSI . FOR MAIN TURB	CJJ41				
	TSI. ANALYSIS & DIAGNOSTIC FOR MAIN TURB & BFPDT	CJJ42				
	MARSHALLING	CJJ91				
49	HPBP-1 (ECP)	CJF34	15	20	25	2C x 16
	HPBP-1 (ECP)	CJF35				
50	Spare		17	20	25	2C x 35
	TOTAL		727			
	TOTAL LOAD WITH 10% SPARE		800			

SG/TG CHARGER Feeder Load

FEEDERS AS PER MCB/FUSE WITH SPARES

Rating	Qty.	spare	total
6A/10A	1	1	2
10A/16A	14	4	18
16A/20A	8	2	10
20A/25A	10	3	13
25A/32A	8	2	10
32A/36A	9	3	12
TOTAL	50	15	65

BATTERY SIZING:

Charger rating	800
Permissible Voltage variation at Panels in volts (A)	19-30
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)	2.5
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)	21.5
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)	1.16
Number of cells required F= (C /D)	19
Ageing factor (G)	0.8
Design Margin (H)	1
Float charge correction factor (I)	0.915
Temperature correction factor at 4 Deg C (J)	0.935
Capacity factor (K)	1.36
Considering Temp correction, Ageing factor, FCC & Design margin	
Required AH = (RATED LOAD x H x K) / (G x I x J)	1590
Selected Battery as per manufacuter's standard catalog:	19KPH 58P

CABLE SIZE CALCULATION

Voltage drop from Battery to Charger

1	Number of cells (A)	19	
2	Float Voltage per cell (B)	1.4	
3	Float mode Voltage at Battery Charger (C) = A x B	26.6	
4	Distance from Battery to Charger in mtrs (per run) (D)	25	
5	Actual Load (Amps) (E)	727	
6	Size of Cable from Battery to Charger (Sqmm Cu) *	630	
7	Resistance of cable at 20 deg.C in Ohms/Km (F)	0.0283	
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894	0.0317	
9	Number of runs of cable (H)	2	
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)	0.5753	
11			

Voltage drop from charger to DCDB

1	charger to DCDB connected by solid Cu bus bar (Z)	0	
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Voltage drop from DCDB to Panels

1	Distance from DCDB to Panels (mtrs) (K)	50	50
2	Panel Load Current range (Amps)	2 - 15	16 - 25
3	Max Load current considered (Amps) (L)	15	25
4	Size of Cable from DCDB to Panels (Sqmm Cu)*	16	35
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)	1.15	0.524
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894	1.2864	0.5861
7	Number of runs of cable (O)	1	1
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)	1.93	1.47
	Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P	2.50	2.04
	Voltage available at panel on Full Load in Float Mode = C - P	24.10	24.56
	Voltage available at panel on 50% Load in Float Mode = C - P/2	25.64	25.87

Note:- 1. The above feeders are mentioned per DCDB. Same is applicable for both DCDB

2. 2C 16 / 2C 35Sqmm cable are envisaged for connecting loads from DCDB. Once core as +ve cable and another as -ve

3. 1C 630 Sqmm cable are envisaged for charger to battery. 2 cores will be used as +ve cable and another 2 cores as -ve

C&I CHARGER FEEDER LIST							
FDR No.	Description of panel	PANEL NAME	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable Size (Sqmm Cu)	
1	IDF-A, FDF-A, FURNACE PRESSURE	CRE01	18	25	32	2C x 35	
	IDF-A, FDF-A, FURNACE PRESSURE	CRE02					
	IDF-A, FDF-A, FURNACE PRESSURE	CRE03					
	MARSHALLING CABINET	CVP01					
2	IDF-B, FDF-B, AIR FLOW CTRL	CRE04	18	25	32	2C x 35	
	IDF-B, FDF-B, AIR FLOW CTRL	CRE05					
	IDF-B, FDF-B, AIR FLOW CTRL	CRE06					
	MARSHALLING CABINET	CVP02					
3	AH-A, SCAPH A	CRE07	18	25	32	2C x 35	
	AH-A, SCAPH A	CRE08					
	AH-A, SCAPH A	CRE09					
	MARSHALLING CABINET	CVP03					
4	AH-B, SCAPH B	CRE10	18	25	32	2C x 35	
	AH-B, SCAPH B	CRE11					
	AH-B, SCAPH B	CRE12					
	MARSHALLING CABINET	CVP04					
5	PA FAN-A, MILL-A,C,E,G CTRL PA HDR PR	CRE13	18	25	32	2C x 35	
	PA FAN-A, MILL-A,C,E,G CTRL PA HDR PR	CRE14					
	PA FAN-A, MILL-A,C,E,G CTRL PA HDR PR	CRE15					
	MARSHALLING CABINET	CVP05					
6	PA FAN-B, MILL-B,D,F,H FUEL FLOW CTRL	CRE16	18	25	32	2C x 35	
	PA FAN-B, MILL-B,D,F,H FUEL FLOW CTRL	CRE17					
	PA FAN-B, MILL-B,D,F,H FUEL FLOW CTRL	CRE18					
	MARSHALLING CABINET	CVP06					
7	CMC, FW CTRL	CRE19	14	20	25	2C x 16	
	CMC, FW CTRL	CRE20					
	MARSHALLING CABINET	CVP07					
8	CHEMICAL DOSING, SWAS	CRE21	18	25	32	2C x 35	
	CHEMICAL DOSING, SWAS	CRE22					
	CHEMICAL DOSING, SWAS	CRE23					
	MARSHALLING CABINET	CVP08					
9	SH,RH,BURNER TILT	CRE24	18	25	32	2C x 35	
	SH,RH,BURNER TILT	CRE25					
	SH,RH,BURNER TILT	CRE26					
	MARSHALLING CABINET	CVP09					
10	CEP-A, CWP-A, ACWP-A,DMCW(TG)-A	CRE27	14	20	25	2C x 16	
	CEP-A, CWP-A, ACWP-A,DMCW(TG)-A	CRE28					
	MARSHALLING CABINET	CVP10					
11	CEP-B, DMCW(TG)-B, DMCW(SG)-A	CRE29	14	20	25	2C x 16	
	CEP-B, DMCW(TG)-B, DMCW(SG)-A	CRE30					
	MARSHALLING CABINET	CVP11					
12	CEP-C, DMCW(TG)-C, DMCW(SG)-B	CRE31	14	20	25	2C x 16	
	CEP-C, DMCW(TG)-C, DMCW(SG)-B	CRE32					
	MARSHALLING CABINET	CVP12					
13	MDBFP-C, ACWP-B, CWP-B, CWP-C	CRE33	18	20	25	2C x 35	
	MDBFP-C, ACWP-B, CWP-B, CWP-C	CRE34					
	MDBFP-C, ACWP-B, CWP-B, CWP-C	CRE35					
	MARSHALLING CABINET	CVP13					
14	DEA, HPH CONTROLS	CRE36	14	20	25	2C x 16	
	DEA, HPH CONTROLS	CRE37					
	MARSHALLING CABINET	CVP14					

C&I CHARGER FEEDER LIST

	Feeder Description	PANEL NAME	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable Size (Sqmm Aluminium)	
15	LPH CONTROLS, MISC DRIVES	CRE38	14	20	25	2C x 16	
	LPH CONTROLS, MISC DRIVES	CRE39					
	MARSHALLING CABINET	CVP15					
16	HOTWELL MKUP-A, BLR PMP-A, DM WTR PMP-A	CRE40	14	20	25	2C x 16	
	HOTWELL MKUP-A, BLR PMP-A, DM WTR PMP-A	CRE41					
	MARSHALLING CABINET	CVP16					
17	HOTWELL MKUP-B, BLR PMP-B, DM WTR PMP-B	CRE42	14	20	25	2C x 16	
	HOTWELL MKUP-B, BLR PMP-B, DM WTR PMP-B	CRE43					
	MARSHALLING CABINET	CVP17					
18	CWPA, ACWPA-CWPH	CRE44	14	20	25	2C x 16	
	CWPA, ACWPA-CWPH	CRE45					
	MARSHALLING CABINET	CVP18					
19	CWPB, CWPC, ACWPB-CWPH	CRE46	14	20	25	2C x 16	
	CWPB, CWPC, ACWPB-CWPH	CRE47					
	MARSHALLING CABINET	CVP19					
20	ELECTRICAL SYSTEM	CRE60	18	25	32	2C x 35	
	ELECTRICAL SYSTEM	CRE61					
	ELECTRICAL SYSTEM	CRE62					
	MARSHALLING CABINET	CVP20					
21	ELECTRICAL SYSTEM	CRE63	18	25	32	2C x 35	
	ELECTRICAL SYSTEM	CRE64					
	ELECTRICAL SYSTEM	CRE65					
	MARSHALLING CABINET	CVP21					
22	ELECTRICAL SYSTEM	CRE66	18	25	32	2C x 35	
	ELECTRICAL SYSTEM	CRE67					
	ELECTRICAL SYSTEM	CRE68					
	MARSHALLING CABINET	CVP22					
23	ELECTRICAL SYSTEM	CRE69	10	16	20	2C x 16	
	ELECTRICAL SYSTEM	CRE70					
	ELECTRICAL SYSTEM	CRE71					
	MARSHALLING CABINET	CVP23					
24	BLR MTM TEMP SIGNAL	CRE72	14	20	25	2C x 16	
	BLR MTM TEMP SIGNAL	CRE73					
	MARSHALLING CABINET	CVP24					
25	RELAY PANEL	CTE01	30	36	40	2C x 35	
	RELAY PANEL	CTE02					
	RELAY PANEL	CTE03					
26	I.P RELAY	CXA01	16	20	25	2C x 35	
	I.P RELAY	CXA02					
27	I.P RELAY	CXA03	16	20	25	2C x 35	
	I.P RELAY	CXA04					
28	N/W PANEL DCS-A	NWPD01	10	16	20	2C x 16	
29	N/W PANEL DCS-B	NWPD02	10	16	20	2C x 16	
30	AC/VENT - DCS		20	16	20	2C x 35	
31	AC/VENT - DCS		20	16	20	2C x 35	
32	AC/VENT - DCS		20	16	20	2C x 35	
33	AC/VENT - DCS		20	16	20	2C x 35	
34	AC/VENT - PEM		9	16	20	2C x 16	
35	AC/VENT - PEM		9	16	20	2C x 16	
36	AC/VENT - PEM		9	16	20	2C x 16	

	C&I CHARGER FEEDER LIST						
37	AC/VENT - PEM		9	16	20	2C x 16	
38	AC/VENT - PEM		9	16	20	2C x 16	
39	AC/VENT - PEM		9	16	20	2C x 16	
40	AC/VENT - PEM		9	16	20	2C x 16	
41	AC/VENT - PEM		9	16	20	2C x 16	
42	AC/VENT - PEM		9	16	20	2C x 16	
43	AC/VENT - PEM		13	16	20	2C x 16	
44	AC/VENT - PEM		13	16	20	2C x 16	
45	VMS		20	25	32	2C x 35	
46	VMS		15	20	25	2C x 35	
47	C&I Drawout console		5	10	16	2C x 16	
48	Spare		21	25	32	2C x 35	
49	Spare		17	20	25	2C x 35	
	TOTAL LOAD (Amps)		727				
	TOTAL LOAD WITH 10% SPARE		800				
SUMMARY OF FEEDER (MCB/FUSE) WITH SPARES							
S.No	Rating	Qty.	spare	TOTAL			
1	16A/20A	18	5	23			
2	20A/25A	16	4	20			
3	25A/32A	13	4	17			
4	36A/40A	1	1	2			
	TOTAL	48	14	62			

C&I CHARGER FEEDER LIST				
INPUT FOR BATTERY SIZING:				
Charger rating		800		
Permissible Voltage variation at Panels in volts (A)		19-30		
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)		2.5		
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)		21.5		
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)		1.16		
Number of cells required F= (C /D)		19		
Ageing factor (G)		0.8		
Design Margin (H)		1		
Float charge correction factor (I)		0.915		
Temperature correction factor at 4 Deg C (J)		0.935		
Capacity factor (K)		1.36		
Considering Temp correction, Ageing factor, FCC & Design margin				
Required AH = (RATED LOAD x H x K) / (G x I x J)		1589		
Selected Battery as per manufacuter's standard catalog:				
CABLE SIZE CALCULATION				
	Voltage drop from Battery to Charger			
1	Number of cells (A)	19		
2	Float Voltage per cell (B)	1.4		
3	Float mode Voltage at Battery Charger (C) = A x B	26.6		
4	Distance from Battery to Charger in mtrs (per run) (D)	25		
5	Actual Load (Amps) (E)	727		
6	Size of Cable from Battery to Charger (Sqmm Cu) *	630		
7	Resistance of cable at 20 deg.C in Ohms/Km (F)	0.0283		
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894	0.0317		
9	Number of runs of cable (H)	2		
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)	0.5753		
	Voltage drop from charger to DCDB			
1	charger to DCDB connected by solid Cu bus bar (Z)	0		
	Voltage drop from DCDB to Panels			
1	Distance from DCDB to Panels (mtrs) (K)	50	50	
2	Panel Load Current range (Amps)	1 - 14	15 - 30	
3	Max Load current considered (Amps) (L)	14	30	
4	Size of Cable from DCDB to Panels (Sqmm Cu)*	16	35	
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)	1.15	0.524	
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894	1.2864	0.5861	
7	Number of runs of cable (O)	1	1	
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)	1.80	1.76	
	Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P	2.376	2.334	
	Voltage available at panel on Full Load in Float Mode = C - P	24.224	24.266	
	Voltage available at panel on Half Load in Float Mode = C - P/2	25.700	25.721	
Note:- 1. The above feeders are mentioned per DCDB. Same is aplicable for both DCDB				
2. 2C 16 / 2C 35Sqmm cable are envisaged for connecting loads from DCDB. Once cable will be as +ve cable and another as -ve				
3. 1C 630 Sqmm cable are envisaged for charger to battery. 2 cores will be used as +ve cable and another 2 cores as -ve				

TG-SIEMENS CHARGER Feeder Load

Fdr No	SI No	PANEL FUNCTION	PANEL NO.	CURRENT Required (Amps)	FEEDER RATING		CABLE SIZE (Sqmm Cu)
					MCB RATING (Amp)	FUSE RATING (Amp)	
1	1	SAG CAB CJJ11	CJJ11	40	50	60	2C x 70
2	2	SAG CAB CJJ12	CJJ12	40	50	60	2C x 70
3	3	SAG CAB CJJ13	CJJ13	40	50	60	2C x 70
		TOTAL		120			

TOTAL LOAD WITH 10% SPARE 132

FEEDERS AS PER MCB/FUSE WITH SPARES

Rating	Qty.	spare	total
50A/60A	3	1	4
TOTAL	3	1	4

BATTERY SIZING: TYPE OF BATTERY- Lead Acid Plante

Charger rating	132
Permissible Voltage variation at Panels in volts (A)	20.4-26.4
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)	2.5
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)	22.9
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)	1.16
Number of cells required F= (C /D)	19
Ageing factor (G)	0.8
Design Margin (H)	1
Float charge correction factor (I)	0.915
Temperature correction factor at 4 Deg C (J)	0.935
Capacity factor (K)	1.36
Considering Temp correction, Ageing factor, FCC & Design margin	
Required AH = (RATED LOAD x H x K) / (G x I x J)	262
Selected Battery as per manufacuter's standard catalog:	19KPH 58P

CABLE SIZE CALCULATION

Voltage drop from Battery to Charger

1	Number of cells (A)	19
2	Float Voltage per cell (B)	1.4
3	Float mode Voltage at Battery Charger (C) = A x B	26.6
4	Distance from Battery to Charger in mtrs (per run) (D)	25
5	Actual Load (Amps) (E)	120
6	Size of Cable from Battery to Charger (Sqmm Cu) *	630
7	Resistance of cable at 20 deg.C in Ohms/Km (F)	0.0283
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894	0.0317
9	Number of runs of cable (H)	1
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)	0.1899

Voltage drop from charger to DCDB

1	charger to DCDB connected by solid Cu bus bar (Z)	0
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Voltage drop from DCDB to Panels

1	Distance from DCDB to Panels (mtrs) (K)	50
2	Panel Load Current range (Amps)	1 - 40
3	Max Load current considered (Amps) (L)	40
4	Size of Cable from DCDB to Panels (Sqmm Cu)*	70
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)	0.268
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894	0.2998
7	Number of runs of cable (O)	1
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)	1.20

Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P 1.389

Voltage available at panel on Full Load in Float Mode = C - P 25.211

Voltage available at panel on Half Load in Float Mode = C - P/2 26.000

Note:- 1. The above feeders are mentioned per DCDB. Same is aplicable for both DCDB

2. 2C 70Sqmm cable are envisaged for connecting loads from DCDB. Once core each will be for +ve and -ve connection

3. 2C 120 Sqmm cable are envisaged for charger to battery. 2 cores will be used as +ve cable and another 2 cores as -ve

WATER PH CHARGER FEEDER LIST						
FDR No.	Description of panel	PANEL NAME	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable Size (Sqmm Cu)
1	RAW WATER, AHP PMPS & ELEC	CRA35	18	25	32	2C x 16
	RAW WATER, AHP PMPS & ELEC	CRA36				
	RAW WATER, AHP PMPS & ELEC	CRA37				
	MARSHALLING CABINET	CVP43				
2	VMS		12	16	20	2C x 16
3	SPARE		6	10	16	2C x 16
	TOTAL LOAD (Amps)		36			
	TOTAL LOAD WITH 10% SPARE		40			
SUMMARY OF FEEDER (MCB/FUSE) WITH SPARES						
S.No	Rating	Qty.	spare	TOTAL		
1	10A/16A	1	1	2		
2	16A/20A	1	1	2		
3	25A/32A	1	1	2		
	TOTAL	3	3	6		
BATTERY SIZING:						
Charger rating						40
Permissible Voltage variation at Panels in volts (A)						19-30
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)						2.5
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)						21.5
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)						1.16
Number of cells required F= (C /D)						19
Ageing factor (G)						0.8
Design Margin (H)						1
Float charge correction factor (I)						0.915
Temperature correction factor at 4 Deg C (J)						0.935
Capacity factor (K)						1.36
Considering Temp correction, Ageing factor, FCC & Design margin						
Required AH = (RATED LOAD x H x K) / (G x I x J)						79
Selected Battery as per manufacuter's standard catalog:						
CABLE SIZE CALCULATION						
Voltage drop from Battery to Charger						
1	Number of cells (A)					19
2	Float Voltage per cell (B)					1.4
3	Float mode Voltage at Battery Charger (C) = A x B					26.6
4	Distance from Battery to Charger in mtrs (per run) (D)					20
5	Actual Load (Amps) (E)					36
6	Size of Cable from Battery to Charger (Sqmm Cu) *					120
7	Resistance of cable at 20 deg.C in Ohms/Km (F)					0.153
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894					0.1711
9	Number of runs of cable (H)					1
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)					0.2464
Voltage drop from charger to DCDB						
1	charger to DCDB connected by solid Cu bus bar (Z)					0
Voltage drop from DCDB to Panels						
1	Distance from DCDB to Panels (mtrs) (K)					40
2	Panel Load Current range (Amps)					1 - 18
3	Max Load current considered (Amps) (L)					18
4	Size of Cable from DCDB to Panels (Sqmm Cu)*					16
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)					1.15
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894					1.2864
7	Number of runs of cable (O)					1
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)					1.85
Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P					2.099	
Voltage available at panel on Full Load in Float Mode = C - P					24.501	
Voltage available at panel on Half Load in Float Mode = C - P/2					25.674	
Note:- 1. The above feeders are mentioned per DCDB. Same is applicable for both DCDB						
2. 2C 16 / 2C 35Sqmm cable are envisaged for connecting loads from DCDB. Once cable will be as +ve cable and another as -ve						
3. 1C 630 Sqmm cable are envisaged for charger to battery. 2 cores will be used as +ve cable and another 2 cores as -ve						

	TRAINING CENTER CHARGER FEEDER LIST
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FDR No.	Description of panel	PANEL NAME	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable Size (Sqmm Cu)
1			20	25	32	2C x 35
2			10	16	20	2C x 35
3	SPARE		6	16	20	2C x 35
	TOTAL LOAD (Amps)		36			
	TOTAL LOAD WITH 10% SPARE		40			
SUMMARY OF FEEDER (MCB/FUSE) WITH SPARES						
S.No	Rating	Qty.	spare	TOTAL		
1	16A/20A	2	1	3		
3	25A/32A	1	1	2		
	TOTAL	3	2	5		

BATTERY SIZING:

Charger rating		40
Permissible Voltage variation at Panels in volts	(A)	19-30
Allowed Voltage drop from Battery to DCDB to DCS panels :	(B)	2.5
Minimum voltage at Battery bank after discharge for 1 hour	C=(A+B)	21.5
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell	(D)	1.16
Number of cells required	F= (C /D)	19
Ageing factor	(G)	0.8
Design Margin	(H)	1
Float charge correction factor	(I)	0.915
Temperature correction factor at 4 Deg C	(J)	0.935
Capacity factor	(K)	1.36
Considering Temp correction, Ageing factor, FCC & Design margin		
Required AH = (RATED LOAD x H x K) / (G x I x J)		79

Selected Battery as per manufacuter's standard catalog:	
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CABLE SIZE CALCULATION

	Voltage drop from Battery to Charger		
1	Number of cells	(A)	19
2	Float Voltage per cell	(B)	1.4
3	Float mode Voltage at Battery Charger	(C) = A x B	26.6
4	Distance from Battery to Charger in mtrs (per run)	(D)	20
5	Actual Load (Amps)	(E)	36
6	Size of Cable from Battery to Charger (Sqmm Cu) *		120
7	Resistance of cable at 20 deg.C in Ohms/Km	(F)	0.153
8	Resistance of cable at 50 deg.C in Ohms/Km	(G) = F/0.894	0.1711
9	Number of runs of cable	(H)	1
10	Voltage drop in Cable per run (Volts)	(I)=(ExGx2D)/(1000xH)	0.2464
	Voltage drop from charger to DCDB		
1	charger to DCDB connected by solid Cu bus bar	(Z)	0
	Voltage drop from DCDB to Panels		
1	Distance from DCDB to Panels (mtrs)	(K)	40
2	Panel Load Current range (Amps)		1 - 20
3	Max Load current considered (Amps)	(L)	20
4	Size of Cable from DCDB to Panels (Sqmm Cu)*		16
5	Resistance of cable at 20 deg.C (Ohms/Km)	(M)	1.15
6	Resistance of cable at 50 deg.C in Ohms/Km	(G) = F/0.894	1.2864
7	Number of runs of cable	(O)	1
8	Voltage drop in Cable (Volts)	(P) =(2KxLxG)/(1000xO)	2.06
	Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P		2.305
	Voltage available at panel on Full Load in Float Mode = C - P		24.295
	Voltage available at panel on Half Load in Float Mode = C - P/2		25.571

Note:- 1. The above feeders are mentioned per DCDB. Same is applicable for both DCDB

2. 2C 16 / 2C 35Sqmm cable are envisaged for connecting loads from DCDB. Once cable will be as +ve cable & other as -ve

3. 1C 630 Sqmm cable are envisaged for charger to battery. 2 cores will be used as +ve cable and another 2 cores as -ve

AUX BOILER CHARGER FEEDER LIST						
FDR No.	Description of panel	PANEL NAME	Load in Amps	MCB Amps	Fuse Amps	Cable Size (Sqmm Cu)
1	AUX BLR BMS (ECP)	CAF50	10	16	20	2C x 16
	AUX BLR RICP (ECP)	CAF51	20	25	32	2C x 16
	AUR BLR RELAY	CAF52				
2	SPARE		6	10	16	
	TOTAL LOAD (Amps)		36			
	TOTAL LOAD WITH 10% SPARE		40			
SUMMARY OF FEEDER (MCB/FUSE) WITH SPARES						
S.No	Rating	Qty.	spare	TOTAL		
1	10A/16A	1	1	2		
2	16A/20A	1	1	2		
3	25A/32A	1	1	2		
	TOTAL	3	3	6		
BATTERY SIZING:						
Charger rating						40
Permissible Voltage variation at Panels in volts (A)						19-30
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)						2.5
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)						21.5
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)						1.16
Number of cells required F= (C /D)						19
Ageing factor (G)						0.8
Design Margin (H)						1
Float charge correction factor (I)						0.915
Temperature correction factor at 4 Deg C (J)						0.935
Capacity factor (K)						1.36
Considering Temp correction, Ageing factor, FCC & Design margin						
Required AH = (RATED LOAD x H x K) / (G x I x J)						79
Selected Battery as per manufacuter's standard catalog:						
CABLE SIZE CALCULATION						
Voltage drop from Battery to Charger						
1	Number of cells (A)					19
2	Float Voltage per cell (B)					1.4
3	Float mode Voltage at Battery Charger (C) = A x B					26.6
4	Distance from Battery to Charger in mtrs (per run) (D)					20
5	Actual Load (Amps) (E)					36
6	Size of Cable from Battery to Charger (Sqmm Cu) *					120
7	Resistance of cable at 20 deg.C in Ohms/Km (F)					0.153
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894					0.1711
9	Number of runs of cable (H)					1
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)					0.2464
Voltage drop from charger to DCDB						
1	charger to DCDB connected by solid Cu bus bar (Z)					0
Voltage drop from DCDB to Panels						
1	Distance from DCDB to Panels (mtrs) (K)					40
2	Panel Load Current range (Amps)					1 - 20
3	Max Load current considered (Amps) (L)					20
4	Size of Cable from DCDB to Panels (Sqmm Cu)*					16
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)					1.15
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894					1.2864
7	Number of runs of cable (O)					1
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)					2.06
Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P					2.305	
Voltage available at panel on Full Load in Float Mode = C - P					24.295	
Voltage available at panel on Half Load in Float Mode = C - P/2					25.571	
Note:- 1. The above feeders are mentioned per DCDB. Same is aplicable for both DCDB						
2. 2C 16 Sqmm cable are envisaged for connecting loads from DCDB. Once cable will be as +ve cable and another as -ve						
3. 2C 120 Sqmm cable are envisaged for charger to battery. 1 cores will be used as +ve cable and 1 core as -ve						

	RW INTAKE ROOM CHARGER FEEDER LIST
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FDR No.	Description of panel	PANEL NAME	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable Size (Sqmm Cu)
1	RW INTAKE, SCREEN WASH PMP & ELEC	CRA38	12	16	20	2C x 16
	RW INTAKE, SCREEN WASH PMP & ELEC	CRA39				
	MARSHALLING CABINET	CVP44				
2	TREAVELLING WATER SCREEN	CRA40	12	16	20	2C x 16
	TREAVELLING WATER SCREEN	CRA41				
	MARSHALLING CABINET	CVP45				
3	VMS		12	16	20	2C x 16
4	Spare		9	16	20	2C x 16
	TOTAL LOAD (Amps)		45			
	TOTAL LOAD WITH 10% SPARE		50			
SUMMARY OF FEEDER (MCB/FUSE) WITH SPARES						
S.No	Rating	Qty.	spare	TOTAL		
1	16A/20A	4	1	5		
	TOTAL	4	1	5		

BATTERY SIZING:	
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Charger rating		50
Permissible Voltage variation at Panels in volts (A)		19-30
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)		2.5
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)		21.5
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)		1.16
Number of cells required F= (C /D)		19
Ageing factor (G)		0.8
Design Margin (H)		1
Float charge correction factor (I)		0.915
Temperature correction factor at 4 Deg C (J)		0.935
Capacity factor (K)		1.36
Considering Temp correction, Ageing factor, FCC & Design margin		
Required AH = (RATED LOAD x H x K) / (G x I x J)		98

Selected Battery as per manufacuter's standard catalog:	
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CABLE SIZE CALCULATION

	Voltage drop from Battery to Charger		
1	Number of cells (A)		19
2	Float Voltage per cell (B)		1.4
3	Float mode Voltage at Battery Charger (C) = A x B		26.6
4	Distance from Battery to Charger in mtrs (per run) (D)		20
5	Actual Load (Amps) (E)		45
6	Size of Cable from Battery to Charger (Sqmm Cu) *		120
7	Resistance of cable at 20 deg.C in Ohms/Km (F)		0.153
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894		0.1711
9	Number of runs of cable (H)		1
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)		0.3081
	Voltage drop from charger to DCDB		
1	charger to DCDB connected by solid Cu bus bar (Z)		0
	Voltage drop from DCDB to Panels		
1	Distance from DCDB to Panels (mtrs) (K)		40
2	Panel Load Current range (Amps)		1 - 12
3	Max Load current considered (Amps) (L)		12
4	Size of Cable from DCDB to Panels (Sqmm Cu)*		16
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)		1.15
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894		1.2864
7	Number of runs of cable (O)		1
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)		1.23
	Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P		1.543
	Voltage available at panel on Full Load in Float Mode = C - P		25.057
	Voltage available at panel on Half Load in Float Mode = C - P/2		25.983

Note:- 1. The above feeders are mentioned per DCDB. Same is applicable for both DCDB

2. 2C 16 / 2C 35Sqmm cable are envisaged for connecting loads from DCDB. Once cable will be as +ve cable & other as -ve

3. 1C 630 Sqmm cable are envisaged for charger to battery. 2 cores will be used as +ve cable and another 2 cores as -ve

CWPH ROOM CHARGER FEEDER LIST						
FDR No.	Description of panel	PANEL NAME	Load in Amps	MCB Amps	Fuse Amps	Cable Size (Sqmm Cu)
1	CWPA, ACWPA-CWPH	CRE44	14	20	25	2C x 16
	CWPA, ACWPA-CWPH	CRE45				
	MARSHALLING CABINET	CVP18				
2	CWPB, CWPC, ACWPB-CWPH	CRE46	14	20	25	2C x 16
	CWPB, CWPC, ACWPB-CWPH	CRE47				
	MARSHALLING CABINET	CVP19				
3	VMS		15	16	20	2C x 16
4	SPARE		2	4	6	2C x 16
	TOTAL LOAD (Amps)		45			
	TOTAL LOAD WITH 10% SPARE		50			
SUMMARY OF FEEDER (MCB/FUSE) WITH SPARES						
S.No	Rating	Qty.	spare	TOTAL		
1	4A/6A	1	1	2		
2	16A/20A	1	1	2		
3	20A/25A	2	1	3		
	TOTAL	4	3	7		
BATTERY SIZING:						
Charger rating						50
Permissible Voltage variation at Panels in volts (A)						19-30
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)						2.5
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)						21.5
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)						1.16
Number of cells required F= (C /D)						19
Ageing factor (G)						0.8
Design Margin (H)						1
Float charge correction factor (I)						0.915
Temperature correction factor at 4 Deg C (J)						0.935
Capacity factor (K)						1.36
Considering Temp correction, Ageing factor, FCC & Design margin						
Required AH = (RATED LOAD x H x K) / (G x I x J)						98
Selected Battery as per manufacuter's standard catalog:						
CABLE SIZE CALCULATION						
	Voltage drop from Battery to Charger					
1	Number of cells (A)					19
2	Float Voltage per cell (B)					1.4
3	Float mode Voltage at Battery Charger (C) = A x B					26.6
4	Distance from Battery to Charger in mtrs (per run) (D)					20
5	Actual Load (Amps) (E)					45
6	Size of Cable from Battery to Charger (Sqmm Cu) *					120
7	Resistance of cable at 20 deg.C in Ohms/Km (F)					0.153
8	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894					0.1711
9	Number of runs of cable (H)					1
10	Voltage drop in Cable per run (Volts) (I)=(ExGx2D)/(1000xH)					0.3081
	Voltage drop from charger to DCDB					
1	charger to DCDB connected by solid Cu bus bar (Z)					0
	Voltage drop from DCDB to Panels					
1	Distance from DCDB to Panels (mtrs) (K)					40
2	Panel Load Current range (Amps)					1 - 15
3	Max Load current considered (Amps) (L)					15
4	Size of Cable from DCDB to Panels (Sqmm Cu)*					16
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)					1.15
6	Resistance of cable at 50 deg.C in Ohms/Km (G) = F/0.894					1.2864
7	Number of runs of cable (O)					1
8	Voltage drop in Cable (Volts) (P) =(2KxLxG)/(1000xO)					1.54
	Total Voltage drop at 100% load (Battery-Charger-DCDB-Panels) R= I+Z+P					1.852
	Voltage available at panel on Full Load in Float Mode = C - P					24.748
	Voltage available at panel on Half Load in Float Mode = C - P/2					25.828
Note:- 1. The above feeders are mentioned per DCDB. Same is aplicable for both DCDB						
2. 2C 16 Sqmm cable are envisaged for connecting loads from DCDB. Once cable will be as +ve cable and another as -ve						
3. 2C 120 Sqmm cable are envisaged for charger to battery. 1 cores will be used as +ve cable and 1 core as -ve						



PAGE 01 OF 02

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RAJASEKAR K

Amit Kr Sharma

DATE
25 / 2 /21

POWER SUPPLY FOR C&I SYSTEMS (UPS/BATTERY/BATTERY CHARGER/ACDB/DCDB)

ITEMS	TESTS																
	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)	General arrangement/BOM/make of components /Mimic ®	Efficiency ,regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range(A)	Premilinary light load test(R)	Load transfer retransfer test (R) *	AC input failiure and return test (R)	Parrallel operation and current divison(R)	Relative harmonic content(R)	Restart with PRI A.C and battery (separately)(R)	System transfer and retransfer (R)*	Asynchronous transfer(R)	Ripple content(R)	Load limiter operation (R)	IR/HV(R)	Tests as per standard &specification (R)&(A)
UPS/CONVERTER (IEC-146 PT-4)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y					Y		Y				Y	
LEAD ACID BATTERY(TUBLAR)-IS-1651																	Y
LEAD ACID BATTERY (PLANTE)-IS-1652																	Y
NICKEL CADMIUM BATTERY(IS-10918/IEC-623)																	Y
SMF BATTERY																	Y
ACDB/DCDB	Y	Y														Y	Y
BATTERY CHARGER	Y	Y	Y	Y	Y				Y					Y	Y	Y	Y

R-Routine Test

A- Acceptance Test

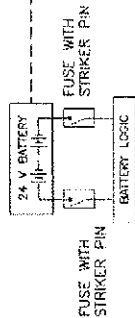
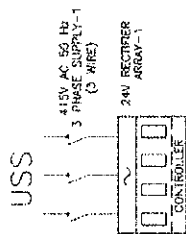
Y – Test applicable

* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded .

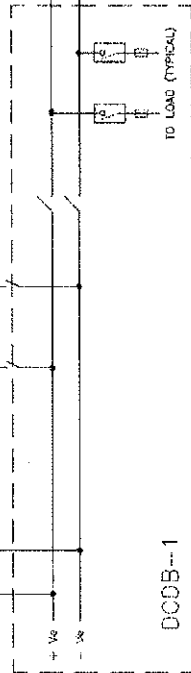
- Note:** 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure finalized during QP finalization
- 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.

		बि एच ई एल  A4-10		CE/416/ PANKI/24VDC /SLD REV00 PAGE 01 OF 02	
		Single Line Diagram for Charger			
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				PREPARED  Amit Kr Sharma	ISSUED 416 DATE 25 / 2 /21

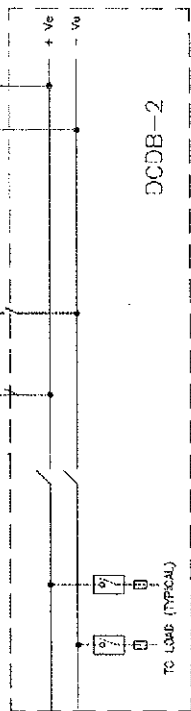
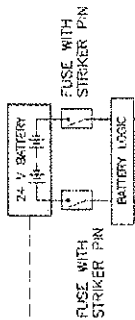
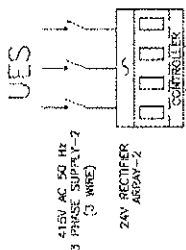
SET-1



BATTERY HEALTH
MONITORING SYSTEM
(BHMS)



SET-2



LEGEND:

ISOLATOR

MCB

FUSE

TWO SET CONFIGURATION

NOTES:-

- SUITABLE INTERLOCK SYSTEM SHALL BE PROVIDED IN FLIGHT/BOOST CHARGING MODE.

FOR TENDER PURPOSE ONLY

		बि एच ई एल  A4-10		CE/416/ PANKI/24VDC /BOM-C REV00 PAGE 01 OF 03
		COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED . IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY. BILL OF MATERIAL- CHARGER		
		REVISION:00	CHECKED & APPROVED  RAJASEKAR K	
			PREPARED  Amit Kr Sharma	ISSUED: 416 DATE: : 25-Feb-21

BOM FOR CHARGER SYSTEM - PANKI 1x660MW

[illegible]

MANDATORY SPARES BOM - TO BE OFFERED ON OVERALL BASIS

Fuses/Semiconductor Fuses	300% of installed of each type, current rating with each panel/board
Miscellaneous parts for the power supplies such as SCRS, transistors, resistors, diodes, light bulbs, static switches , blocking diodes etc	Minimum of 15% or atleast four (whichever is more) of each type model and rating of SCR and power diodes, power transistors shall be included
Electronic cards for Battery health Monitoring	10% or at least two nos (whichever is more) of each type
Electronic Modules like Rectifier control card, Driver card, IGBT Module, DC-DC converter card or any other card as listed in approved BOM for 24 V DC supply.	1 Set of each type & rating
Miniature Circuit breakers for AC and DC supply.	20 % of installed or 10 Nos of each type (which ever is more) for ACDB and DCDB.
Digital/analog panel meters/indicators	5% or 2 no. of each type (whichever is more)
CT's, CVT's VT's chokes, AC/DC isolators, contactors, timers, relays.	10% or 2 nos. of each type and rating, (whichever is more)
Cooling Fans in 24 V DC charger panels	20% or 2 nos. of each type and rating, (whichever is more)
Electronic modules of each type & rating	10% or One set (whichever is more) of each type, model & rating with each set consisting of at least one number of each type of electronic module for inverters, chargers, static switch, stabiliser etc. as per approved BOM.
MCCB for 24 V DC charger panels and DCDB.	20 % of installed or 5 Nos of each type (which ever is more)
Rectifier & controller modules for 24 V DC charger system	Ten (10) percent of each type & Size installed

CHAPTER-7: ~~UNINTERRUPTIBLE POWER SUPPLY SYSTEM~~ & 24 V DC SYSTEMS**7.01.00 ELECTRICAL POWER SUPPLY**

7.01.01 The requirements of Electrical Power Supply system are specified herein on system basis.

The Bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification including tender drawings and Owner approved drawings during detailed engineering. All equipment and accessories required for completeness of this system shall be furnished by the Bidder whether these are specifically mentioned herein or not. All the equipments and sub systems offered shall be from reputed experienced manufacturers. All system cabinets, enclosures, & distribution boards shall be manufactured, assembled, wired and fully tested as a complete assembly as per the requirements of this specification at the manufacturer's works.

~~The Bidder shall furnish all required equipment cubicles and wiring required for conversion and/or stabilization of the power sources provided by the Owner to all other levels which may be necessary for meeting the individual requirement of equipment/system furnished by him including the panel/desk mounted equipment.~~

7.01.02 The power supply system shall be designed to meet the electrical power requirements of various C&I systems including DDCMIS. The Power Supply System shall be designed to give the voltage at approximate mid level of the tolerance band of the power supply modules/packs of Control System, when the charger is feeding the load. This shall also take in consideration the voltage drop in cables from DCDB to the control panels. In case the Power Supply Output of a charger exceeds the voltage band tolerated by the power supply modules/packs of Control System, provision for safe tripping of that charger is to be ensured.

7.01.03 The DC Power Supply for various sub-systems shall consist of one or more of the following configurations. The applicable configurations are as indicated in Appendix-1 to Part-A, Vol. V: -

at each location

- (A) DC power supply system shall comprise of two sets. Each set shall consist of 1 x 100% microprocessor controlled, intelligent, modular rectifier banks, Controller –one for each rectifier bank, 1 x 100% Nickel - Cadmium batteries for one 1 hour duty, 1 X 100% DC distribution board. 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS)–common for both the sets.

The specifications for this configuration shall be as per Cl.No.7.02.01 to 7.05.00 as a minimum.

- (B) In case parallel redundant power supply module/power packs with 24 VDC output are used, the input power supply to the same can be either of 24 VDC/110 VAC/230 VAC/220 VDC, to be finalized during detailed engineering.

Bidder shall clearly bring out in the proposal the redundancy features along with configuration diagram, single line diagram & data sheets etc.



1 x 660 MW - Panki Thermal Power Station "

Bidding Doc. No. : 14A14-SPC-G-0001



- 7.02.01 Microprocessor based, Intelligent, Modular Power Supply
- 7.02.02 Microprocessor based, Intelligent, Modular Power Supply shall be sized for continuous duty to meet 100% load requirements and keep the connected battery fully charged in float mode.
- 10% design margin** has to be considered over and above the load requirement. Either of the bank of rectifier modules shall be able to re-charge the fully discharged battery within 8 hours. It shall also be possible to discharge batteries periodically manually. Each rectifier bank shall be provided with **N+1** rectifier modules and the maximum numbers of rectifier modules shall not be more than 25 Nos. The exact sizing of the rectifiers in one bank shall be subject to Owner approval during detailed engineering. It shall be ensured that all rectifier modules in one rectifier bank shall be of same rating and not more than three ratings of rectifier modules shall be used in various rectifier banks.
- Provision for manual boost charging with isolation of loads shall be provided.** While selecting the components and finalizing the cooling arrangements, Bidder to note that these rectifier modules are required to operate at 30-40% of the rated load for most of the time. While sizing, the temperature derating factor as applicable, is to be considered for arriving at the rating of the modules as per Bidder's manufacturing standard if the modules are rated for lower than the **50 deg. C ambient**. For the rectifier bank, matching controller along with applicable software shall be provided to meet system requirements under all modes of operation." 24 V DC system rating shall be submitted by bidder for approval considering full load operation.
- 7.02.03 The rectifier module shall be microprocessor controlled, IGBT/ Power MOSFET based, high frequency with active load sharing, designed for single and parallel operation with battery and shall have automatic voltage regulators for a close voltage stability even when AC supply voltage and DC load fluctuates, effective current limiting features, front access design, programmable temperature compensation feature for battery charging and filters on both input and output to minimise harmonics. The rectifier module output regulation shall be $\pm 1\%$ or better from no load to full load with an input power supply variation of $\pm 10\%$ in voltage and $\pm 5\%$ in frequency. In addition to indications/display on rectifier panel, alarms along with relevant analog measurements shall also be provided by employing RS 485 Port Modbus Protocol / Ethernet TCP/IP protocol for use in DDCMIS. Further isolated 4-20 mA signals shall be provided for important parameters like rectifier bank voltage, rectifier bank current, battery voltage, battery current, DCDB Voltage, DCDB current etc. The list of alarm output & 4-20 mA signals shall be as approved by Owner during detailed engineering. Necessary provision shall be done in DDCMIS end also.
- 7.02.04 The rectifier module shall be fed from 415V AC, 50 HZ, 3 phase, 3 wire system.
- 7.02.05 "Float/Boost" charge functions shall be provided with alarm/indications. In Boost mode, each of the chargers shall be able to re-charge the fully discharged battery within 8 hours. **However, each charger shall be able to supply full load current requirements plus the battery charging current in boost mode. Complete operation shall be in auto mode. Operator intervention shall not be required for 24 V DC system operations**
- 7.02.06 The rectifier module shall be current limited for circuit protection and protection of battery from overcharge. The current limit shall be continuously

programmable.

- 7.02.07 The rectifier module shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.
- 7.02.08 The full load efficiency of rectifier module at nominal input and output shall be at least 90%. The ripple content shall be limited to +/- 0.5 % of output voltage.
- 7.02.09 The Controller shall be microprocessor controlled for monitoring & control of rectifier modules with features viz. Auto/Manual battery discharge test, battery reserve time prediction, energy management, float/boost mode control etc.
- 7.02.10 All Software as required for smooth operation and monitoring of rectifier modules in conjunction with Controller & BHMS shall be provided by the Bidder.
- 7.02.11 Bidder shall furnish the equipment complete in all respects along with rectifier module rating & voltage drop calculations, supporting curves/data etc.
- 7.02.12 MCCB shall be provided at input, output, battery side, & DCDB side etc with ON, OFF & Trip indication.
- 7.03.00 **DC Distribution Board (DCDB)**
- Redundant DC feeders (one from each DCDB) shall supply each of the connected loads. The exact design, rating & number of feeders of the each redundant DCDB shall be as finalised during detailed engineering and as approved by Owner. However, 25% spare feeders (min. 1 no. of each type & rating) with LED indication, MCB and fuses for each rating shall be provided in each DCDB.
- 7.04.00 **Battery Health Monitoring System (BHMS)**
- BHMS, wherever applicable, shall include microprocessor based hardware and software to monitor the condition of each battery cell of 24 V DC systems & UPS battery banks on-line. With BHMS it shall be possible to measure & analyse the minimum and maximum voltage values of each battery-cell so that any damage to battery shall be prevented by pro-active maintenance. BHMS shall communicate with the DDCMIS and provide alarms as finalized by Owner during detailed engineering.
- Complete hardware like detector units, Battery clips, cables, monitor (power control unit) and other accessories etc as required to complete the system shall be provided by bidder. LED indication shall be provided on detector units for power, alarm and RUN indication etc. Data from Online Battery Health Monitoring System shall be communicate/transferred to respective DDCMIS/respective PLC for Monitoring and analysis using different protocol like RS485 Modbus/OPC etc.
- 7.05.00 Power Supply shall be sized to meet connected load requirements and keep the connected battery full charged in Float/ Boost mode. The rectifier module output regulation shall be $\pm 1\%$ or better from no load to full load with an input power supply variation of $\pm 10\%$ in voltage and $\pm 5\%$ in frequency. In addition to indications/display on the panel, potential free contacts for alarms like O/P

voltage high & low, AC Input supply failure, battery feeding the load etc shall also be provided for use in respective control system i.e., PLC/Remote IO etc. Further isolated 4-20 mA signals shall be provided for important parameters like rectifier module voltage, rectifier bank current, battery voltage etc. The list of alarm output & 4-20 mA signals shall be as approved by Owner during detailed engineering. The exact design, rating & number of feeders of the DCDB shall be as finalised during detailed engineering and as approved by Owner. However, 25% spare feeder (min. 1 no. of each type & rating) with LED indication, MCB, fuses for each rating shall be provided in each DCDB.

7.06.00 UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM

The UPS shall be designed at a load factor of 0.8 lagging at 50 deg C keeping a 10% design margin over the actual load requirement. UPS load rating shall be submitted by bidder for approval considering full load operation.

The UPS System shall meet the following requirements as a minimum.

If UPS KVA rating is applicable at a lower ambient temperature than specified 50 deg. C, the Bidder shall consider a derating factor of at least 1.5%/deg. C for arriving at the specified UPS capacity at 50 deg. C ambient. The UPS shall have an overload capacity of 125 % rated capacity for 10 minutes, 150 % rated capacity for 60 seconds, 200% for 10 seconds and 300% for 4 milli-seconds. The inverter shall have sufficient capability to clear fault in the maximum rated branch circuit, limited to 8 percent of finally selected UPS Capacity.

Acoustic noise at rated linear load shall be < 75 dBA at 1 meter distance from UPS as per ISO 3746.

The industrial grade UPS system for main plant & for each individual BOP/ offsite package shall include the following equipment:

Sr. No.	Descriptions	Configuration for UPS of main plant DDCMIS Package and BOP/Off-site DDCMIS package.	Configuration for UPS for Off site / BOP package PLC based.
1.	100% capacity of IGBT based PWM Inverter with output Voltage, current, frequency, KVA & KW digital display/meter.	2 nos.	2 nos.
2.	100% capacity static switches with input Voltage, current, frequency digital display/meter at bypass line.	(As required) 2 no. (Min)	(As required) 2 no. (Min)
3.	Manual by-pass switch	1 no.	1no.
4.	100% capacity floats-cum-boast full wave Chargers	2 nos.	2 nos.
5.	Battery Set with accessories each	2 set for 1 hour back-up at 100% of	2 set for 1 hour back-up at 100% of

have removable cover at the front. Removable back covers shall be provided at the back of the panels.

The details of the AC distribution board, i.e. exact, rating and number of feeders etc. of the 2x100% ACDB shall be as approved by Owner during detailed engineering. Each feeder shall have fast acting semi conductor fuse, MCB & LED indication for ON status. ACDB shall be designed to cater to the requirements of all the loads. The number of feeders (including 20 % spare feeders on each panel with 2 nos. minimum spare feeder of each rating) and rating of each feeder shall be to suit the individual load keeping in view the fuse clearance capability of UPS system already stipulated and shall be as finalised during engineering. No price implication is admissible for the number ratings of feeders as decided during engineering and owners decision in this shall be final.

7.11.00 Batteries

The batteries shall be heavy duty valve regulated Nickel-cadmium type and shall be sized for one hour of full load operation at 100% of selected UPS rating irrespective of the actual load on UPS and 24 VDC Charger system during non-availability of AC supply / chargers. The Ni-Cd batteries shall conform to IS: 10918. For sizing calculation, design margin, an aging factor of 0.8 and a temperature correction factor as per manufacturer's standard at 4 deg. C electrolyte temperature (Based on temperature characteristics curve to be submitted by the Bidder at a temperature of 4 deg. C), Capacity factor, float correction (if applicable) shall be taken into consideration. The sizing of the battery shall be as approved by Owner during detailed engineering. The Bidder shall consider a voltage drop of 2.5V from battery room to DCDB and DCDB to load, while sizing the battery for 24 V DC Charger System and 4V from battery room to the inverter input while sizing the battery for UPS System.

Nickel coated copper connectors shall be used for connecting up adjacent cells and rows. Bolts, nuts and washers shall be effectively Nickel coated to prevent corrosion.

All the terminals and cells inter-connectors shall be fully insulated or have insulation shrouds.

7.11.01 The following information/details shall be indelibly marked on outside of each cell:-

- i) Manufacturers' name and trade marks.
- ii) Country and year of manufacture.
- iii) Manufacturer type designation.
- iv) AH capacity at 5 & 8 hour discharge rate.
- v) Nominal voltage
- vi) Voltage for float operation at 27°C with tolerance of $\pm 1\%$.
- vii) Serial Number.

For detail Battery & Battery Charger specification refer Chapte-20 of Volume-IV.

7.11.02 One complete set of all accessories and devices required for maintenance and testing of batteries shall be supplied for each set of the batteries of each unit/plant auxiliary system. Each set include at least the following:



a)	Hydrometer	5 Nos
b)	Cell testing voltmeter (3-0-3 V)	5 Nos
c)	Alkali mixing jar	5 Nos
d)	Rubber aprons	5 Nos
e)	Pair of rubber gloves	5 Nos
f)	Set of spanners	5 Nos
g)	No smoking notice for each battery room	2 Nos
h)	Goggles (industrial)	5 Nos
i)	Instruction card	10 Nos
j)	Minimum and maximum temperature indicator for battery room	1 No.
k)	Cell lifting facility	1 Set
l)	Vent Caps	2 set
m)	Terminal Bolts & Washers	1 Set
n)	Plastic Filling Bottles	10 Nos.
o)	Alkali resistant funnel & Mugs	10 Nos.
p)	Electrolyte testing kit	1 No

7.12.00 AUXILIARY EQUIPMENTS

- 7.12.01 All required auxiliary equipment/materials as finalised during detailed engineering shall be furnished with each rectifier bank, UPS & battery bank and shall include as a minimum various meters (AC/DC voltage/current, kVA, power factor, frequency meters etc), circuit breakers, selector switches, push buttons indicating lights, ground detector system, battery accessories like (inter cell connectors, inter step connectors, battery racks etc.) isolated 4-20 mA signals for important parameters and potential free contacts for important alarms shall be provided for use in DDCMIS.
- 7.12.02 **Manual Discharge Resistance bank** of adequate capacity for UPS & 24 V DC Power Supply System batteries as indicated in Appendix-1 to Part-A shall be provided by the Bidder.
- 7.12.03 Not Used
- 7.12.04 **Cell booster charger shall be provided with main plant's** UPS & 24 V DC charger system batteries and UPS & 24 V DC charger system batteries for BOP's each DDCMIS set to charge the new & sick cell for revival of cell. **The cell booster shall be built in separate portable panel.**
- 7.12.05 Class of insulation of wound components (All transformers, chokes/inductances etc.) shall be **class H with temp rating up to class B.**
- 7.12.06 The UPS, 24 V DC system equipment and the complete system shall have surge withstanding capability (SWC) to meet the requirements of ANSI C 37.90a – IEEE Standard 472 –1974. UPS should be provided with Class C type surge protection device. The Class C type surge arrester should be single MOV type , pluggable, should have fault indication and should be tested as per IEC 61643-1 to withstand 40KA 8/20 μ s pulse. The arresters should have potential free contact to ensure maintainability.
- 7.12.07 Lamp / Space Heaters / Receptacles
- a) The panels shall be provided with:
- i) Internal illumination lamp with door switch.



ii) Space heater with thermostat control.

ii) 3-pin 6A receptacle with plug.

b) Lamp, heater and receptacle circuits shall have individual switch fuse units.

7.12.08 UPS Signal interfacing with DDCMIS/DCS & PLC

- a) The bidder shall provide alarms and status indications, current, voltage, frequency, PF etc through serial link with MODBUS or another compatible protocol.
- b) The Bidder shall furnish 4-20 mA signals to DDCMIS/DCS/PLC for the following:
 - i) Inverter A & B output voltages
 - ii) Inverter A & B output currents
 - iii) Inverter A&B output frequency
- c) List of alarms (min.) to DDCMIS/DCS/PLC through potential free contacts shall be as follows:-
 - i. Rectifier – 1 Trip.
 - ii. Inverter – 1 Trip.
 - iii. UPS battery low.
 - iv. Rectifier – 2 Trip.
 - v. Inverter – 2 Trip.
 - vi. Load on static Bypass.
 - vii. Static Bypass failure
 - viii. ACDB – 1 Incomer Tripped.
 - ix. ACDB – 2 Incomer Tripped.
 - x. UPS – 1 Fan Tripped.
 - xi. UPS – 2 Fan Tripped.

The above alarm shall also be duplicated in UPS panel. Alarm facia shall be provided on each charger and inverter panel, complete with proper actuating devices, circuitry and legends to incorporate above minimum requirement.

7.13.00 BATTERY RACKS

Battery racks of mild steel construction to bear 150% over load, anti acid paint etc. in accordance with applicable codes and standard shall be provided. AISC Specification shall apply in the absence of another design specification.

7.14.00 DRAWINGS/DOCUMENTS REQUIREMENTS

Bidder shall furnish the power supply distribution scheme, single line diagram, all calculations such as Rectifier Modules / UPS Charger / Inverter rating calculations, battery sizing calculation etc. for DC system as well as for UPS during detailed engineering for Owner's review and approval.

7.15.00 CABINETS / ENCLOSURES



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The Construction details for Power Supply System Cabinets/ Enclosure/Racks shall conform to the requirements of the following paragraphs.

- (1) The Construction details for UPS & 24 V DC charger system cabinets/enclosure shall conform to the requirements indicated in chapter 6.
- (2) The temperature rise inside all the cabinets/enclosures shall not exceed 10 deg.C above ambient temperature. The cabinets shall be IP-32 protection class.
- (3) The Colour shade of Panels exterior/interior shall be as per Vol. V, Part B, Chapter 6.

7.16.00 COOLING SYSTEM

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements:

- (1) Reserve cooling equipment shall be furnished for each assembly. Reserve fan capacity shall be equal to 100 percent of cooling fan requirements for full load operation with only one bank of rectifier/inverter in service at the specified maximum ambient temperature.
- (2) Completely independent duplicable wiring and control systems shall be provided for the normal cooling fan system and the reserve cooling fan system.
- (3) Each cooling fan shall normally run continuously and shall be powered from the output of the inverter whose enclosure it serves (for cubicles housing inverters). For other cubicles, fan power supply shall be as finalised during detailed engineering. Each cooling fan supply circuit shall be separately fused.
- (4) Each cooling fan shall be equipped with a switch having an alarm contact that closes upon failure of airflow or rise of temperature.

7.17.00 Grounding

Normal, AC power supply will be grounded at the source. For grounding other than this, I/P and O/P isolation transformers shall be furnished with the UPS and 24 V DC charger system.

Panels shall have fully rated ground bus with two ground terminals, one at each end. Each terminal shall comprise two-bolt drilling M10 G.I. bolts and nuts to receive Purchaser's ground connection of 50 x 6 mm G.S. flat.

7.18.00 Wiring / Cabling

- a) The panels shall be completely wired up. All wiring shall be done with flexible, 1100V grade, PVC insulated wires with stranded 2.5 Sq.mm copper conductors and routed through wiring troughs. Each wire shall be ferruled by plastic tube with indelible ink print at both end having terminal block No., terminal number as per approved wiring diagram.



In case of Control wiring to be terminated at connectors on Card Section it shall be done with flexible, 1100V grade, PVC insulated wires with stranded 0.5 Sq.mm copper conductors

- b) Panels shall have removable gland plate for cable entry. All incoming/outgoing cables shall be terminated in suitable terminal block.
- c) Control terminal blocks shall be box-clamp type, minimum 10 Sq.mm. 20% spare terminals shall be furnished.

7.19.00 Nameplate

- a) Engraved nameplates shall be provided for each panel and for each equipment/device mounted on it.
- b) The material shall be anodized aluminium / lamicoid, 3 mm thick, with white letters on black background.
- c) Nameplates shall be held by self-tapping screws. The size of nameplates shall be approximately 20 mm x 75 mm for equipment and 40 mm x 150 mm for panels.
- d) Nameplates for panels shall be provided both on the front and rear.
- e) Control and meter selection switches shall have integral nameplates. Nameplates for all other devices shall be located below the respective devices.
- f) Instruments and devices mounted on the face of the panels shall also be identified on the rear with the instrument/device number. The number may be painted on or adjacent to the instrument or device case.
- g) Caution notice on suitable metal plate shall be affixed at the back of each panel.

7.20.00 Tropical protection

- a) All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus insects and corrosion.
- b) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

7.21.00 SITE TESTS

The Bidder shall also carry out the site tests on Uninterruptible Power Supply System and 24V DC Power Supply System for demonstrating the specification requirements. In case any other site test is required to be conducted as a standard practice of the Bidder and mutually agreed between the Bidder and the Owner, the same shall also be carried out.

7.22.00 Tests on UPS System

- a) Type & routine test for various components.



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The float charger will be normally ON, supplying the D.C. load current and at the same time trickle charging the battery. The characteristics shall be such that if load is high and exceeds the charger capacity, the excess load will be supplied by the battery.

The float-cum-boost charger will be normally in stand-by (auto float/charge) mode and will cut into the circuit automatically:

- (a) to provide occasional equalising charge as required
- (b) to take over the functions of float charger in case of its failure
- (c) to boost charge the battery upto 2.75 Volts per cell.
- (d) Necessary arrangement shall be provided so that connected DC load shall not be subjected to high voltage during equalizing or boost charging of battery.

The float-cum-boost charger shall also have provision for float, equalising, and boost charging the battery through manual selection.

On failure of station A.C. supply, both float and float-cum-boost chargers will go out of service and battery will take over to supply emergency loads.

If float charger fails, it will be annunciated in the control room and standby float charger of the float cum boost charger will have to cut into the circuit automatically by double pole double throw switch to take over the function of float charger.

Output of the chargers shall be controlled automatically as well as manually. AUTO/MANUAL selector switch along with voltage/current setter shall be provided for this purpose.

Interlock shall be provided to ensure that the battery can be taken to boost mode only if the float charger is healthy and running. Interlock defeat arrangement shall also be provided for initial charging of battery.

For ungrounded DC system, suitable ground fault detection system with annunciation shall be provided in the battery charger panel to detect ground fault on either polarity.

6.00.00 LAYOUT

- The battery and battery charger will be located indoor.
- Battery room ventilation shall be under the scope of the Contractor.
- Sufficient clear space shall be provided for attending individual cells.

7.00.00 NICKEL CADMIUM BATTERY

7.01.00 BATTERY RATINGS



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1.	For Ni-Cd Type Battery		
a)	Battery Voltage	220	48V
b)	No. of Cells	As per Sizing Calculation	As per Sizing Calculation
c)	Battery type	Stationary Nickel-Cadmium Pocket Plate High discharge type (KPH)	Stationary Ni-Cd Pocket Plate Low discharge type (KPL)
d)	Capacity for five(5)hour rate	As per requirement	As per requirement
e)	Nominal discharge voltage per Cell	1.2	1.2
f)	Float voltage	1.42V/Cell	1.42V/Cell

Note:

The calculated minimum battery size is indicated in the BOQ. Bidder to offer the battery meeting the minimum size requirement as indicated in the BOQ. All tests shall be carried out corresponding to the offered battery size.

07.02.01 Equipments

- (a.) DC Batteries shall be stationary Nickel Cadmium Pocket plate type (KPH)/ (KPL) conforming to IS:10918. The batteries shall be high discharge performance type as specified. For the purpose of design an ambient temperature of 50 degree centigrade and relative humidity of 85% shall be considered.
- (b.) DC batteries shall be suitable for standby duty. The batteries shall normally be permanently connected to the load in parallel with a charger and shall supply the load during emergency conditions when AC supplies are lost. Batteries shall be suitable for a long life under continuous float operations and occasional discharges. The batteries shall be boost charged at about 1.54 to 1.7 volts per cell maximum and float charged at about 1.42 V/cell.
- (c.) Batteries should be suitable for continuous operation for the maximum ambient temperature as defined in technical parameters.

7.02.00 Construction Features

a) Containers

Containers shall be made of polypropylene plastic material. Containers shall be robust, heat resistance, leak proof, non absorbent, alkali resistant, non-bulging type and free from flaws, such as wrinkles, cracks, blisters, pin holes etc. Electrolyte level lines shall be marked on container in case of translucent containers.

b) Vent Plugs

Vent plugs shall be provided in each cells. They shall be antisplash type, having more than one exit hole shall allow the gases to escape freely but shall prevent alkali from coming out. The design shall be such that the water loss due to evaporation is kept to minimum. In addition the ventilator shall be easily removed for topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte samples.

c) Plates

The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuations of load. The construction of plates shall conform to latest revisions of IS:10918.

The separators shall maintain the electrical insulation between the plates and shall allow the electrolyte to flow freely. Separators should be suitable for continuous immersion in the electrolyte without distortion.

The positive and negative terminal posts shall be clearly marked.

d) Sediment Space

Sufficient sediment space shall be provided so that cells will not have to be cleaned during normal life and prevent shorts within the cells.

e) Electrolyte

The electrolyte shall be prepared from battery grade potassium hydroxide conforming to BS:1069.

The cells can be shipped either in charged condition or in dry condition

Necessary electrolyte for make-up shall be supplied separately.

f) Connectors and Fasteners

Nickel coated copper connectors shall be used for connecting up adjacent cells and rows. Bolts, nuts and washers shall be effectively Nickel coated to prevent corrosion. The thickness of Nickel coating of connectors should be not less than 0.02 mm. All the terminals and cells inter-connectors shall be fully insulated or have insulation shrouds. End take off connections from positive and negative poles of batteries shall be made by single core cables having stranded AL conductors and XLPE insulation. Necessary supports and lugs for termination of these cables on batteries shall also be supplied by the contractor. All connectors and lugs shall be capable of continuously carrying the 30 minutes discharge current of the respective batteries and through fault short circuit current which the battery can produce and withstand for the period declared. Contractor shall furnish necessary sizing calculations to prove compliance to the same. Suitable number of Inter-rack connectors shall be supplied by the contractor to suit the battery room layout during detailed engineering.

g) Battery racks

Mild steel racks for all the batteries shall be provided. They shall be free standing type mounted on porcelain/hard rubber/PVC pads insulators/High impact plastic insulators.

Batteries shall preferably be located in the single tier arrangement. However, batteries having a complete cell weight of lower than 50 Kg could be located in the double tier arrangement. The batteries racks and supports for cable termination shall be coated with three (3) coats of anti-alkali paint of approved shade. Name plates, resistant to alkali, for each cell shall be attached on to the necessary racks. The bottom tier of the stand shall not be less than 150 mm above the floor.

Wherever racks are transported in dismantled conditions, match markings shall be provided to facilitate easy assembly.

7.02.01 Manufacturer's Identification System

The following information shall be indelibly marked on outside of each cell.

- a.) Manufacturers' name and trade marks
- b.) Country and year of manufacture.
- c.) Manufacturer type designation.
- d.) AH capacity at 5 hour discharge rate.
- (e.) Serial number

7.02.02 THE FOLLOWING INFORMATION SHALL BE GIVEN ON THE INSTRUCTION CARDS SUPPLIED WITH THE BATTERY:

- (a.) Manufacturer's instructions for filling and initial charging of the battery together with starting and finishing charging rate.
- (b.) Maintenance instructions.
- (c.) Designation of cell in accordance with IS:10918.
- (d.) Storing conditions of electrolyte.

7.02.03 TESTS

- a)** All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
- b)** However if the contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.
- c)** All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
- d)** The type test reports once approved for any projects shall be treated as reference. For subsequent projects of UPRVUNL, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design change". Minor changes if any shall be highlighted on the endorsement sheet.

7.04.00 GENERAL

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b) Burn-in Tests and Temperature Rise Tests

Each component of UPS & 24 V DC system shall undergo burn-in test for 50 hours continuously. All equipment provided under this specification shall be operated under rated conditions and maximum ambient temperature for not less than 120 hours prior to release for shipment. In addition, static switches shall be subjected to not less than 1000 "Transfer/retransfer" cycles at full load. During temperature rise test final rise in temperature of semiconductor and devices will be measured at rated conditions and the temperature shall be within stipulated limits for components. After manufacture, the system shall be subjected to routine tests as per standards. The bidder shall indicate all these routine tests in their offer. These shall include insulation resistance test, die-electric with stand test (by applying voltage of 2000 V for one minute) noise test, interference noise test, surge with stand capability.

- c) Burning test on PCBS - Assembled PCBS shall be tested at 70°C for 72 hours in loaded condition.
- d) Rapid temperature cycling test at 70°C and 0°C for 30 minutes at each temperature - 5 such cycles.
- e) Functional tests to demonstrate compliance with all specified requirements and published. Specifications such as frequency, regulation, voltage regulation, current limiting, fuse clearing capability of inverters, demonstration of phase and frequency control of inverter for synchronization with range of adjustments transfer and retransfer of static switches under influence of under voltage and over current, tests on chargers, batteries and other system component to confirm compliance with specification.

Type test certificates of any equipment shall be furnished, if so desired by the Purchaser. Otherwise, the equipment shall have to be type tested, free of charge, to prove the design.

For detail test on Battery & Battery Charger specification refer Chaptre-20 of Volume-IV.

7.02.02 THE FOLLOWING INFORMATION SHALL BE GIVEN ON THE INSTRUCTION CARDS SUPPLIED WITH THE BATTERY:

- (a.) Manufacturer's instructions for filling and initial charging of the battery together with starting and finishing charging rate.
- (b.) Maintenance instructions.
- (c.) Designation of cell in accordance with IS:10918.
- (d.) Storing conditions of electrolyte.

7.02.03 TESTS

- a)** All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
- b)** However if the contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.
- c)** All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
- d)** The type test reports once approved for any projects shall be treated as reference. For subsequent projects of UPRVUNL, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design change". Minor changes if any shall be highlighted on the endorsement sheet.

7.04.00 GENERAL

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The Contractor shall submit for Owner's approval the reports of all the type tests carried out as per latest IS-1146(for all applicable tests for containers) / IS-10918 (for NI-CD batteries). The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier.

7.04.01 Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of battery.

7.05.00 Commissioning Checks:

All tests as listed below shall be carried out on sample cell selected at random by the owner at site after completion of installation.

- (a.) Physical Examination
- (b.) Dimensions, Mass & layout
- (c.) MARKING
- (d.) Polarity and absence of short circuit.
- (e) Air pressure test
- (f.) Ampere - hour capacity
- (g.) Retention of charge
- (h.) Insulation resistance

The Contractor shall arrange for all necessary equipment, including the variable resistor, tools, tackles and instruments.

8.00.00 LEAD-ACID PLANTE BATTERY

For Lead Acid Plante type Battery			
a)	Battery Voltage	220 V	48V
b)	No. of Cells	As per sizing Calculation	
c)	Battery type	Stationary Lead Acid Plante high discharge type.	
d)	Capacity for ten (10)hour rate	As per requirement	
e)	Nominal discharge voltage per Cell	2.0V	2.0V
f)	Float voltage	2.25VV/Cell	2.25VV/Cell

8.01.00 Equipments



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9.20.00 PAINTING

Treatment as per IS:6005. Two coats of lead oxide primer followed by powder painting with final shade of RAL9002 for complete panel except end covers & RAL 5012 for end covers.

9.21.00 Battery Discharge Resistor Unit

9.21.01 It shall be designed to perform periodic discharge tests. The Resistor Unit shall be made specially to check initial battery performance, guarantee smooth operation of back up system during emergencies and improve overall health and life of Battery system.

9.21.02 Resistor Unit shall be an assembly consisting of copper-nickel alloy wire grid elements supported by stainless steel tie rods. The resistor bank shall have adequate trimming facility (coarse and fine) to maintain a constant current against falling voltage during discharge operation. An ammeter shall be provided on the unit to monitor discharge current of battery.

9.22.01 TESTS

9.22.01 All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

9.22.02 However if the contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

9.22.03 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

9.22.04 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of UPRVUNL, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design change". Minor changes if any shall be highlighted on the endorsement sheet.

9.22.05 GENERAL

1. The contractor shall submit the following type tests on one sample of each rating of the equipment to be supplied under this contract.
 - a) Complete physical examination
 - b) Temperature rise test at full load.

- c) Insulation resistance test.
- d) High voltage (power frequency) test on power and control circuits except low voltage electronic circuits.
- e) Ripple content test at
 - i) No load
 - ii) Half load
 - iii) Full load
- f) Automatic voltage regulator operation test at specified A.C. supply variations at
 - i) No load
 - ii) Half load
 - iii) Full load
- g) Load limiter operation test
- h) Efficiency and power factor measurement.
- i) Input and output surge withstand capability test. Surge Voltage as per ANSI-C37.90a shall be applied for period not less than 2 sec. At the following points of the Charger operating at full load:
 - i) Across each A.C. input phase
 - ii) Across AC input line to ground.
 - iii) Across D.C. output terminals.
 - iv) Across each D.C. output terminal to ground

The Charger shall not exhibit any component damage and there shall be no change in performance as per (g) and (h).

- j) Environmental Tests

Steady state performance tests (f) and (g) shall be carried out before and after each of the following tests.

- i) Soak Test

The electronic modules shall be subjected to continuous operation for a minimum period of 72 hours. During last 48 hours, the ambient temperature shall be maintained at 50 deg. C. The 48 hour test period shall be divided into four equal 12 hour segments. The input voltage during each 12 hours shall be nominal voltage for 11 hours followed by 110% of nominal voltage for 30 minutes, followed by 90% of nominal voltage for 30 minutes.

- ii) Degree of protection test.

2. All routine tests as per QA table and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price. Dynamic response test and Temperature rise test at full load shall be carried out on each charger before dispatch at manufacturer's works.

9.23.00 COMMISSIONING

9.23.01 The contractor shall carryout the following commissioning tests and checks after installation of the equipment at site:

- a) Complete physical examination.
- b) Checking of proper operation of annunciation system.
- d) Insulation resistance test.
- e) Automatic voltage regulator operation.
- f) Load limiter operation.
- h) Updation of charger status in DC Battery Health monitoring system.

10.00.00 DC HEALTH MONITORING SYSTEM

10.01.00 DC Health Monitoring System shall include microprocessor based hardware and software to monitor the condition of each battery cell of 220V DC systems battery banks on-line on 24x7 basis. With DC Health Monitoring System it shall be possible to measure & analyse the individual cell and battery parameters so that any damage to battery shall be prevented by pro-active maintenance. A typical Architecture is shown in Drg. No. 0000-000-POE- A-002. Each Battery set shall have its own independent DC Health Monitoring System.

10.02.00 DC Health Monitoring System shall measure and store the following parameters at pre- determined time interval as decided by the owner during detail engineering:

- a) Each Cell Voltage
- b) Battery DC Current
- c) Ambient and Cell temperature

Further, DC Health Monitoring System module shall have additional provision of accepting at least 6 Nos. of Digital inputs and 2 Nos. of Analog inputs(4-20mA). DC Health Monitoring System shall also be able to store these inputs status for future reference.

10.03.00 Technical Parameters

- | | |
|---------------------------------|------------------------|
| a) Input Power Supply | 230V AC(UPS) / 220V DC |
| b) Voltage Measurement Accuracy | 0.5% or better |
| c) Current Measurement Accuracy | 0.5% or better |
| d) Operating Temperature Range | 0-50 ⁰ C |
| e) Mounting Panel Mounting | |
| f) IP Protection | IP42 |

10.04.00 Communication

DC Health Monitoring System shall communicate with the DDCMIS System

24 V DC Power Supply system shall be of continuous duty as mentioned in Subsection "Uninterruptable Power Supply System & 24 V DC systems", chapter 7, Part-B, Vol. V shall be provided on as required basis meeting the specification requirements and taking care of the approved configurations and layouts.

- 3.00.01
- a) Control system as well as remote I/O system in this context would cover as a minimum, controllers, I/Os, associated modules etc. as well as, data communication system & Network devices (like LAN Switches), related to control system associated relays and solenoid valves driven by 24 V DC system, etc;. Any other loads of Bidder requiring 24 V DC supply shall also be included in this calculation.
 - b) Bidder to note that the Charger rating shall take care of all Bidder's Load as required, taking care of all the requirements as indicated in the Part B of the Technical specifications within the quoted lumpsum price.
 - c) For the main plant SG, TG and BOP systems, the 24 VDC power supply system has to be supplied. The 24 VDC configuration for main plant SG, TG and BOP Systems shall be as per clause 7.01.03(A), Part-B, chapter 7 of the specification. Bidder may note that separate unitized 24 V DC Charger system has to be supplied for each Main Plant BOP systems. However, for main plant SG and TG systems common or separate unitized 24 V DC Charger systems can be offered meeting the technical requirements of the system. For other offsite DDCMIS packages systems configuration as per clause 7.01.03(A), Part-B, chapter 7 shall be provided.
 - d) For off-site PLC systems, configuration as per clause 7.01.03(A & B), Part-B, chapter 7 and chapter 14, Part-B, Vol. V shall be provided.

3.00.02 One set of manual discharge resistance bank of adequate capacity shall be provided for the following:

(a)	Main Plant BOP(C&I) 24 V DC Charger System	:	1 Set
(b)	Water System DDCMIS	:	1 Set
(c)	AHP DDCMIS	:	1 Set
(d)	CHP DDCMIS	:	1 Set
(e)	RIO system of Max rating	:	1 Set
(f)	Off site PLC system max rating	:	1 set

- 4.00.00
- a) Bidder to note that, 5 number of loose PDBs for the plant with redundant 230 V input AC supply with Auto Change Over and 5 number of output feeders with LED, MCB and Fuse ratings of 4A/6A are to be provided.
 - b) Further more, 1 number of PDB with 230 V input AC utility supply for distribution of utility power supply to the cabinets being procured under this package and located in CER is to be provided.

C QUANTITIES FOR INSTRUMENTATION CABLES

1.00.00 The Bidder shall supply, erect, lay, terminate and test the following cables ensuring functional completeness of the control system on as required basis.



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



~~6.09.01 An arc shaped Large Video Screen (LVS) panel shall be supplied for mounting large video screens in number of tiers in various Control rooms as specified at Vol-V Part-A of specification. An indicative typical sketch of Control Room Concept showing LVS & OWS is given in drawing no. 14A14-DWG-I-0011.~~

~~6.09.02 The profile, dimensions and the general arrangement shall be finalized & approved by Owner during detailed engineering. Recommendations, if any, for the control room lighting in order to ensure continuous proper viewing of the LVS screen by the operator & shift incharge (without any fatigue) shall be clearly brought out by the Bidder in his offer, along with all relevant details/basis.~~

~~6.09.03 Any other requirement for proper LVS mounting & functioning & viewing shall also be specifically brought out by the Bidder in his offer, along with all relevant details.~~

6.10.00 CONSTRUCTIONAL FEATURES OF LOCAL CONTROL PANELS, CONSOLES, CONTROL Desk, CUBICLES & ENCLOSURES

- i. All control panels, cubicles, consoles, SOV panels and enclosures provided anywhere for subject plant per this specification shall be of free standing type and shall be constructed of specified gauge of steel plates (CRCA). The minimum sheet thickness of panels shall be as follows unless otherwise specified herein.

Side and top – not less than 1.6 mm
Door – not less than 2.0 mm
Mounting plate – 2.5 mm
Base metal plate - 2.5 mm
Gland plate – 3 mm

- ii. The panels, consoles/desks shall be reinforced as required to ensure true surfaces and adequate support for instruments mounted thereon. All instrument cutouts, mounting studs, and support brackets shall be accurately located. All welds on the exposed panel surfaces shall be ground smooth. Finished panel surfaces shall be free from waves, bellies, or other imperfections. Unless specified, otherwise, panel doors shall be 4 points hinged and shall have turned back edges and additional bracing where required to ensure rigidity. Door hinges shall be of the concealed type. Door latches shall be of the three/four -point type to ensure tight closing. Door locks shall be furnished which will allow actuation of all locks by a single master key. All panels shall have removable lifting eyebolts for safe lifting from top during storage and installation handling.

Cabinet doors shall be hinged and shall have turned back edges and additional bracing where required ensuring rigidity. Hinges shall be of concealed type. Door latches shall be of three/four -point type to assure tight closing. Detachable lifting eyes or angles shall be furnished at the top of each separately shipped section and all necessary provisions shall be made to facilitate handling without damage. Front and rear doors shall be provided with locking arrangements with a master key for all cabinets. If width of a cabinet is equal or more than 800 mm, double doors shall be provided.



- iii. All panels shall be mounted on vibration dampers, which are secured to C-channels mounted on the floor. The channels shall be field welded to steel plates set into the concrete flooring. The steel plates shall be located such as to approximate the outline of panel bases. The exact mounting details shall be as approved by the owner during detailed engineering stage. All panels shall be provided with adequate ventilation and packaging density of components shall be restricted so as to limit the temperature rise above ambient to 10°C under the worst conditions. All panels shall have auto on/off switch for internal lighting. All the power supply circuit for control panels shall be provided with auto changeover circuitry.
- iv. In each panel /cabinet, a 24 VDC Voltmeter digital type shall be provided to check the Field Interrogation voltage.
- v. Exhaust Fans with louvers & filters shall be provided on upper side to remove hot air in all consoles and panels.
- vi. Fire & Smoke detectors shall be provided inside the Control room mounted system/control cabinets.
- vii. Feeder failure/ healthy indication shall be provided in each cabinet & remote indication shall be hooked up to DDCMIS/ PLC/annunciation & suitably grouped.
- viii. All the panels shall be equipped with Anti vibration pad of min. 15 mm size thickness. Cable gland plate thickness shall be 3 mm. C Channel height shall be min. 100 mm.
- ix. Doors shall be provided with neoprene/polyurethane gasket only. The front and rear doors shall be of full height .
- x. Protection class shall be as specified at Vol. V, Part B, chapter 1.
- xi. All the cable entries shall be at the bottom of electronic cubicles/control panels.
- xii. Control panels shall be provided with proper arrangement and hardware to terminate the inert gas required for fire protection.
- xiii. 25x6 mm copper ground bus to be provided for each panel/control desk.
- xiv. Terminal blocks shall be Rail mounted 650 V AC grade Terminal blocks (Screw less cage clamp type) with markers and 20% spare wired terminals of each type.
- xv. For Panels/cubicles internal wiring details, Bidder to refer Vol. V, Part B, Chapter 9.

6.11.00 TERMINATION / Marshalling CABINETS & Interposing Relay Panel

Marshalling/Termination cabinets for the control system shall be supplied for terminating all cables originating from the field, MCC/SWGR or any other source

of signal and for distributing the signals to different functional panels, MCC/SWGR and control cubicles.

Incoming cables from the field, MCC/SWGR or any other source of signal shall be terminated in suitable terminal blocks in logical sequence.

Prefabricated cables with plug in connectors at both ends shall be used for extending the signals to the functional panels. Matching plug sockets shall be provided in the termination cabinets for terminating the plugs.

Interposing relay panels for the system shall be supplied for mounting interposing relays & terminating all cables originating from the DO cards in case of solenoid valves, HW Annunciation windows and other required services etc. IPR panels shall be placed in CER and LCR.

Interposing relay shall be mounted in respective SWGR/MCC/integral starter required for commands signals of HT/LT unidirectional drives and bidirectional drives, breakers, isolators, bus couplers etc from DDCMIS/DCS/PLC or any control system.

Terminal blocks shall be located inside the cabinets on support wings fabricated of metal plates.

The plug socket shall be mounted on hinged plates to provide an access to the rear pins of the plugs.

General features of termination cabinets and accessories shall conform to the general design and construction specification of panels. Terminal blocks shall be Rail mounted 650 V AC grade Terminal blocks (Screw less cage clamp type) with markers and 20% spare wired terminals.

Wiring shall be 650V grade. PVC insulated FRLS stranded copper wire.

6.12.00 SURFACE PREPARATION AND PAINTING

All panel exterior steel surfaces shall be ground smooth, and painted as specified below:

Suitable filler shall be applied to all pits, blemishes and voids in the surfaces. The filler shall be sand blasted so that surfaces are level and flat, corners are smooth and even. Exposed raw metal edges shall be ground burr free. The entire panel surface shall be sand blasted to remove rust and scale and all other residue due to the fabrication operation. Oil grease and salts etc. shall be removed from the panels by one or more solvent cleaning methods. Alternatively 7 tank process shall be followed.

Two spray coats of inhibitive epoxy primer – surface shall be applied to all exterior and interior surfaces, each coat of primer surface shall be of dry film thickness of 1.5 mil. A minimum of two spray coats of final finish colour (Catalysed epoxy finish) shall be applied to all surfaces of dry film thickness 2.0 mil. The final finished thickness of paint film on steel shall not be less than 65-75 micron for sheet thickness of 2 mm and 50 microns for sheet thickness of 1.6



mm. As an alternative, single coat of anodic dip coat primer along with single textured powder coating with epoxy polyester meeting the thickness requirement is also acceptable.

The Bidder shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory applied painted surface of each item of equipment.

The finish colours for exterior and interior surfaces shall conform to the following shades:

- a) Exterior - RAL 7032/RAL 7035.
- b) Interior - Glossy white two coats/RAL 7035 with fire resistant paint

One uniform colour shade as finalized by owner during detailed engineering shall be applicable for complete plant.

Paint films, which show sags, checks, blisters teardrops, fat edges or other painting imperfections, shall not be acceptable and if any such defects appear, they shall be repaired by and at the expenses of the Bidder.

6.13.00 PANEL ILLUMINATION

Panels shall be provided with LED based illuminating lamps with door switch and six (6) point 5/15A, 240V AC universal type power sockets with switch for maintenance purposes. These switches shall be with quick make and break mechanism. 100 % spare LED lamps shall be provided with each panel, these are in additional to mandatory spares.

6.14.00 Panel Cooling Fans (for ventilation of the DDCMIS/ PLC / DCS & other cabinets)

Filter Fan for electrical cabinets and enclosures to be used with 120 V or 230 V AC versions having very low acoustic noise and lower power consumption. The fans must have UL approval and should have air flow volume as per the cabinet requirement. Wherever required, the EMC filter fans may be used. Fans should have a life of 50,000 Hours at 40 Deg C. Fan Housing, cover should be of V0 material as per UL94. Filter mat should be compliant to EU3 according to DIN 24185 standard and have a filtering degree of 80 to 90 %. The Ambient temperature range °C should be -10 to +70 Deg C and Protection class should be IP 54. Filter Material shall be Synthetic fibre with progressive construction, temperature resistant to +100°C, self extinguishing, Class F1 as per DIN 53438 standard.

6.15.00 Panel Thermostat (for temperature control of the DDCMIS/PLC/DCS panel – to be connected to switch On/Off Fan/Heater)

The panel thermostat shall be DIN Rail Mounted with an inbuilt snap action thermostatic bimetal sensor and shall be connected in series with the load without any additional supply voltage. The panel thermostat shall be available in setting temperature range of -20 deg C to 40 deg C or 0 to 60 deg C with separate modules for NO or NC contact. The electrical life at rated load AC1 shall be 1 Lakh switching cycles and shall work at an ambient temperature of -45 to +80 deg C. With AgNi contact material for switching, the contact current carrying

capacity shall be 10 Amp at a rated voltage of 250 V AC with a dielectric strength between open contacts of 500 V AC and shall have UL approval.

6.16.00 FUSES & MCB

All fuses shall be fast acting semiconductor types for AC supply and compatible to the UPS fuses. For all DC Powered devices, similarly the fuses shall be fast acting compatible to DCDB fuse provisions. All the AC power supplies shall be provided with the protection of Fast acting semi conductor fuses & 2 P thermo magnetic type MCB. For all the DC power supply circuits, electronic type DC MCB shall be used only. Make of DC MCB shall be Siemens, Phoenix contacts, Murr, Weidmuller, or Lutze.

50 % spare fuses shall be provided with each panel, these are in additional to mandatory spares.

6.17.00 NAME PLATES AND LABELS

Name plates of adequate size shall be provided for each panel on front and rear of the panel. Instruments/other accessories mounted inside the panels shall have identification marking clearly visible from inside.

Devices to be mounted on the panels shall also be labeled on the panels shall also be labeled on the outside of the panel. Name plates shall be of polyamide sheets with black letters on white background. Name plates shall be attached to the boards by means of stainless steel panhead screws. Fuses provided for protection of various boxes shall be accessible for replacement. Fuse boxes shall be provided with circuit label and fuse rated current and voltage.

Markings /Labels

All markers/labels shall be made of halogen & silicon free polyamide material with inflammability class V2 as per UL 94, ensuring scratch proof printing with the use of environment friendly solvent free ink & latest BLUEMARK UV technology so as to comply the WIPE RESISTANCE according to DIN EN 61010-1/VDE 0411-1.

~~6.18.00 QUANTITIES~~

~~Refer Appendix-I to Part-A, Vol.-V of Technical Specifications. Quantities indicated are the minimum requirements, however each & every item shall be provided as per system requirements.~~

~~6.19.00 Design Criteria for Control Rooms:~~

~~The interiors of the each control Room shall be aesthetically designed with modern designs and technologies. The bidder shall have 2-D and 3-D software for designing the control room layouts. The bidder shall have thorough knowledge on Indian power plant control room requirements. Control rooms shall also be designed as per standard "ISO 11064 (1-7) - Ergonomic design of control centres".~~

	CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन SUB-VENDOR QUESTIONNAIRE/ सब-वेंडर प्रश्नावली
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i.	Item/Scope of Sub-contracting उप-सबिदा(□ नुबध) का मद/ दायरा		
ii.	Address of the registered office पंजीकृत कार्यालय का पता 	Details of Contact Person संपर्क व्यक्ति का विवरण (Name, Designation, Mobile, Email) (नाम, पदनाम, मोबाइल, ईमेल) 	
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured प्रस्तावित उप-विक्रेता के कार्यों का नाम और पता, जहां मद का निर्माण किया जा रहा है 	Details of Contact Person: संपर्क व्यक्ति का विवरण (Name, Designation, Mobile, Email) (नाम, पदनाम, मोबाइल, ईमेल) 	
iv.	Annual Production Capacity for proposed item/scope of sub-contracting उप-सबिदा(□ नुबध) के प्रस्तावित मद / दायरे के लिए वार्षिक उत्पादन क्षमता		
v.	Annual production for last 3 years for proposed item/scope of sub-contracting उप-सबिदा(□ नुबध) के प्रस्तावित मद / दायरे के लिए पिछले 3 वर्षों का वार्षिक उत्पादन		
vi.	Details of proposed works प्रस्तावित कार्यों का विवरण		
1.	Year of establishment of present works वर्तमान फैक्टरी की स्थापना का वर्ष		
2.	Year of commencement of manufacturing at above works उपरोक्त फैक्टरी में निर्माण कार्य शुरू होने का वर्ष		
3.	Details of change in Works address in past (if any) पूर्व में फैक्टरी स्थल में परिवर्तन का विवरण (यदि कोई हो)		
4.	Total Area कुल क्षेत्र Covered Area शामिल क्षेत्र		
5.	Factory Registration Certificate फैक्टरी पंजीकरण प्रमाण पत्र Details attached at Annexure – F2.1 विवरण अनुलग्नक- एफ 2.1 पर संलग्न है		
6.	Design/ Research & development set-up डिजाइन / अनुसंधान और विकास सेटअप (No. of manpower, their qualification, machines & tools employed etc.) (श्रमिकों की संख्या, उनकी योग्यता, मशीन और उपलब्ध उपकरण आदि) Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 (if applicable) लागू / लागू नहीं, अगर विनिर्माण मुख्य संविदाकार / खरीददार के डिजाइन के अनुसार है) विवरण अनुलग्नक –एफ 2.2 पर संलग्न है। (यदि लागू हो)		
7.	Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc) मैनपावर विवरण के साथ समग्र संगठन का चार्ट(डिजाइन / विनिर्माण / गुणवत्ता आदि) Details attached at Annexure – F2.3 विवरण अनुलग्नक – F2.3 में संलग्न है।		
8.	After sales service set up in India, in case of foreign sub-vendor(Location, Contact Person, Contact details etc.) भारत Applicable / Not applicable लागू / लागू नहीं		

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	में बिक्री सेवा की स्थापना के बाद, विदेशी उप-विक्रेता के मामले में(स्थल , संपर्क व्यक्ति, संपर्क विवरण आदि)	<i>Details attached at Annexure – F2.4</i> विवरण अनुलग्नक -2.4 पर संलग्न है।			
9.	<i>Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any</i> फ्लोचार्ट सहित विनिर्माण प्रक्रिया निष्पादन योजना , जिसमें आउटसोर्स प्रक्रिया, यदि कोई हो, सहित कच्चे माल से तैयार उत्पाद तक विनिर्माण के विभिन्न चरणों को दर्शाया गया हो,	<i>Details attached at Annexure – F2.5</i> विवरण अनुलग्नक - F2.5में संलग्न है।			
10.	<i>Sources of Raw Material/Major Bought Out Item</i> कच्चे माल के स्रोत / खरीदे हुए मुख्य मद	<i>Details attached at Annexure – F2.6</i> विवरण अनुलग्नक - F2.6में संलग्न है।			
11.	<i>Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing</i> कच्चे माल / खरीदे हुए मद, प्रक्रियाबद्ध, अंतिम परीक्षण, पैकिंग करते समय गुणवत्ता नियंत्रण	<i>Details attached at Annexure – F2.7</i> विवरण अनुलग्नक - F2.7 पर संलग्न है			
12.	<i>Manufacturing facilities (List of machines, special process facilities, material handling etc.)</i> विनिर्माण सुविधाएं (मशीनों की सूची , विशेष प्रक्रिया सुविधाएं, सामग्री रख-रखाव आदि)	<i>Details attached at Annexure – F2.8</i> विवरण अनुलग्नक - F2.8में संलग्न है।			
13.	<i>Testing facilities (List of testing equipment)</i> परीक्षण सुविधाएं(परीक्षण उपकरण की सूची)	<i>Details attached at Annexure – F2.9</i> विवरण अनुलग्नक – F2. 9 में संलग्न है।			
14.	<i>If manufacturing process involves fabrication then-</i> यदि निर्माण प्रक्रिया में फेब्रिकेशन की गई है तो- <i>List of qualified Welders</i> पात्र वेल्डर की सूची <i>List of qualified NDT personnel with area of specialization</i> विशेषज्ञता के क्षेत्र सहित पात्र एनडीटी कार्मिकों की सूची	<i>Applicable / Not applicable</i> लागू / लागू नहीं <i>Details attached at Annexure – F2.10</i> विवरण अनुलग्नक - F2.10में संलग्न है। <i>(if applicable)</i> लागू / लागू नहीं			
15.	<i>List of out-sourced manufacturing processes with Sub-Vendors' names & addresses</i> सब-वेंडर द्वारा बाह्य स्रोतों (उनके नाम और पते सहित)से करवाएं गए निर्माण प्रक्रियाओं की सूची	<i>Applicable / Not applicable</i> लागू / लागू नहीं <i>Details attached at Annexure. –F2.11</i> विवरण अनुलग्नक - F2.10में संलग्न है। <i>(if applicable)</i> (यदि लागू हो)			
16.	<i>Supply reference list including recent supplies</i> नवीनतम आपूर्ति सहित आपूर्ति संदर्भ सूची	<i>Details attached at Annexure – F2.12</i> विवरण अनुलग्नक - F2.12 में संलग्न है। <i>(as per format given below)</i> (नीचे दिए गए प्रारूप के अनुसार)			
<i>Project/ package परियोजना /पैकेज</i>	<i>Customer Name ग्राहक का नाम</i>	<i>Supplied Item (Type/Rating/Model /Capacity/Size etc) आपूर्ति की गई वस्तु (प्रकार / रेटिंग / मॉडल / क्षमता / आकार आदि)</i>	<i>PO ref no/date पीओ संदर्भ सं. / तिथि</i>	<i>Supplied Quantity आपूर्ति की मात्रा</i>	<i>Date of Supply आपूर्ति की तारीख</i>
17.	<i>Product satisfactory performance feedback letter/certificates/End User Feedback</i> उत्पाद के संतोषजनक प्रदर्शन संबंधी फीडबैक पत्र / प्रमाण पत्र / अंतिम उपयोगकर्ता फीडबैक	<i>Attached at annexure - F2.13</i> अनुलग्नक F2. 3पर संलग्न है			
18.	<i>Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product</i>	<i>Applicable / Not applicable</i> लागू / लागू नहीं			

	CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन SUB-VENDOR QUESTIONNAIRE/ सब-वेंडर प्रश्नावली
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	<i>(similar or higher rating)</i> प्रस्तावित उत्पाद (एक समान या उच्च रेटिंग वाले) के लिए टाइप टेस्ट रिपोर्ट (टाइप टेस्ट विवरण, रिपोर्ट संख्या, एजेंसी, जांच की तारीख) का सारांश नोट: - रिपोर्ट प्रस्तुत करने की आवश्यकता नहीं है <i>Note:- Reports need not to be submitted</i>	<i>Details attached at Annexure – F2.14</i> विवरण अनुलग्नक - F2.1 4में संलग्न है <i>(if applicable)</i> (यदि लागू हो)
19.	Statutory / mandatory certification for the proposed product प्रस्तावित उत्पाद के लिए वैधानिक / अनिवार्य प्रमाणीकरण	<i>Applicable / Not applicable</i> लागू / लागू नहीं <i>Details attached at Annexure – F2.15</i> <i>(if applicable)</i> (यदि लागू हो)
20.	Copy of ISO 9001 certificate आईएसओ 9001 प्रमाण पत्र की प्रति <i>(if available)</i> (यदि उपलब्ध हो)	<i>Attached at Annexure – F2.16</i> अनुलग्नक में संलग्न - F2.1 6 है
21.	Product technical catalogues for proposed item (if available) प्रस्तावित मद के लिए उत्पाद तकनीकी कैटलॉग (यदि उपलब्ध हो)	<i>Details attached at Annexure – F2.17</i> विवरण अनुलग्नक - F2.1 7 में संलग्न है

Name: नाम:		Desig: पद:		Sign: हस्ताक्षर:		Date: तिथि:	
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Company's Seal/Stamp:- कंपनी की मुहर / मोहर: -



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भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Page 1 of 5

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

CE: PR: 003- Rev 02

PB 2606 , Mysore Road Bangalore , 560026 INDIA

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 03) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 02).

These two documents along with Special Conditions of Contract annexed to this RFQ will form an integral part of the contract as and when the RFQ culminates into a Purchase Order / Contract.

RFQ No. : MGRM0000388
RFQ Date : 02.03.2021
RFQ Due Date : 13.03.2021
Customer/Project : M/s. UPRVUNL/Panki (1X660 MW) TPP
Scope Description : 24V DC SMPS based Charger System

Kindly submit your quotation as ~~single~~/**two**/~~three-part bid~~ (PQR+Techno-Commercial bid-1st part & Price bid-2nd Part) in E-Procurement System portal: <https://eprocurebhel.co.in> within the Due- Date of 13.03.2021 before 11.00 hours IST and note that tenders will be opened on the same day at 11.05 hours IST.

Purchase Executives: Clarifications with regard to the tender shall be addressed to purchase officers whose e-mail IDs are given below:

mounishg@bhel.in or vijaykumarym@bhel.in

Splitting of tendered quantity to MSE vendors: ~~The tendered quantity will be split to MSE vendor/s subject to submission of relevant document/s by vendors. Refer clause-I of Instructions to Bidders for conditions applicable and for information on document/s to be submitted.~~

Destination: For Indigenous scope of supply, items are to be directly despatched to BHEL site office/stores located at Panki TPP project site in Uttar-Pradesh state, India. Detailed Consignee details will be issued by BHEL along with Despatch Clearance.

Terms of Delivery:

- **Indigenous scope of supply:** Ex-works, <indicate station of dispatch> (including Packing & Forwarding charges but excluding Taxes).

Under-mentioned details shall be provided against indigenous supplies & services:

a. GSTIN of place of supply : _____
b. HSN (Harmonized System of Nomenclature) code : _____
Applicable tax and Rate : _____ & _____

- c. GSTIN of place of supply of service : _____
- d. SAC (Service Accounting Code) : _____
- Applicable tax and Rate : _____ & _____

I. Bidders to mandatorily provide confirmation/compliance for the under-mentioned terms:

SL NO	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	REMARKS,if any
01	Reverse Auction (RA)	BHEL shall be resorting to Reverse Auction (Guidelines as available on http://www.bhel.com/index.php/vender) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.	AGREE	
02	Parting of license for imported raw materials	In case of projects where Basic Custom Duty is NIL and vendor is importing any raw materials / components for the enquired item, same are eligible for Zero Customs duty. As per EXIM policy, BHEL will part the import licence with the vendors to obtain import licence by themselves and custom clear the raw materials/ components by availing zero customs duty. Hence, please furnish list of raw materials / components to be imported by you with Quantity and CIF value (for which BHEL has to share import licence). The benefit due to the above shall be passed on to BHEL and confirmed in the quotation. If there are no imported raw materials/ components, same shall be confirmed in the offer.	AGREE CIF value Yes, benefit passed on to BHEL in the priced quotation. (or) We confirm that there are no imported components	
03	Delivery Period	Within 10 weeks from the date of issue of Manufacturing clearance along with approved document. Delay in contractual delivery will attract Penalty as per GCC Clause no.:04.b.	AGREE weeks	
04	Terms of Payment at the time of material supply	Refer Clause "F" of Instructions to Bidder for BHEL standard Payment terms and loading factors applicable for non-compliance against payment terms: Indigenous Scope : a)Supply with Service(s) b)Supply only Imported Scope:-	AGREE	

		c)Supply with Service(s) d)Supply only High-Sea sales :- e)Supply with Service(s) f)Supply only Mandatory Spares : b) and/or d)/f) depending upon the scope		
05	Declaration of local content : The 'Class-I local supplier'/'Class-II local supplier' shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier'/'Class-II local supplier', as the case may be.	'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent. {'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%, as defined under Public procurement order no.P-45021/2/2017-PP (BE-II) dt: 16.09.2020. 'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content more than 20% but less than 50%, as defined under Public procurement order no.P-45021/2/2017-PP (BE-II) dt: 16.09.2020. In the event of any Nodal Ministry prescribing higher or lower margin of purchase preference and/or higher or lower percentage of local content in respect of this procurement, same shall be applicable}.' (Refer Clause 'A' Sl. No. 12 of Instructions to Bidders).	Percentage of local content : _____% Details of the Location(s) at which the local value addition is made : _____	
06	Declaration as a compliance to Rule 144(xi) of GFR, 2017 amendment dt 23.07.2020 issued by Ministry of Finance, Govt. of India.	The below declaration is to be submitted on Company Letter head duly signed and sealed by authorised signatory, for ascertaining the eligibility of offer in the tender. "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that our firm is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that our firm fulfils all requirements in this regard and is eligible to be considered." (Refer Clause 'A' Sl. No. 13 of Instructions to Bidders).		

II. Bidder to note that Deviations shall not be permitted for the below mentioned terms and are deemed to be complied. In case of non-compliance/deviation, offer shall be liable for rejection:

- (1) **Submission of documents post PO viz., drawings /data sheet etc. as indicated in Cl: 04 of GCC:** Within _03_ weeks from the date of receipt of Purchase Order. Delay in submission of complete set of specified documents in NIT, will attract Penalty as per GCC Clause no.04.a.
- (2) **Validity:** The offer will be valid for a period of _90_ days from the date of part-I bid opening and in case of Negotiation/ Counter-offer, price validity will apply afresh for a period of _30_ days from the date of according final price by bidder (or) up to original validity period, whichever is later.
- (3) **Warranty:** _30_ months from the date of dispatch of goods (or) _24_ months from the date of commissioning, whichever is earlier.
- (4) **Performance Bank Guarantee (PBG):** PBG will be applicable for a period of _30_ months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10% of the basic value of purchase order. It shall however be noted that PBG is not applicable against supply of Mandatory Spares.

Refer Clause "H" of Instructions to Bidders. Also note that PBG should be in the format specified in Annexure VII of ITB and no deviation to this format will be allowed.

Note: In case PBG is not furnished, the 10% basic amount will be withheld from the supply invoice. This withheld amount will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.

- (5) **Despatch Documents:** Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to Purchase Executive/BHEL directly. Despatch documents shall include the following:

Invoice (01 original and 01 copy with original sign & seal / digitally signed invoice), Lorry Receipt (L/R), Packing List, NIL Short-Shipment Certificate, insurance intimation letter, E-way bill, original Performance Bank Guarantee (directly from issuing bank to BHEL) and original POD (Proof of Delivery) on L/R.

One set of Invoice, Packing List, Lorry Receipt & E-way bill shall be e-mailed immediately to BHEL-EDN at the time of despatch.

Note: Detailed Packing List should indicate package-wise content details and also Net & Gross weight of each package.

- (6) **Freight Charges (for indigenous scope of supply):** Freight charges shall be to vendor's account. Bidder to quote Lump sum reasonable Freight charges along with applicable tax, in price bid.
- (7) **Evaluation criteria to determine L1 bidder:**
 - (a) ~~Item-wise evaluation of tendered item.~~
 - (or)
 - (b) Items will not be split on item-wise lowest offer. Evaluation of the lowest bidder will be done as a combined package basis.

- (8) **Erection Supervision and Commissioning charges:**

In case the quoted total Erection Supervision & Commissioning value is less than __05%__ of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price and apportioning towards Erection Supervision & Commissioning charges.

Refer Sl. no. 'h' under Clause 'F' of Instructions to Bidders for Payment terms of Erection Supervision & Commissioning charges.

With this, we hereby confirm that all the terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 03) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 02) are accepted without any deviation.

Vendor's Signature with Seal



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Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE:PR:001- Rev 03

INSTRUCTIONS TO BIDDERS

Bidder is requested to read the instructions carefully and submit their quotation taking into consideration of all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: CE: PR: 001 – Rev 03), General Conditions of Contract (document reference: CE: PR: 002 - Rev 02) and Special Conditions of Contract, if any, of the enquiry.
2. Any deviations from or additions to the “General Conditions of Contract” or “Special Conditions of Contract” require BHEL’s express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Regret letter (either through post or by mail or by EPS) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender.

Supplier shall be liable for removal as a registered vendor of BHEL when the supplier fails to quote against four consecutive tender enquiries for the same item or all enquiries in last two years for the same item, whichever is earlier.

4. Procurement directly from the manufacturers is preferred. However, if the OEM/ Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/ supplier in the same tender.

Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer/ supplier could bid directly but not both. Agent/Representative authorized by the OEM/Principal in turn cannot further sub authorize any other firm for submitting the offer or for placement of order.

In case bids are received from the manufacturer/ supplier and his agent, bid received from the agent shall be ignored.

5. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
6. If an Indian representative/associate/liaison office quotes on behalf of a foreign based bidder, such representative shall furnish the following documents:
 - a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
 - b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
 - c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages/damages/replacement/repair of imported scope

till the equipment is commissioned and handed over to customer will be the sole responsibility of the Indian representative/associates/agent/liaison office.

d. Refer **Annexure I** on “Guidelines for Indian Agents”.

7. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport /Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment.

Warehousing charges due to incomplete or missing documentation will be to supplier's account. All offers for imported scope of supply by air, must be made from any of the gateway ports (within the country) indicated **(Refer Annexure II)**.

8. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: http://www.bhel.com/vender_registration/vender.php
9. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices/misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike/lockout for a long period. Bidder may refer “Guidelines for Suspension of Business Dealings with Suppliers/ Contractors” available on www.bhel.com for more details.

The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies / guidelines.

10. The bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to your notice.
11. Offer is to be submitted in English language only.
12. For this procurement, the local content to categorize a supplier as a Class-I local supplier/ Class-II local supplier/ Non-local supplier and purchase preference to Class-I local supplier, is as defined in Public procurement (Preference to Make in India), Order 2017 dated 16.09.2020 issued by DPIIT.

In case of subsequent Orders issued by the Nodal Ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of price bids against this NIT. Default margin of purchase preference shall be 20% for Class-I local supplier only.

13. The Bidder shall mandatorily submit Declaration as mentioned under Rule 144(xi) of General Financial Rules, 2017 amendment dt 23.07.2020 issued by Ministry of Finance, Govt. of India. Where applicable, evidence of valid registration by the Competent Authority shall be attached.

The Competent Authority for the purpose of registration under this Order shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT). Refer Annexure-X for ‘Restrictions under Rule 144(Xi) of General Financial Rules, 2017 amendment dt: 23.07.2020’.

B. GUIDELINES FOR PREPARATION OF OFFER:

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
 - **SINGLE PART BID:** Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
 - **TWO PART BID:** Unpriced offer i.e. “Techno-commercial Bid” with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the “Price Bid” without the prices** should be enclosed in one cover and the cover must be super scribed **“Techno-commercial offer)** and Priced offer i.e. “Price Bid” containing price summary in a separate sealed envelope and must be super scribed **“Price Bid”**.

Both these envelopes shall be enclosed in a single sealed envelope superscribed with enquiry number, due date of tender and any other details as called for in the tender document.

- **THREE PART BID:** Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope superscribed with enquiry number, due date of tender and any other details as called for in the tender document.

If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission (or) if any part of the offer is incomplete, the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to superscribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is “Techno Commercial Bid” or “Price Bid” or “Pre-Qualification Bid”.

Please ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.

3. BHEL standard Commercial Terms and Conditions (duly filled, signed & stamped) must accompany Technical-Commercial offer without fail and should be submitted in original only.

The above indicated submission of Offers in “sealed envelope/hard copy” as mentioned in points B.1-B.3 is applicable for tenders that are not floated through E-Procurement System (EPS).

4. Validity: Unless otherwise specified in SCC (special commercial conditions of contract), the offer will be valid for a period of 90 days from the date of part-I bid opening and in case of Negotiation/Counter-offer/Reverse Auction, price validity will apply afresh for a period of 60 days from the date of according final price by bidder (or) up to original validity period, whichever is later.
5. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid.

If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without deviation.

6. Deviation to this specification/item description, if any, shall be brought out clearly indicating “DEVIATION TO BHEL SPECIFICATION” without fail, as a part of Techno-Commercial Bid.

If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.

7. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and/or any other relevant documents called in purchase specification as part of Technical Bid.
8. "Price Bid" shall be complete in all respects containing price break-up of all components along with all applicable taxes and duties, freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.
9. In addition, bidder shall also quote for erection & commissioning charges/erection supervision & commissioning charges (E&C service charges), documentation charges, testing Charges (type & routine), training charges etc. if & as applicable along with corresponding tax. The price summary must indicate all the elements clearly.
10. Wherever applicable, bidders should indicate "lumpsum" Erection and Commissioning (or) Erection Supervision and Commissioning charges, as applicable (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for carrying out E&C activity and further handing over to customer.
The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist (if any).
11. Wherever bidders require PAC (Project Authority Certificate)/applicable certificates for import of raw materials, components required for DECC,EPCG Power Projects, Export Projects or other similar projects wherein supplies are eligible for customs duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.
12. Prices should be indicated in both figures & words. Bid should be free from correction/overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for rejection.
Any typographical error, totalling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure III** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid" and BHEL decision will be final.
13. Documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder. However, this requirement is not mandatory for offers uploaded through E-Procurement System (EPS).

C. GUIDELINES FOR OFFER SUBMISSION:

The under-mentioned clauses 1, 2&3 will not be applicable for EPS tenders.

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE".

Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer.
2. E-Mail/ Internet/EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email ID specified in the SCC document of the tender.
3. Offers of Vendors who already have a valid Technical/Commercial MOU with BHEL-EDN for the items of the RFQ shall mention the relevant MOU reference no. and give only such other details not covered in the MOU.

4. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over either of the two purchase officers whose names are mentioned in the SCC document of tender RFQ.
5. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. For EPS tenders, e-mail notifications will be automatically generated and forwarded to registered e-mail ID/s of bidders during opening of tenders.
6. Bidder will be solely responsible:
 - a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
 - b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
 - c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box (or) if the tender document is handed over to the wrong person, BHEL will not be responsible for any such delays.
 - d. For offers received through email etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time (This clause will not be applicable for EPS tenders).

The above indicated submission of Offers as mentioned in points 6.a-6.d is applicable for tenders that are not floated through EPS.

- e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, system/software requirements etc. will be the sole responsibility of the bidder.

Wherever assistance is needed for submission of e-tenders, help-line numbers as available in the website of service provider of BHEL may be contacted.

Purchase Executive/ BHEL shall not be responsible for any of the activities relating to submission of offer.

D. PROCESSING OF OFFERS RECEIVED:

1. Any discount/ revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid).
The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes/revisions are requested by BHEL.
In case of withdrawal of any Technical/Commercial deviation(s) by the bidder before opening of price bids/conducting the Reverse Auction, revision of price/impact bid will not be accepted.
3. In case there is no change in the technical scope and/ or specifications and/ or commercial terms & conditions, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening).
4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL

and it accounts for price implications from bidders, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid.

Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening.

5. Un-opened bids (including price bids) will be returned to the respective bidders after release of Purchase order.

Regarding Offers for EPS tenders that get rejected on PQC/ techno-commercial grounds, the bids for the subsequent parts will not be opened i.e., both technical bid and price bid (Parts-II & III) will not be opened in case of rejection on PQC ground and price bid (Part-II/Part-III, as applicable) will not be opened in case of rejection on techno-commercial ground.

6. After receipt of Purchase Order, supplier should submit required documents viz., specified drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report, O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
7. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL and agreed upon in the Purchase Order.
8. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL").

"Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and/or duties (as applicable), freight charges, taxes on Services, customs clearance charges for imported items, any other cost indicated by bidder for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions).

Benefits arising out of Nil Import Duty on DEEC, EPCG, DFIA Projects, Physical Exports or such 100% exemptions (statutory benefits), project imports, customer reimbursements of statutory duties (like Basic Customs Duty and cess on customs duty), Input tax credits as applicable will also be taken into account for arriving at the Total cost to BHEL (wherever applicable and as indicated in SCC document of tender).

For EPS tenders, it shall be noted that the prices (including discounts) vis-a-vis currency quoted in EPS portal only will be considered as Final for the purpose of evaluation of the lowest bidder.

Bidder shall ensure to indicate the applicable taxes against each line item in online portal, failing to which the same will be considered as inclusive/NIL.

In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.

In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss/draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s).

Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.

9. The evaluation currency for this tender shall be INR. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

Single part bids: Date of tender opening

Two/three part bids: Date of Part-I bid opening

Reverse Auction: Date of Part-I bid opening

In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.

10. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers.
11. GeM Seller ID shall be mandatory before placement of order/award of contract for goods and services to the successful bidder(s), for orders exceeding Rs.25 lakhs (including all taxes etc.). Department of Expenditure (DoE) OM no.6/9/2020-PPD dated: 24.08.2020 may be referred in this regard.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format (**Refer Annexure IV**) for receiving all payments through NEFT.(Applicable for Indian vendors only).
2. In case of High Sea Sales transaction, customs clearance of the consignment landed on Indian Sea/Air ports will be done by BHEL based on the original HSS documents provided by vendors.
All warehousing charges due to delay in submission of complete and or correct HSS documents to BHEL will be to supplier's account only. Such recovery will be made out of any of the available bills (**Refer Annexure V**).
3. Statutory deductions, if any, will be made and the deduction certificate shall be issued.
 - A. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act.
In addition to the above, Foreign vendors shall also submit relevant details of their bankers like Swift Code, Banker's Name &Address etc.
 - B. TDS deduction as per section 51 of CGST Act,2017 shall be applicable as per Gazette Notification No. 50/2018-Central Tax, Dated: 13th September 2018 and subsequent notification/s, as and when released by Govt. authorities.
4. Levy and Collection of TCS by the seller of goods u/s 206C (1H) shall be in compliance with Govt. norms. The seller shall raise the invoice including the amount of TCS in the Tax Invoice and no separate debit note will be entertained.

The seller should indicate his PAN number and TAN number in the Invoice. The seller should remit the TCS so collected from BHEL and provide TCS certificate/s with invoice no., invoice date, Amount etc.

If by any chance seller is not remitting /not able to submit TCS certificates to BHEL on time, then the TCS amount with penalty, if any applicable will be recovered from seller in the available bills.

5. Incomplete documentation will not be accepted. Delayed submission of invoice / documents may result in corresponding delay in payment. In this connection, request to also refer clause: G about invoicing & payment formalities under GST regime.

Applicable documents shall be submitted to the purchaser at the time of execution of supplies/services for availing GST input credits.

F. STANDARD PAYMENT TERMS OF BHEL-EDN:

<u>PURCHASE ORDERS FOR:</u>	<u>SUPPLY WITH SERVICE(S)</u>	<u>SUPPLY ONLY</u>
<u>INDIGENOUS PROCUREMENT</u>	a. 100% of basic value with taxes and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later. <u>Note:</u> In case PBG is not furnished, only 90% payment will be released against 100% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.	b. 100% of PO value with taxes and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later.
<u>IMPORT PROCUREMENT</u>	c. 100% of basic value will be paid against usance draft of 45 days from the date of AWB/BOL on submission of complete set of documents. <u>Note:</u> In case PBG is not furnished, only 90% payment will be released against 100% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.	d. 100% of PO value will be paid against usance draft of 45 days from the date of AWB/BOL on submission of complete set of documents.
<u>HIGH-SEA SALES PROCUREMENT</u>	e. 100% of basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later <u>Note:</u> In case PBG is not furnished, only 90% payment will be released against 100% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.	f. 100% of basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later.

g. Erection and Commissioning:

Evaluation methodology: Unless and otherwise specified in SCC, E&C charges should not be less than 10% of the main supply value. In case the quoted total E&C value is less than 10% of the main supply value, BHEL shall

evaluate Bidders Price deducting differential amount from main supply price proportionally from all items and apportioning towards E&C charges.

Payment term: 100% E&C charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.

h. Erection Supervision and Commissioning:

Evaluation methodology: Unless and otherwise specified in SCC, E&C charges should not be less than 5% of the main supply value. In case the quoted total E&C value is less than 5% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price proportionally from all items and apportioning towards E&C charges.

Payment term: 100% E&C charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.

i. Comprehensive Annual Maintenance Contract:

Evaluation methodology: Unless and otherwise specified in SCC, CAMC will be applicable for a period of 04 years from the date of expiry of warranty period (or) from the date of completion of commissioning of equipment, whichever is later and the total CAMC value should not be less than 20% of the main supply value. In case the quoted total CAMC value is less than 20% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price proportionally from all items and apportioning towards CAMC charges.

Payment terms: 100% CAMC charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of CAMC on yearly basis.

j. Terms of Payment for Training: 100% payment will be made in 45 days from the date of completion of Training or 15 days from the date of submission of complete set of invoice along with documentary evidence, whichever is later.

LOADING FACTORS FOR DEVIATION IN PAYMENT TERMS (APPLICABLE FOR IMPORT PROCUREMENT ONLY):

- 1) For offers received with Sight draft payment term in place of Usance draft, loading applicable will be 1.0% of basic value.
- 2) For offers received with Letter of Credit payment term with Usance of 45 days, loading applicable will be 2.5% of basic value.
Additional loading of 2% will be applicable for payment term as Letter of Credit at Sight.
- k. Any payment term with credit period of less than 45 days for indigenous supply/HSS and any other variation of payment terms are liable for rejection.
- l. Standard payment terms indicated in Clauses: F (a), (b), (c), (d), (e), (f), (g), (h), (i) & (j) will not attract any loading.

Note 1: Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight, training charges, E&C and AMC charges (wherever applicable). Wherever the Purchase Order is split into import portion and indigenous portion of supply, minimum % to be quoted for Services, wherever mentioned, will be of both purchase order values put together.

Note 2: In case of multiple packages/units in a power plant, payment of E&C charges will be processed on pro-rata basis.

Note 3: No deviation will be permitted from the duration of Guarantee/Warranty and/or Comprehensive Annual Maintenance Contract period specified in SCC.

G. Terms & Conditions to be complied under GST regime:

1. All invoices to contain BHEL-EDN (buyer) GSTIN number: 29AAACB4146P1ZB. However for CGST +SGST/UGST billing outside the state of Karnataka, invoice has to be generated with BHEL's Nodal Agency GSTIN number. Address of Nodal Agency along with GSTIN number will be provided by BHEL at the time of issuing dispatch clearance.
2. The Bidder shall mention Bidder's GSTIN number in all quotations and Invoices submitted.
3. The Bidder shall also mention HSN (Harmonized System of Nomenclature) / SAC (Services Accounting Code) mandatorily in all quotations and invoices submitted.
4. Invoice submitted should be in the format as specified under GST Laws viz., all details as mentioned in Invoice Rules like GST registration number(GSTIN), invoice number with date of issue, quantity, rate, value, taxes with nomenclature – CGST, SGST, UGST,IGST mentioned separately, HSN Code / SAC Code etc. Invoice should be submitted in original for buyer plus duplicate for credit availment.
5. Payment of GST to Vendor will be made only if it is matching with data uploaded by the Vendor in GST portal.
6. For invoices paid on Reverse charge basis – “Tax payable on reverse charge basis” to be mentioned on the invoice.
7. In case GST credit is delayed/denied to BHEL due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount will be recoverable from vendor along with interest levied/ leviable on BHEL.
8. In case vendor delays declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law will be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.
9. Vendor should intimate BHEL immediately on the same date of invoicing without any delay.
10. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the supplies, within the calendar month notified by BHEL.
11. Bidders to note that Rules & Regulations pertaining to E-way bill system are to be strictly adhered to, as and when notified by Govt. authorities.
12. As per Notification 88/2020-Central Tax dated 10th November 2020 (applicable w.e.f. 01 January 2021), the turnover for applicability of E-invoicing provisions has been reduced from 500 crores to 100 crores. In other words, registered person [other than a SEZ unit and those referred in Rule 54(2), 54(3), 54(4) and 54(4A) of the CGST Rules], whose aggregate turnover in any preceding financial year from 2017-18 onwards exceeds 100 crores, is required to comply with the requirement of IRN and QR code in respect of supply of goods or services or both to a registered person or for exports.

H. Performance bank guarantee (PBG):

Performance bank guarantee (PBG) will be applicable as called in the tender documents. Unless otherwise specified in the SCC, the PBG against performance of the contract shall be valid for a period of 24 months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10 % of the basic value of the purchase order which will include all components of the purchase order and will exclude only taxes, duties, freight, training charges, E&C and AMC charges (wherever applicable).

1. The BG issued in Indian Rupees by Banks in India is to be executed on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Bank issuing the guarantee.
2. No deviation for the duration and value of PBG will be permitted.
3. PBG shall be from any of the BHEL consortium of bankers (**refer Annexure VI**).
4. PBGs from nationalized banks are also acceptable.
5. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order.
6. PBG should be in the format specified (**refer Annexure VII**). No deviation to this format will be allowed. However in case BHEL changes the PBG format, bidder shall honor the same.
7. Bank Guarantee should be enforceable in Bangalore.
8. In Case of Bank Guarantees submitted by Foreign Vendors-
 - a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in Bangalore.
 - b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)
 - b.1 Please note that Bank Guarantee issued by any of the Consortium Banks only will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter-Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It shall be noted that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor.
 - b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at sl.no. b.1 is required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time).
9. Expired PBGs will be returned only after expiry of the claim period.
10. PBG shall not be applicable for spares.

I. PROVISIONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES) :

Benefits/facilities as applicable for Micro and Small Enterprises (MSEs) shall be available to MSEs registered with Government designated authorities as per the Purchase & Price Preference Policy of the Government subject to them becoming eligible otherwise.

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit the Udyog Aadhaar certificate along with attested copy of a CA certificate (Annexure VIII) or Udyam Registration certificate applicable for the relevant financial year (latest audited) along with the tender documents in the Part-I bid to avail the applicable benefits.

Date to be reckoned for determining the deemed validity will be the date of bid opening (Part-I in case of two-part bid and three-part bid).

Documents have to be notarized/attested by a Gazetted officer and must be valid as on the date of part I bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Please note that no benefit shall be applicable if any deficiency in the above required documents are not submitted before the price bid opening/Reverse Auction. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal.

Bidders to however note the documents that shall be furnished in order to establish credentials as MSE vendor should be as per the extant statutory requirements specified by the Ministry of Micro, Small and Medium Enterprises.

PURCHASE PREFERENCE FOR MSE VENDORS:

In tender, participating MSEs quoting price within price band of L1+15 percent shall also be allowed to supply a portion of requirement by bringing down their price to L1 price in a situation where L1 price from someone other than a MSE and such MSE shall be allowed to supply at least 25% of total tendered value. In case of more than one such MSE, the supply shall be shared proportionately (to tendered quantity).

- 3% of the 25% will be earmarked for women owned MSEs.
- 25% of the 25% (i.e., 6.25% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) & (2) are fulfilled.
- In case where no SC/ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, the 6.25% of earmarked quantity for SC/ST owned MSE firms will be distributed among the other eligible MSE vendors who have participated in the tender.

In case after the bid opening it is seen that no MSE has become L1, then depending on the nature of the item, if it is not possible to split the tendered items/quantities on account of reasons like customer contract requirements of supplying one make for a given project or technical reasons like the tendered item being a system etc., then BHEL would not counter offer the L1 prices even though there may be MSE bidders within the +15% band of L1. Such information that tendered quantity will not be split, shall be indicated in the SCC.

J. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL: BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.
2. Commitment by Bidder(s)/ Contractor(s):
 - a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
 - b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
 - c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. The Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain or pass on to others, any information or document provided by BHEL as part of business relationship.
 - d. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made,

and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

K. Integrity Pact (IP):

- a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner.

Following independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

1. Shri Arun Chandra Verma, IPS (Retd.)
Email: acverma1@gmail.com
2. Shri Virendra Bahadur Singh, IPS (Retd.)
Email: vbsinghips@gmail.com

- b) Please refer Section-8 of the IP for Role and Responsibilities of IEMs (Annexure IX). In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEM/s shall be done through email only.

Note: No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are indicated in SCC document of tender.

Annexure

Annexure I
Guidelines for Indian Agents

- **Definition of Indian Agent:** An Indian Agent of foreign principal is an individual, a partnership, an association of persons, a private or public company, that carries out specific obligation(s) towards processing of BHEL tender or finalization or execution of BHEL's contract on behalf of the foreign supplier.

In case of yes, vendor to note the following and reply accordingly:

- i. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.
- ii. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.
- iii. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.
- iv. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.
- v. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.
- vi. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.
- vii. The "Guidelines for Indian Agents of Foreign Suppliers" enclosed at annexure - 'A' shall apply in all such cases.

- viii. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. In this regard, details may be checked as per Annexure-B (copy enclosed). It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

—X—

Vendor's Signature with Seal

Guidelines for Indian Agents of Foreign Suppliers

- 1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with BHEL shall apply for registration in the registration form in line with SEARP.
- 1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the Principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/ salary/ retainership being paid by the principal to the agent before the placement of order by BHEL.
- 1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.
- 2.0 **Disclosure of particulars of agents/ representatives in India, if any.**
- 2.1 Tenderers of Foreign nationality shall furnish the following details in their offers:
 - 2.1.1 The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the agents/ representatives in India if any and the extent of authorization and authority given to commit the Principals. In case the agent/ representative be a foreign Company, it shall be confirmed whether it is existing Company and details of the same shall be furnished.
 - 2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.
 - 2.1.3 Confirmation of the Tenderer that the commission/ remuneration, if any, payable to his agents/ representatives in India, may be paid by BHEL in Indian Rupees only.
- 2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:
 - 2.2.1 The Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/ representatives.
 - 2.2.2 The amount of commission/ remuneration included in the price (s) quoted by the Tenderer for himself.
 - 2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/ remuneration, if any, reserved for the Tenderer in the quoted price(s), may be paid by BHEL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.
- 2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/ remuneration, if any payable to the agents/ representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.
- 2.4 Failure to furnish correct and detailed information as called for in paragraph 2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BHEL. Besides this there would be a penalty of banning business dealings with BHEL or damage or payment of a named sum.

ANNEXURE - II
LIST OF INTERNATIONAL GATEWAY AIRPORTS

For air based consignment, terms of delivery will be on FCA basis from following listed airports only. Vendors are requested to verify this list for use before submission of offer.

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
D06	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE – III

DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

(a) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE - IV
Electronic Funds Transfer (EFT) OR
Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.

TYPE OF REQUEST(Tick one): ☐ CREATE ☐ CHANGE

BHEL Vendor / Supplier Code:

Company Name :

Permanent Account Number(PAN):

Address

City:

PINCODE

STATE

Contact Person(s)

Telephone No:

Fax No:

e-mail id:

1 Bank Name:

2 Bank Address:

3 Bank Telephone No:

4 Bank Account No:

5 Account Type: Savings/Cash Credit

6 9 Digit Code Number of Bank and branch

appearing on MICR cheque issued by Bank

7 Bank IFSC Code(applicable for NEFT)

8 Bank IFSC code(applicable for RTGS)

(Indian Financial System Code)

- A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.
- B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transferring Bank responsible.
- C This authority remains in full force until BHEL, EDN, Bangalore receives written notification requesting a change or cancellation.
- D I have read the contents of the covering letter and agree to discharge the responsibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:

Designation:

Telephone No. with STD Code

Company Seal

Bank Certificate

We certify that _____ has an Account No _____ with us and we confirm that the bank details given above are correct as per our records.

Date:

(.....)

Place:

Signature

Please return completed form along with a blank cancelled cheque or photocopy thereof to:

Bharath Heavy Electricals Ltd,

Attn:

Electronics Division, Mysore Road,

BANGALORE - 560 026

In case of any Query, please call concerned purchase executive.

ANNEXURE - V
PRESENT PROCEDURE FOR SALE IN TRANSIT (HIGH SEA SALES)

In case of High Sea Sales, vendor should submit following documents:

1. ORIGINAL HIGH SEA SALES AGREEMENT

- Sale agreement (on Rs. 200/- non-judicial stamp paper & notarised with 2 witnesses with identity) has to be signed between BHEL and the Party importing material. The date of the sale documents should be in between the date of House Air Way Bill / Bill of Lading and before landing of the goods in Indian origin.
- Following shall be included in the High Sea Sales Agreement:
"THE BUYER ALSO UNDERTAKE DISCHARGES, THE OBLIGATION AND FULFILLMENT OF CONDITIONS, IF ANY, ATTACHED TO THE IMPORTATION, ASSESSMENT AND CLEARANCE OF THE GOODS IN TERMS CUSTOMS TARIFF ACT 1975, THE CUSTOMS ACT 1962 & RULES & REGULATIONS MADE THERE UNDER AND OTHER RELEVANT ACTS, ORDERS, NOTIFICATIONS".

2. ORIGINAL INVOICES: INDIGENOUS RUPEE INVOICE & FOREIGN CURRENCY INVOICE

- Prices should be C.I.F., designated airport/seaport basis.
- I.E.C., C.S.T., K.S.T. Nos. to be mentioned.
- Description of item (Nomenclature), Unit & Quantity in both the Foreign Currency & the Indigenous Invoice in Rupee shall be exactly as per Purchase Order Description of item, Quantity and Unit. The Indigenous Invoice value shall be exactly as per Purchase Order value.
- Seller should give Foreign Currency Invoice from the original consignor. The Foreign Currency Invoice value should be at least 2% (two per cent) less than the Indigenous Rupee Invoice value in equivalent foreign currency.

4. ORIGINAL HOUSE AIR WAY BILL/ BILL OF LADING

- The sale agents should duly endorse House Air Way Bill (HAWB) for air shipments or original Bill of Lading (O.B.L.) for sea shipments and Foreign Currency Invoice in favour of BHEL-EDN.

5. ORIGINAL CARGO ARRIVAL NOTICE FROM FORWARDER.

6. ORIGINAL DELIVERY ORDER ISSUED IN NAME OF BHEL-EDN.

7. ORIGINAL PACKING LIST.

8. A LETTER TO THE COMMISSIONER OF CUSTOMS FOR EFFECTING ABOVE SALE.

9. A LETTER TO THE DEPUTY ASSESSOR (OCTROI) FOR EFFECTING ABOVE SALE IN FAVOUR OF BHEL.

REMARKS: In case vendor needs any clarifications on the above, the same may be sought in writing.



ELECTRONICS DIVISION, BANGALORE

Annexure-VI

BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

Bank Guarantee (BG) shall be issued from the following banks only:

Sl. No.	Nationalised Banks	Sl. No.	Public Sector Banks
1	Allahabad Bank	18	IDBI
2	Andhra Bank		
3	Bank of Baroda	Sl. No.	Foreign Banks
4	Canara Bank	19	CITI Bank N.A
5	Corporation Bank	20	Deutsche Bank AG
6	Central Bank	21	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
7	Indian Bank	22	Standard Chartered Bank
8	Indian Overseas Bank	23	J P Morgan
9	Oriental Bank of Commerce		
10	Punjab National Bank	Sl. No.	Private Banks
11	Punjab & Sindh Bank	24	Axis Bank
12	State Bank of India	25	The Federal Bank Limited
13	Syndicate Bank	26	HDFC Bank
14	UCO Bank	27	Kotak Mahindra Bank Ltd
15	Union Bank of India	28	ICICI Bank
16	United Bank of India	29	IndusInd Bank
17	Vijaya Bank	30	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.
- Bank Guarantees issued by Co-operative Banks/Financial Institutions cannot be accepted under any circumstance.

Annexure-VII

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____¹ through its Unit at.....(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) with its registered office at _____² hereinafter referred to as the 'Vendor / Contractor / Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated³ valued at Rs.....⁴ (Rupees -----)/FC.....(in words.....) for⁵ (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to% (.... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we,, (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer any sum or sums upto a maximum amount of Rs --⁶ (Rupees -----) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor / Contractor / Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the Vendor / Contractor / Supplier shall have no claim against us for making such payment.

We thebank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/satisfactory completion of the performance guarantee period as per the terms of the Contract and that it shall continue to be enforceable till

all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

WeBANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor / Contractor / Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor / Contractor / Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor / Contractor / Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor / Contractor / Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor / Contractor / Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor / Contractor / Supplier 's liabilities.

This Guarantee shall remain in force upto and including.....⁷ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Vendor / Contractor / Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the⁸we shall be discharged from all liabilities under this guarantee thereafter.

We, BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁶
- b) This Guarantee shall be valid up to⁷
- c) Unless the Bank is served a written claim or demand on or before⁸ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

² NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

⁴ CONTRACT VALUE

⁵ PROJECT/SUPPLY DETAILS

⁶ BG AMOUNT IN FIGURES AND WORDS

⁷ VALIDITY DATE

⁸ DATE OF EXPIRY OF CLAIM PERIOD

Annexure-VIII

Certificate by Chartered Accountant on letterhead

This is to certify that M/s _____
(hereinafter referred to as 'enterprise') having P A N Number _____ and
UDYAM Registration Number _____, registered office at _____
_____ is falling under the category
_____ (Micro / Small / Medium) under MSMED Act 2006. (Copy of UDYAM Registration
Certificate to be enclosed).

The said classification of _____ (Micro / Small / Medium) is arrived at based on the
Notifications / guidelines / clarifications issued under Micro, Small and Medium Enterprises
Development Act, 2006 including the notification S.O.2119 (E) dated 26th June 2020.

The Investment of the enterprise in Plant and Machinery or Equipment as at 31st March
2020 as per Clause 4 of the Notification is _____ (Rupees in Lakhs).

The turnover of the Enterprise for the period ending 31st March 2020 as per Clause 5
of the Notification is _____ (Rupees in Lakhs).

Date:

(Signature) Name-
Membership number-

Seal of Chartered Accountant with UDIN reference

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions:

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.
- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/ Contractors / Sub-contractors

- 6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.
- 6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - Independent External Monitor(s)

- 8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- 8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.
- 8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.
- 8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.
- 8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.
- 8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

- 9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.
- 9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

- 10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

- 10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- 10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
- 10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

Place-----

Date-----

Witness:_____

(Name & Address) _____

For & On behalf of the Bidder/

Contractor

(Office Seal)

Witness:_____

(Name & Address) _____

Annexure-X

Restrictions under Rule 144(xi) of General Financial Rules, 2017 amendment dt: 23.07.2020

- I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.
- II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.
- III. "Bidder from a country which shares a land border with India" for the purpose of this Order means :-
 - a. An entity incorporated, established or registered in such a country; or
 - b. A subsidiary of an entity incorporated, established or registered in such a country; or
 - c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - d. An entity whose *beneficial owner* is situated in such a country; or
 - e. An Indian (or other) agent of such an entity; or
 - f. A natural person who is a citizen of such a country; or
 - g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
- IV. The *beneficial owner* for the purpose of (iii) above will be as under:
 1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation--

 - a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent of shares or capital or profits of the company;
 - b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;
 2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.



ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 002- Rev 02

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' herein after referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects/ customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

- a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
- b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
- c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent/acceptance/ award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection/ Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
- d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Order of Precedence:

In case of any inconsistency or contradiction between any of the documents, the order of precedence shall be Purchase Order, LOI / LOA, Special Conditions of Contract and General Conditions of Contract for commercial conditions; and specific agreement on technical conditions, RFQ/offer and specification for Technical Conditions.

Interpretation:

In the contract, except where the context requires otherwise:

- a) words indicating one gender include all genders;
- b) words indicating the singular also include the plural and words indicating the plural also include the singular;

- c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
- d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. **Price Basis:** All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted.
2. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head/ through e-mail within a week from the date of receipt of Purchase Order or such other period as specified/ agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
The purchase order will be deemed to have been accepted if no communication to the contrary is received within one week (or the time limit as specified/agreed by BHEL) from the date of receipt of the purchase order.
3. **Documentation:** After receipt of Purchase Order, vendor should submit necessary documents (if & as applicable) like drawings specified, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report, O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents / specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.
4. **Penalty:**
 - a. **For delay in documentation:** In the event of delay in submission of complete set of specified documents ((like drawings, bill of materials, datasheets, catalogues, quality plan etc. as called in tender specifications including soft copies wherever applicable) in required sets beyond two(02) weeks (or as agreed/indicated in the SCC/Purchase Order) from the date of receipt of Purchase Order (by email), penalty at 0.5% (half percent) per week or part thereof, limited to a maximum of 5% (five percent) of the basic material value of the Purchase Order will be applicable.

Penalty for delayed documentation if applicable, shall be deducted at the time of first supply payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted. GST as applicable will be recovered along with penalty amount.
 - b. **For delay in delivery:** In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of issue of Manufacturing clearance along with approved document. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

Penalty for delayed delivery if applicable, shall be deducted at the time of first supply payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted. GST as applicable will be recovered along with penalty amount.

5. Contract variations (Increase or decrease in the scope of supply): BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be the basis for such additional work. Vendor shall not perform additional work before BHEL has issued written instructions/ amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.
6. Inspection: Prior written notice of at least 10 days shall be given along with internal test certificates/COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification/acceptance for issue of dispatch clearance. BHEL reserves the right for conducting repeat test, if required.
All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.
7. Transit Insurance: Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency (as mentioned in dispatch instructions issued by BHEL) through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.
8. Mode of dispatch:
Indigenous Scope: By road on Door Delivery Consignee Copy attached basis through your approved transporter (unless otherwise indicated in Dispatch Instructions), only on receipt of Despatch Clearance from BHEL.
Imported Scope: By Air/Sea through BHEL approved Freight Forwarder/supplier approved Consolidator respectively as per agreed contractual terms, only on receipt of Dispatch Clearance from BHEL.
9. Changes in Statutory levies:
If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the execution of Contract, which was or will be assessed on the bidder in connection with performance of the Contract, an equitable adjustment of the Contract Price shall be made to fully take into account any such change by addition to the Contract Price or deduction there from, as the case may be. However, these adjustments would be restricted to direct transactions between BHEL and the bidder /agent of foreign bidder (if applicable). These adjustments shall not be applicable on procurement of raw materials, intermediary components etc. by the bidder /agent.
10. Availing duty/tax exemption benefits by bidder, wherever applicable: BHEL shall issue the required Certificate/s, as per relevant policies of the Govt. of India, to facilitate the bidders to avail any such benefits under the Contract. In case of failure of the bidders to receive the benefits partly or fully from the Govt. of India and/or in case of any delay in receipt of such benefits, BHEL shall neither be liable nor responsible in any manner whatsoever.

11. Taxes against sub-vendor dispatches: All taxes/levies, as applicable in respect of all components, equipments and material to be despatched directly from the sub-vendor's works to Site irrespective of the fact whether such taxes and levies are assessable and chargeable on Vendor or the BHEL, shall be to the vendor's account and no separate claim in this regard will be entertained by BHEL.
12. High Sea Sales (HSS): Customs clearance of the consignment landed on Indian Sea/Air ports will be done by BHEL based on the original HSS documents provided by vendors.
Any delay in submission of complete/correct HSS documents to BHEL may incur demurrage charges. All demurrage charges on account of incomplete /incorrect HSS documents submission by vendor will be to vendor's account and all such charges will be recovered from any of the available vendor bills with BHEL.
13. Packaging and dispatch: The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea/ Air / Rail/ Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures/ hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw/ solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitary/ Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (LxBxH) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated in the packing list.
Separate packing & identification of items should be as follows.
 1. Main Scope - All items must be tagged with part no. & item description.
 2. Commissioning accessories/spares - All items must be tagged with part no. & item description.
 3. Mandatory spares - All items must be tagged with part no. & item description.
 Nevertheless, vendor shall adhere to dispatch & packing instructions issued by BHEL at the time of dispatch.
14. Assignment of Rights & Obligations; Subcontracting: Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.
15. Progress report: Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.
16. Non-disclosure and Information Obligations: Vendor shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal any specified confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.
17. Cancellation /Termination of contract: BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so on account of any decline, diminution, curtailment or stoppage of the business.

18. Risk Purchase Clause: In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services not supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.

In case of items demanding services at site like erection and commissioning, vendor should send his servicemen/representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase/service including additional handling charges due to the change.

19. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages, caused by supplier's act or omission, shall be made good at free of cost within a reasonable time that BHEL may allow from such intimation.

Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, supplier shall make good of all such damages within a reasonable time from such intimation by BHEL. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will be reimbursed to supplier.

20. Remedial work: Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.

21. Indemnity Clause: Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.

22. Product Information, Drawings and Documents: All specified drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.

Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.

All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.

23. Intellectual Property Rights, Licenses: If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods/related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged)

claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

24. **Force Majeure:** Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.

A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

25. **Warranty:**

Wherever required, and so provided in the specifications/ Purchaser Order, the Seller shall ensure that the goods supplied shall comply with the specifications laid down, for materials, workmanship and performance.

Unless otherwise specified in SCC, warranty period shall be applicable for a period of 24 months from the date of delivery of goods or 18 months from the date of commissioning of goods, whichever is earlier.

The warranty period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable warranty period.

26. **Limitation of Liability:** Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.

The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

27. **Liability during warranty:** Vendor shall arrange replacement / repair of all the defective materials / services under its obligation during the warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor. In case, defects attributable to vendor are detected during Warranty period or where the commissioning call is issued within the warranty period, vendor shall be responsible for replacement/ repair of the goods as required by BHEL at vendor's cost even after expiry of warranty period.

Further if the equipment or any part thereof cannot be used by reason of such defect and/or making good of such defect, the warranty period of the equipment or such part, as the case may be, shall be extended by a period equal to the period during which the equipment or such part cannot be used by BHEL because of any of the aforesaid reasons. Upon correction of the defects in the facilities or any part thereof by repair/replacement, such repair/replacement shall have the warranty period for a period of twelve (12) months from the time such replacement/repair of the equipment or any part thereof has been completed.

28. **Liability after warranty period:** At the end of the warranty, the Vendor's liability ceases except for latent defects. For the purpose of this clause, latent defects shall be the defects inherently lying within the material or arising out of design deficiency which do not manifest themselves during the warranty Period, but later. The Contractor's liability for latent defects warranty for the equipment including spares shall be limited to a period of six months from the end of the warranty period of the respective equipment including spares or first time commissioning, whichever is later but not later than one (01) year from the date of expiry of warranty period.

29. Compliance with Laws: Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.
30. Settlement of Disputes: Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).
31. Arbitration Clause in case of Contract with vendors other than Public Sector Enterprise (PSE) or a Government Department:

Arbitration & Conciliation:

The parties shall attempt to settle any disputes or difference arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, or in connection with this contract through friendly discussions. In case no amicable settlement can be reached between the parties through such discussions, in respect of any dispute; then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL–EDN. Such Sole Arbitrator appointed, shall conduct the arbitration in English language.

The Arbitrator shall pass a reasoned award and the award of the Arbitration shall be final and binding upon the Parties.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Bangalore.

The cost of arbitration shall be borne as decided by the Arbitrator upon him entering the reference.

Subject to the Arbitration Clause as above, the Courts at Bangalore alone shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.

Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the parties shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and efficiency in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.

Arbitration Clause in case of Contract with a Public Sector Enterprise (PSE) or a Government Department:

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred by either party for Arbitration to the Sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any Party aggrieved by such Award may make further reference for setting aside or revision of the Award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the Parties hereto finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.'

32. Applicable Laws and Jurisdiction of Courts: Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in Bangalore alone shall have jurisdiction to consider over any matters touching upon this contract.
33. General Terms: That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.

That the headings used in this agreement are for convenience of reference only.

That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.