ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

PHONE : 080 - 26998377
Fax : 080 -26989217
E-MAIL pragadeeshtg@bhel.in

Bharat Heavy Electricals Limited

(A Government of India Undertaking)

ELECTRONICS DIVISION

P.O. Box No. 2606, Mysuru Road, Bengaluru - 560 026

An ISO 9001, ISO 14001, OHSAS 18001 & ISO/IEC 27001:2005 Company

E-Tender

The Quotations are invited under two part bid system for Design, Supply, Installation and Commissioning of 220kV switchyards and laying of underground cables for 75MW (AC) Solar Photovoltaic Grid-connected power plant at Dhuvaran, Gujarat.

RFQ NO and date	TGPBOS0049 dated 04.12.2019 (e-tender)
RFQ due date & time	16.12.2019 up to 13.00 hrs (IST)
Date, Time & Venue of Part-I Bid Opening	16.12.2019 after 13.30 hrs (IST)
Date, Time & Venue of Price Bid opening	Will be intimated later for technically accepted vendors
Address for Commercial Communication & Contact Person in BHEL (MM dept)	Mr. T.G.Pragadeesh (09742576787) Manager Mr. Ramachandra (09980958476), SDGM SC&PV MM Department, BHEL Electronics Division, PB NO 2606, Mysuru road, Bengaluru-560 026. INDIA Email: pragadeeshtg@bhel.in ramachandra@bhel.in Telephone number: +91 80 26998377, +91 80 26998476
Address for Technical Communication & Contact Person in BHEL with CC to MM dept	Mr. G L N Murthy (9449869527) Dy. General Manager Mr. PHALGUNI SAHOO (8147090660), Sr. Engineer SC&PV ENGINEERING Department, BHEL Electronics Division, PB NO 2606, Mysuru road, Bengaluru-560 026. INDIA Email: murthygln@bhel.in phalguni@bhel.in Telephone number: +91 80 26998951, +91 80 26989632

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.

PRE QUALIFICATION CRITERIA

A . Bidder should have completed supply, E&C of switchyard/substation of voltage rating 132kV and above in India within the last 7 years from the tender opening date. Evidence in the form of Purchase Orders and Completion certificate from their clients shall be submitted along with the technical offer.

B. Bidder shall give an undertaking stating that " All Works Related to substation and Liasoning work shall be executed under GETCO approval only"

C. Vendor should have achieved minimum annual average financial turnover of Rs. 5 Crores in last three financial years (2015-16, 16-17 and 17-18). Vendor shall submit the audited balance sheets for all the 3 years.

D. Any vendors against whom action due to non –performance has been initiated by BHEL are not eligible for participation. Such offers will not be considered Submitted for kind approval.

REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER:
TGPBOS0049

RFQ DATE :
04.12.2019

Due Date/Day: 16.12.2019 MON
Time : 13:00 HRS
Tender Box : Reception Area
Opening Venue:
NEW ENGG. BLDG

(address for communication) :

(for all correspondence)
Purchase Executive : TG Pragadeesh
Phone : 080 26998377
Fax :
E-mail: pragadeeshtg@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	PS0679083162 supply of items for 220kv switchyard * HSN/SAC : 9405 Test Certificate All Earthing Materials, Structural Material,control cable, conductor, Insulator,Connectors & clamp. component like Isolator, CT, PT,control & relay paneletc	1	ST	1	24.03.2020
2	PS0679083170 I&C of all items related to 220kv switch * HSN/SAC : 8536 for 75MW Dhuvaran project	1	AU	1	05.05.2020
3	PS0679083189 supply of spare items * HSN/SAC : 9405 Test Certificate SUPPLY OF SPARE FOR 220KV SWITCH-YARD	1	ST	1	24.03.2020
4	PS0679083197 LAYING OF 630SQMM CABLE * HSN/SAC : 8536 LAYING OF 630SQMM CABLE FROM SWITCHYARD TO SOLAR PLANT for 75mw dhuvaran project	1	AU	1	05.05.2020

Total Number of Items - 4

1.
2.

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

NOTES:
1. This RFQ is governed by:
a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OF CONTRACT FOR PURCHASE available at **http://edn.bhel.com (RFQ-PO Terms & Conditions)**
b) Any other specific Terms and Conditions mentioned.
2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same.
* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

TG Pragadeesh
Semiconductors & Pho

Existing switchyard
oping switch
Google
Maxar Technologies Camera : 2

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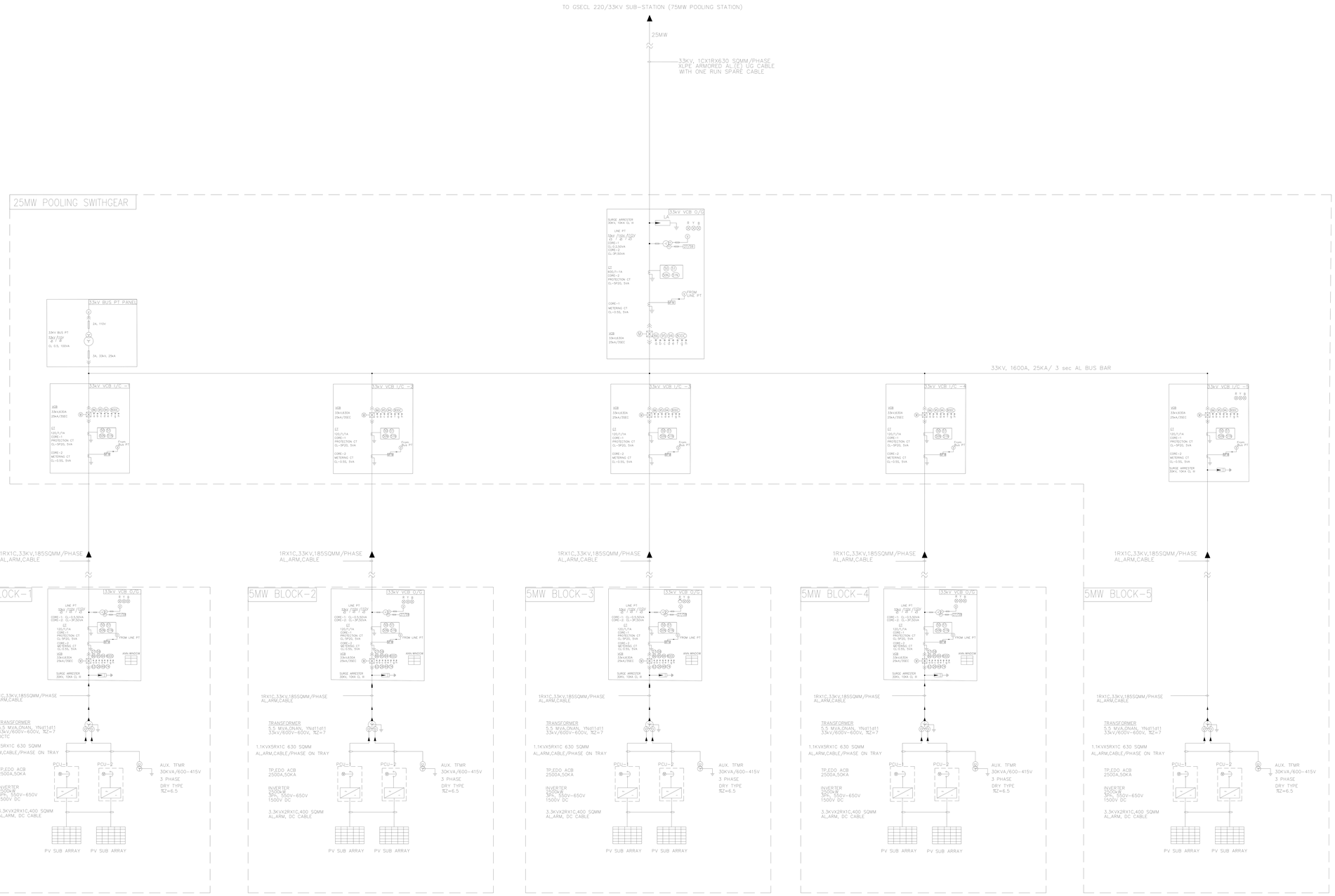


LEGEND DETAILS

SL. NO.	SYMBOL	DESCRIPTION
1		INVERTER TRANSFORMER
2	M	VCB 33kV,630A
3		245 kV SF6 BREAKER
4	86	MASTER TRIP RELAY
5	95 195 295	TRIP CIRCUIT SUPERVISION RELAY
6	94	ANTI PUMPING RELAY
7	63	BUCHHOLZ RELAY
8	26	MAGNETIC OIL LEVEL GAUGE
9	49	WINDING TEMP INDICATOR AND OIL TEMP INDICATOR
10	74	PRESSURE RELIEF DEVICE
11	50	INST OVER CURRENT RELAY
12	51	IDMT OVER CURRENT RELAY
13	50N	NEUTRAL INSTANTANEOUS OVER CURRENT RELAY
14	51N	NEUTRAL IDMT EARTH FAULT RELAY
15	27	UNDER VOLTAGE RELAY
16	59	OVER VOLTAGE RELAY
17	80DC	DC FAILURE INDICATION
18	87	DIFFERENTIAL PROTECTION RELAY
19	30	ANNUNCIATOR RELAY
20	95	TRIP CIRCUIT SUPERVISION RELAY
21	67	AC DIRECTIONAL OVER CURRENT RELAY
22	24	VOLTS PER HERTZ RELAY
23	64R HV	RESTRICTED EARTH FAULT RELAY (HV SIDE)
24	64R LV	RESTRICTED EARTH FAULT RELAY (LV SIDE)
25	50LBB	LOCAL BREAKER BACKUP PROTECTION
26		CURRENT TRANSFORMER
27		FUSE
28	MFM	MULTI FUNCTION METER
29	ABT	ABT TARIFF ENERGY METER
30		POTENTIAL TRANSFORMER
31		LIGHTENING ARRESTER
32		ISOLATOR WITH DOUBLE EARTH SWITCH
33		ISOLATOR WITH SINGLE EARTH SWITCH
34		ISOLATOR WITHOUT EARTH SWITCH
35		INVERTER, 2500kVA, 600V AC, 1500V DC
36		ELECTRICALLY DRAW OUT ACB
37	a	VCB ON
38	b	VCB OFF
39	c	SPRING CHARGE
40	d	AUTO TRIP
41	e	TRIP CIRCUIT HEALTHY
42	f	SERVICE POSITION
43	g	TEST POSITION
44	h	DC FAILURE
44		RYB INDICATION

NOTE:

* THERE WILL BE THREE BLOCKS OF 25MW FOR THE 75 SPV PLANT.
* ALL PCUS, TRANSFORMER, HT PANEL ARE OF OUTDOOR TYPE.

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED
01	8-8-19		02	21-8-19		03	30-10-19							
		AS PER DISCUSSIONS AT VADODARA ON DATED 31-7-19, THE NECESSARY MODIFICATIONS ADDED.			1) BUS PT IS OF DRAW OUT TYPE. 2) RYB INDICATION AT OUTDOER ADDED. AS PER ON CUSTOMER COMMENTS. 3) BUSHING CT PROVIDED FOR 64RHV PROTECTION.			1) DC CABLE VOLTAGE GRADE CHANGED TO 3.3KV FOR 400SQMM CABLE. 2) LT AC CABLE NO OF RUNS CHANGED TO 5 RUNS AND LAYING ON TRAY. 3) HT 33KV CABLE 300SQMM CHANGED TO 185SQMM.						

NAME OF PROJECT: 25MW SOLAR POWER PLANT (DHUVARAN-PHASE2)
NAME OF CUSTOMER: GSECL

BHARAT HEAVY ELECTRICALS LIMITED
ELECTRONICS DIVISION, BANGALORE

	NAME	SIGN.	DATE
DRN	SEEMA		8-8-19
CKD	GLNM		
APPD	MS		

No.OF VAR

DEPT.	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM NO.	No.OF ITEM
SC&PV					
CODE					

TITLE
AC SINGLE LINE DIAGRAM- 75MW

DRAWING NO. 3-SK-GSECL-75-SLD

REV. 03.

SHEET NO. 01 | NO. OF SHEETS : 02

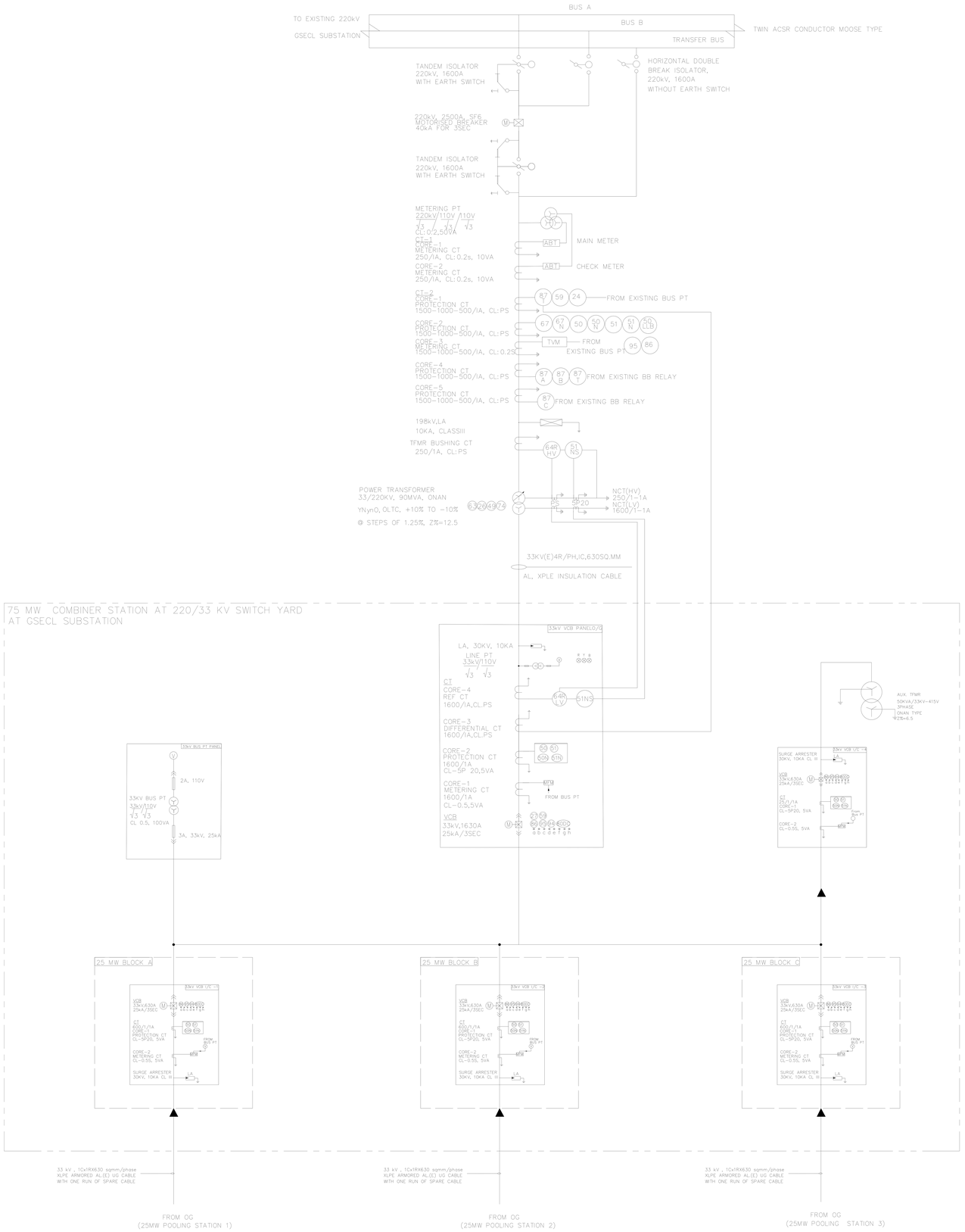
A2 SIZE

FILEREF | REF. DRG.NO. | SIGN. & DATE | INVENTORY NO.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

DRAWING NO



NOTE:
ALL PCUS, TRANSFORMER,
HT PANEL ARE OF OUTDOOR TYPE.

LEGEND DETAILS

SL. NO.	SYMBOL	DESCRIPTION
1		INVERTER TRANSFORMER
2		VCB 33kV,630A
3		245 kV SF6 BREAKER
4	86	MASTER TRIP RELAY
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6	94	ANTI PUMPING RELAY
7	63	BUCHHOLZ RELAY
8	26	MAGNETIC OIL LEVEL GAUGE
9	49	WINDING TEMP INDICATOR AND OIL TEMP INDICATOR
10	74	PRESSURE RELIEF DEVICE
11	50	INST OVER CURRENT RELAY
12	51	IDMT OVER CURRENT RELAY
13	50 N	NEUTRAL INSTANTANEOUS OVER CURRENT RELAY
14	51 N	NEUTRAL IDMT EARTH FAULT RELAY
15	27	UNDER VOLTAGE RELAY
16	59	OVER VOLTAGE RELAY
17	80DC	DC FAILURE INDICATION
18	87	DIFFERENTIAL PROTECTION RELAY
19	30	ANNUNCIATOR RELAY
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23	64R HV	RESTRICTED EARTH FAULT RELAY (HV SIDE)
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28	MFM	MULTI FUNCTION METER
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40	d	AUTO TRIP
41	e	TRIP CIRCUIT HEALTHY
42	f	SERVICE POSITION
43	g	TEST POSITION
44	h	DC FAILURE
44	R Y B	RYB INDICATION

PROJECT : 75 SOLAR POWER PLANT DHUVARAN
CUSTOMER: GSECL

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

	NAME	SIGN.	DATE	No.OF VAR
DRN	SEEMA		8-8-19	
CKD	GLNM			
APPD	MS			

DEPT. SC&PV
CODE
SCALE
WEIGHT(Kg)
REF. TO ASSY. DRG.
ITEM NO.
No.OF ITEM

TITLE
AC SINGLE LINE DIAGRAM- 75MW

DRAWING NO. 3-SK-GSECL-75-SLD
REV. 03
SHEET NO. 01
NO. OF SHEETS.02

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED
01	8-8-19		02	21-8-19		03	30-10-19	

01: AS PER DISCUSSIONS AT VADODARA ON DATED 31-7-19, THE NECESSARY MODIFICATIONS ADDED.

02:
1) BUS PT IS OF DRAW OUT TYPE.
2) RYB INDICATION AT OUTGOER ADDED. AS PER ON CUSTOMER COMMENTS.
3) BUSHING CT PROVIDED FOR 64RHV PROTECTION.

03:
1) DC CABLE VOLTAGE GRADE CHANGED TO 3.3KV FOR 400SQMM CABLE.
2) LT AC CABLE NO OF RUNS CHANGED TO 5 RUNS AND LAYING ON TRAY.
3) HT 33KV CABLE 300SQMM CHANGED TO 185SQMM.

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REF. DRG.NO. REF

SIGN & DATE

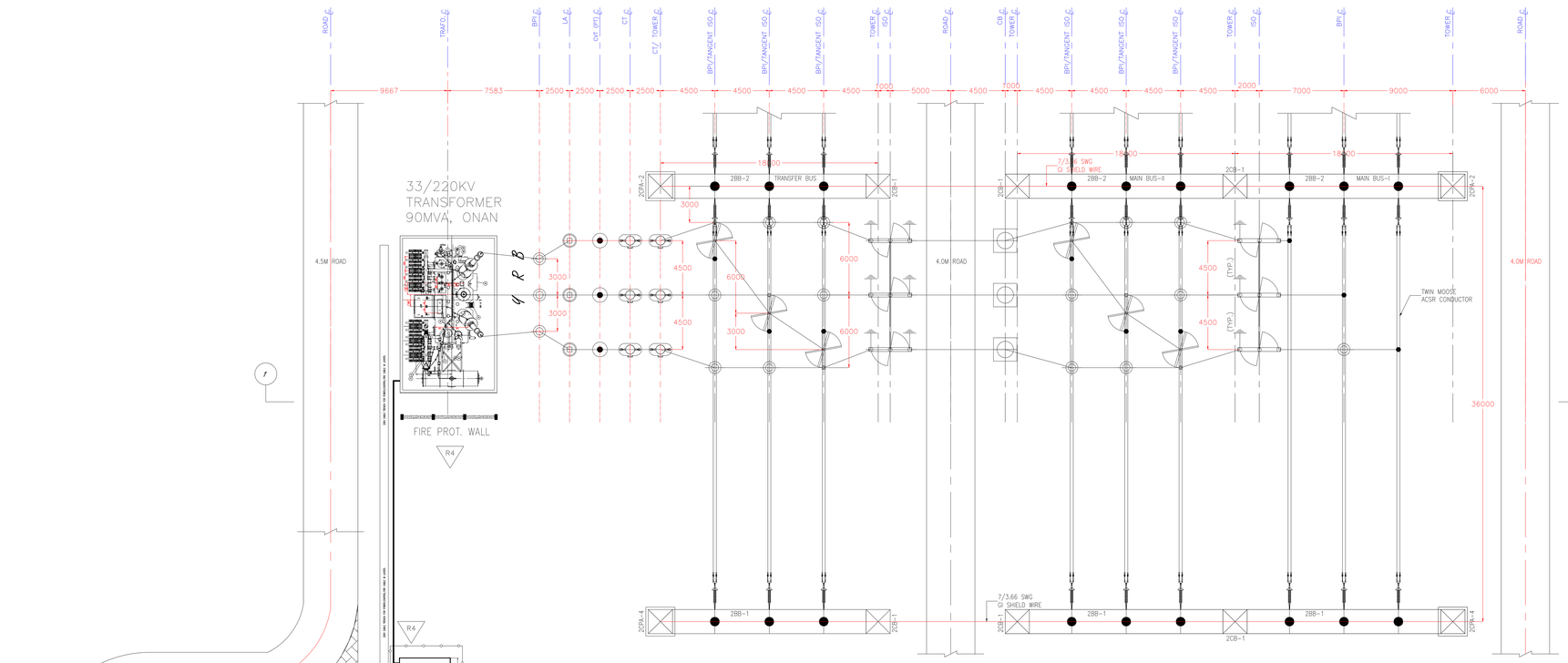
INVENTORY NO.

A1 SIZE

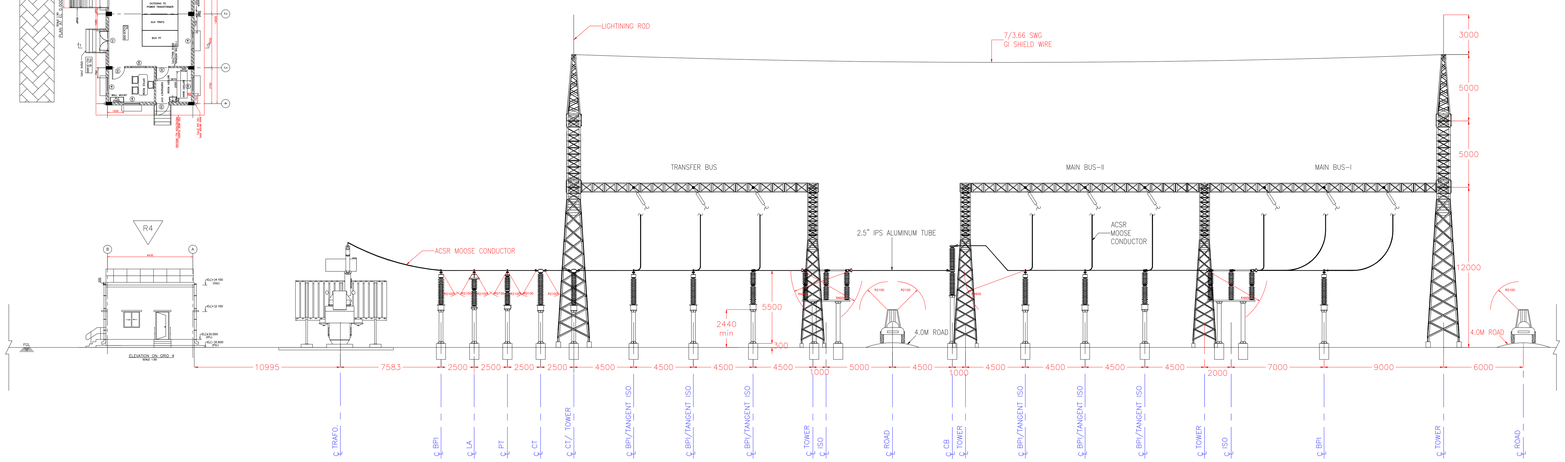
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

DRAWING NO. 3 679 05 00952



220kV SWITCHYARD PLAN VIEW



220kV SWITCHYARD SECTION 1-1

LEGEND

- COLUMN WITH PEAK
- COLUMN WO PEAK
- BEAM
- 220 KV CIRCUIT BREAKER (CB)
- 220 KV CURRENT TRANSFORMER (CT)
- LIGHTNING ARRESTOR (LA)
- POTENTIAL TRANSFORMER (PT)
- BUS POST INSULATOR (BPI)
- HDB ISOLATOR (ISO) WITH SINGLE EARTH SWITCH.
- HDB ISOLATOR (ISO) WITH DOUBLE EARTH SWITCH.
- TANDEM DB ISOLATOR
- 22033KV TRANSFORMER
- BUS TENSION INSULATOR
- EARTH WIRE

NOTES

1. DESIGN VOLTAGE LEVEL
   - a) OPERATING VOLTAGE : NOMINAL — 220 KV RMS
   - b) HIGHEST SYSTEM VOLTAGE — 245 kV RMS
   - c) LIGHTNING IMPULSE VOLTAGE: — 1050 kVp
   - d) POWER FREQUENCY WITHSTAND FOR 1MIN — 460 kV RMS C
   - e) MINIMUM CREEPAGE DISTANCE: — 31mm/kV
   - f) RATED AMBIENT TEMPERATURE: — 50° C
   - g) RATED SHORT CIRCUIT CURRENT — 40 kA 3 secs
2. MINIMUM CLEARANCES
   - a) PHASE TO PHASE CLEARANCE — 2100 mm
   - b) PHASE TO EARTH CLEARANCE — 2100 mm
   - c) SECTIONAL CLEARANCE — 4600 mm
   - d) GROUND CLEARANCE (THE LOWEST LIVE POINT TO FINISHED GRADE) — 5500 mm
3. ALL DIMENSIONS ARE IN MM. DIMENSIONS INDICATED ARE TENTATIVE ONLY.
4. EXTENSION OF MAIN AND TRANSFER BUS IS IN GSECL SCOPE.
5. TRANSFER, MAIN-1 & MAIN-2 BUS CONDUCTOR IS TWIN MOOSE ACSR. FOR CONNECTION BETWEEN EQUIPMENTS 2.5" IPS AL TUBE IS USED. FOR CONNECTION FROM 220kV EQUIPMENT TO BUS ACSR MOOSE CONDUCTOR IS USED.
6. TRANSFORMER IMAGE IS TENTATIVE. ACTUAL WILL BE AS PER TRANSFORMER GA.
7. CORONA EXTINCTION VOLTAGE – 208kV
8. MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5 MHz & 2 MHz AT 320kV rms FOR 400kV SYSTEM & 156kV rms FOR 220kV & 92kV rms FOR 132kV SYSTEM – 1000 MICRO VOLTS
9. BOT & AUX TRANSFORMER SIZE IS KEPT ON HOLD AS PER GSECL INSTRUCTION TILL FURTHER COMMUNICATION

NOTE :

THIS IS AN INDICATIVE DRAWING FOR TENDER PURPOSE ONLY. DIMENSIONS/DESIGN/RATING SHALL BE FINALISED DURING DETAILED ENGINEERING.

PROJECT : 75MW SOLAR POWER PLANT
CUSTOMER : GSECL-DHUVARAN-GUJARAT

REV.	DATE	ALTERED	CHECKED	APPROVED
00		FIRST ISSUE		

	NAME	SIGN	DATE
DRAWN	SAN		251019
CHECKED	GLN		251019
APPROVED	SNB		251019

DISTRIBUTION OF PRINTS

DEPT.	CODE
SC&PV	439

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: 220KV SWITHCHYARD

No. OF SHEETS	01
SHEET No.	01
REV	00

BHEL DRG. No. 3 679 05 00952

A0 SIZE

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Technical specification

for

Design, Supply, Installation and Commissioning
of 220kV switchyards and laying of underground cables
for 75MW (AC) Solar Photovoltaic Grid-connected Power plant
at

DHUVARAN, Gujarat

Revision details :	Prepared by	Approved by	Date

1.0 INTRODUCTION

1.1 Overall project outline of 75MW (AC) solar photovoltaic power plant

Bharat Heavy Electricals Limited (BHEL), Electronics Division, Bangalore is setting up a 75 MW (AC) solar photovoltaic (SPV) power plant for GSECL at Dhuvaran Solar Park, Gujarat.

Solar PV modules employed at the plant generates DC electricity that in turn will be inverted to 3 phase AC in the range 600 - 680V. Output of each solar block (5 MWp) with independent inverter platform / transformer yards will be stepped up to 33kV. Combined AC output at 75 MW pooling station near switchyard is stepped up to 220kV using 90MVA power transformer. At these outgoer level, there is one outdoor switchyard bay with necessary gantries / towers / beams / Cables to facilitate 220kV transmission at GSECL substation.

Power generated at the above SPV plant shall be transported to GSECL substation using 33kV underground cables from solar plant. Distance between SPV plant and substation is 3500m approximately. At substation, one outdoor switchyard bay exclusive for this plant shall be constructed with necessary equipments to facilitate 220 KV transmission.

1.2 Brief outline of vendor scope

Vendor scope includes activities but not limited to design, engineering, drafting of drawings, obtaining approval from BHEL/GSECL/GETCO/CEIG /CEA/GEDA whichever is applicable for the drawings, manufacture/ testing/ inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery to site, unloading, storage, civil activities (foundations for electrical equipment, Transformer foundation, switchyard structures, NIFPS system, Oil pit for transformer etc.), erection of switchyard structures/equipment, coordination / liaison with concerned state / central authorities such as GETCO/ CEIG/CEA/GSECL/GEDA etc. for the following activities of the project:

(1) 33kV/220kV switchyard at GSECL substation consisting of 1 no of 220kV bay with all equipments viz CTs, CVTs(PTs), SF6 Breaker, Isolators (with & without earth switch), metering panel, Lightning Arrestor etc including erection and commissioning of 90MVA, 33/220kV power transformer along with NIFPS system.

(2) This 33/220 KV switchyard will be replica of existing 33/220 KV switchyard adjacent to site. In view of this, vendor shall visit the Switchyard site at Dhuvaran and obtain all necessary details from site before they participate in tender.

(3) Construction of one number of 220 KV structure with foundation at southern side low level area for hooking up to Bus 1 of 220 KV line "R' phase.

(4) Laying of 33kV, 1C,630 SQMM cable in underground between SPV power plant 25 MW pooling stations of 3 numbers till 75 MW pooling station located near 220 KV Substation and extend further to 33 KV side of Power transformer at 220 KV substation in RCC cable trench. The cable shall be laid as per BHEL/GSECL approved drawings.

(5) Obtaining statutory clearance from the relevant agencies (GETCO, GEDA, CEA, CEIG, GUVNL, SLDC etc whichever applicable) required **for Charging 33/220 KV substation and**

charging / commissioning of 75 MW Solar plant as well in vendor scope.

(6) Vendor shall be GETCO approved vendor or the sub-contractor hired shall be GETCO approved in case the Vendor is not GETCO approved for developing of Switchyard.

The vendor shall have design capability for substation / switchyard / transmission line. In case they do not have design/drafting capability, after receiving purchase order from BHEL, the vendor shall tie up with competent design consultants in which case vendor shall submit the credentials of the proposed consultants to BHEL for approval by BHEL/GSECL/GETCO. Vendor shall award the work on the GETCO approved Vendors only after approval by BHEL. All drawings/ design documents shall be originated by the consultants, endorsed by the vendor clearly stating the name of the project, names of clients (BHEL/GSECL), drawing/document number, revision number, number of sheets etc. Details of drawings/ design documents to be submitted are brought out under section 5.0 of this specification.

All civil related works shall be tested as per BHEL/GSECL/GETCO approved FQP that will be issued during course of project execution. All third party testing shall be carried out only at NABL accredited laboratories (or) Government laboratories.

Note: The above is only a broad outline of vendor scope for the sake of introduction. The detailed vendor scope is listed under sections 3.0 and 5.0 and elaborated in various other sections of this specification.

1.3 Location/ address of power plant:

75MW (AC) Solar Photovoltaic Power Plant
Gujarat,
Village: Dhuvaran, Taluka: Khambhat,
District: Ananda, Gujarat

1.4 Enclosures to this specification

(a) Tentative AC SLD of the overall 75 MW SPV plant.
(b) Indicative location of the 220kV Switchyard google view.
(c) Tentative 220 KV Switchyard drawing.

1.5 Other indicative details to the bidders for tender purpose:

(a) Distance between end of 75MW solar plant and 220kV switchyard at GSECL substation: 3500m approx.
(b) At GSECL substation side, AC/DC aux supplies for ABT metering panel and 220kV switchyard equipments in vendor scope shall be taken from the ACDB panel located at 75 MW pooling station which is 25 meters away from Switchyard.
(c) Vendor shall visit project site prior to submission of bids so as to make a clear assessment of site conditions such as:
(1) land terrain,
(2) Nature of soil,
(3) Arrangement of existing bus at GETCO substation to which the feeder extension bay will be hooked up

(4) Other details like location of extension bay and the C&R Panel Room/Main Substation Control Room for the purpose of power supply / control cabling works.
(5) Details of Earth mat extension and cable trenching and laying works
(6) Cable Routing for 33kV Underground Cable from Plant to GSECL substation.

BIDDER SHALL EMPLOY MINIMUM 65% of the jobs that will be created due to the projected in the supervisory and managerial
cadres and 80% of the jobs that will be created in other cadres due to the project shall be filled in by employing the local persons. The expression "local person" shall mean a person domicile in Gujarat state for a minimum period of 15 years prior to applying for employment to the

2.0 LIST OF ITEMS TO BE SUPPLIED BY VENDOR:

#	Deliverables	Qty
2.1	**Supply of all electrical equipment and other materials of 220kV switchyard at GSECL SUBSTATION:** such as CTs, CVTs (PTs), surge arrestors / lightning arrestors, Bus post insulators/ Bus Tension Insulators / Bushings, HDB / Tandem Isolators / dis-connectors, Earth switches, Motors & related controls for isolators/dis-connectors / earth switches, SF6 circuit breakers, ACSR conductors, Electrical cables & cable trays, Marshalling boxes / panels / distribution boards, ABT Metering Panel with Main & Check Meters, Control panel and Relay panel with BCPU, SCADA connectivity from switchyard equipment, RTU Panel for SLDC connectivity, Earth wire, Earth mat items (rods/risers etc.), Earth strips/ electrodes, stone jelly etc together with all related accessories (disc insulators, clamps, connectors/ bimetallic where required, cable glands/lugs/ties etc.) and complete set of hardware required to meet the electrical requirements of the switchyard , also all the related items required to hook up to the existing bay of GSECL substation, communication system as per GSECL/GETCO requirement, integration of new feeder bays with existing SCADA system at GSECL substation with all required equipment like Ethernet fiber switch, kiosk, LIU etc. as per GSECL requirement. There are three overhead 220 KV bus namely Bus 1, Bus 2 and Transfer bus. The output power of solar plant shall be hooked to these buses.	1 Set
2.2	**Supply of structural items of 220kV switchyards:** for mounting the electrical equipment together with all related accessories and complete set of hardware required to meet the structural support requirements of the switchyards.	1 Set
2.4	**Supply of 33kV cable accessories like termination kits, straight through jointing kits etc**. Detailed scope as per section 4.0 of this spec.	1 set
2.5	**Supply of spare items for 220 kV switchyards:** Following spares shall be supplied along with main equipment: Sl.No | Item Description | Quantity 1 | Surge arrester for 220 KV | 1 No. 2 | Disc Insulators string 220 kV (Each type) | 2 Sets 3 | Conductor of each type | 50 Meter	1 set

4	Stringing hardware	01 Set
5	Terminal Connectors on high voltage conductors and equipment each type	01 Set
6	Complete drive mechanism including motor for dis-connector switches	01 No.
7	Trip coils for circuit breakers	01 No.
8	Closing coils for circuit breakers	01 No.
10	220kV Current transformer of each rating	01 No.
11	220kV Voltage transformer of each rating	1 No.
12	220kV Post insulator	01 Set
13	220kV Isolator contacts set (Male+ Female)	01 Set
14	Maintenance earthing rod for 220kV	01 Set
15	Breaker operating mechanism	01 Set
16	SF6 bottle (To fill SF6 in one complete Circuit breaker)	01 No.
17	Contactors of each type and rating used in circuit breaker and isolator control cubicle / Mechanism box	01 set.
18	Limit switch for the isolator	01 set.
19	220kV Earth switch contact assy.	01 Set (For three pole)
20	Spring charge motor of SF6 breaker	1 No
21	MCBs, fuses (each type)	5% of total population
22	Termination kit for 33KV, 1C, 630 SQMM cable	5 Nos
23	Straight through joint kit for 33KV, 1C, 630 SQMM cable	3 Nos

2.6	**Installation of 220kV Switch Yard :** Vendor shall install supplied electrical equipment's and steel structures after land levelling / grading if required, civil foundations for all structures to mount electrical equipment's, cable trenches, mounting of cable trays and laying of cables, cable terminations / interconnections, installation of earthing electrodes, construction of earthing chambers with lids, earthing terminations extension of earth grid to existing earth mat of GSECL substation, stone jelly spreading, together with all related activities, civil foundations/ cable trenches etc., marking of all electrical equipment / cables, installation of sign / danger boards etc. and hooking up the switchyard to the existing bus (A, B & Transfer bus) at GSECL substation. Scope shall also include installation of (vendor-supplied) outdoor weather proof ABT metering panel (GETCO approved) in the switchyard nearest to the Metering CT/PTs, including & all related electrical works such as cable trenching, laying, terminations, interconnections (including aux AC/DC supply & distribution boards as required for Metering Panels and other equipment), and earthing connections. Detailed scope as per section 4.0 of this spec.	1 AU
2.7	**Installation of underground 33kV cable from 75MW SPV Plant end to Switchyard at 220kV GSECL substation**. Detailed scope as per section 4.0 of this spec.	1 AU
2.8	**Pre-commissioning inspections: All** checks / tests on 220kV switchyard equipment's / transmission line / C&R panel / ABT metering panel etc and coordination / liaison activities with related state / central departments / GETCO/GUVNL/CEIG/GEDA/SLDC etc as applicable for necessary approvals/ clearances for drawings/ documents/ inspection at equipment manufacturers' works and at site by GETCO/ CEIG / GEDA /CEA and also for plant commissioning activities viz line-charging/ grid synchronization. Detailed scope as per section 4.0 of this spec.	1 AU

Note 1: Final scope of supply and installation works for the feeder bay at GSECL substation and the laying and termination of 33kV underground cable shall be as per GETCO requirement.

Note 2: There are no separate charges for design/ drafting of engineering documents viz drawings/ schemes/ layouts/ calculations etc. and consultancy, as these charges shall be deemed to be absorbed in the above line items.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER

a) List of installations of substations / switchyards of 220kV and above in past three years from date of tender opening shall be submitted with details viz client name, project name, rating of installation, scope of supply, scope of installation and year of installation along with Purchase Orders/Completion Certificate.
b) Vendor company profile and brochure
c) Statement expressing compliance to this BHEL specification (NIL deviation statement).
d) List of spares offered (with quantity) and without prices.

4.0 DETAILED SCOPE OF BHEL AND VENDOR

4.1 220kV switchyard at GSECL SUBSTATION

All 220kV Equipment Ratings shall be as per attached Single Line Diagram switchyard Drawing.
This switchyard is located at GSECL SUBSTATION and this Sub-station shall be replica of the existing sub-station next to switchyard site. The overall size and **layout of switchyard with 1 bay shall be proposed by the vendor** (for approval by BHEL/GSECL) based on the space required to accommodate the electrical equipment (including the 90 MVA power transformer and 50 kVA auxiliary transformer that are in BHEL scope of supply, Foundations for 90 MVA transformer, earth mat grid, earth chambers, various marshalling boxes etc. duly considering the spacing / clearances between the various electrical equipment as per relevant standards and Indian electricity rules (1956), CBIP, state electricity board / GETCO/ DISCOM/ CEIG regulations/any other statutory directives etc.

Accordingly, the respective scopes of BHEL and the vendor are listed as below, whereas detailed specifications are provided in other sections of this specification.

4.1.1 BHEL scope

4.1	Scope description	Quantity
1	Supply of oil-filled, 90MVA, 33/220kV transformer along with RTCC panel and NIFPS system.	1 No
2	Supply of 33kV cables for Laying from Solar Plant to 220kV Switchyard at GSECL SUBSTAION located 3.5 KMs away from Solar plant.	1 No
3	Supply of 50 KVA aux .Transformer, Foundation for Transformer, laying and termination of LT (433V side) and HT side (33KV) cables for the aux transformer.	1 set
4	Construction of 75 MW pooling station, supply, Installation & commissioning of all electrical equipments viz HT panels, ACDB, Battery charger(FCBC), Battery bank, DCDB, at GSECL SUBSTATION Near to 220Kv Switchyard.	1 set

4.1.2 Vendor scope

(a) Supply, Unloading including BHEL supplied items for switchyard, installation, testing and commissioning as per relevant standards, Indian electricity rules (1956), CBIP, State electricity board / GETCO/ DISCOM/ CEIG regulations/ GERC/Electricity Act-2003 etc. shall be approved by BHEL/GSECL.

1	Design calculations for equipment mounting structure, earth mat grid for 220kV switchyard in Designated place at GSECL SUB STATION.

2	Unloading, Installation, testing and commissioning of 90MVA, 33/220 kV, YNyn0 Power transformer along with RTCC panel, NIFPS system of BHEL scope supply.
3	Supply and installation of 1 No. of Control panel and 1 NO of Relay panel along with the other numerical relays and other components as required as per SLD. **Note: Control panel & Relay panel of one each shall be installed inside the existing GSECL Control room which is of 1 KM away. The supply of Control panel & Relay panel is in Vendors scope & not in BHEL scope.**
4	Supply, installation and commissioning of following outdoor switchyard items including mechanical operations (bolting, bending, welding etc.), electrical cabling, ACSR conductor terminations, terminations at marshalling boxes for CT/ CVT (PT) / bay marshalling kiosks, other related panels/ distribution boards and hardware, earthing connections etc. (a) 198kV (System voltage 245kV), 10kA nominal discharge current, class-3 gapless metal oxide surge arrestor (LA) – 6 Nos (inclusive of 3 Nos spare) (b) 245kV CVT (PT) (2-core) – 3 Nos (220kV/110V-110V), CL:0.2, 50 VA for metering. (c) 245kV CT (2-core) – 3 Nos (Metering PT) with 250 / 1-1 A, 10 VA, 0.2 S class. (d) 245kV CT (5-core) – 3 Nos No's (1500-1000-500/1-1-1-1-1A) for – 1 core for Metering with 0.2S class, 4 cores with PS class protection. (e) 245kV 1600A Tandem Isolator, horizontal central break, triple pole, with Single earth switch, motor operated (locally) – 1 set (f) 245kV 1600A Tandem Isolator, horizontal central break, triple pole, with Double earth switch, motor operated (locally) – 1 set (g) 245kV 1600A Tandem DB Isolator, horizontal Double break, triple pole, without earth switch, motor operated (locally) – 2 sets (h) 245kV SF6 Motorized breaker with local/remote operation – 1 set (i) Bus post Insulator (BPI) and Bus Tension Insulator as per site requirement. (j) Twin moose ACSR conductor for connecting to Bus 1,2 & Transfer bus and normal ACSR conductor for connecting of LA, CT & Pts etc. (k) Control panel, Relay panel shall be supplied, erected at Main control room located at 1 KM approx. away from switchyard, and commissioning. (l) Auxiliaries system such as Illumination system. (m) Special maintenance tools and tackles. (n) Power, control & special cables, earthing & lighting protection system etc. (o) GI structures with all necessary hardware for mounting the above electrical equipment's. (p) Disc insulators (suspension/ tension) along with other accessories such as clamps, hardware etc. – quantity as required. (q) ACSR conductor with related accessories for termination such as connectors/ bimetallic where required, clamps, hardware etc. – quantity as required.

	(r) Marshalling boxes for CTs/PTs – quantity as required (s) Bay marshalling kiosks – quantity as required (t) Motors and motor control boxes for GOS isolators/ earth switches (u) LT aux power supply and control cables (v) Cable trays for laying of cables in cable trenches (w) Underground earth mat grid items comprising of risers, electrodes, earth rods etc (x) GI earth strips for earthing of structures, electrical equipment's, panels/ DBs/ marshalling boxes etc. (y) Earth pits / chambers with lids. **Note:** LA shall have separate earthing. *(z)* Any other items considered essential to meet the functional / operational requirements of the 220kV switchyard as per relevant standards or Indian Electricity rules (1956), CBIP, state electricity board/ GETCO/ DISCOM/ CEIG/ any other statutory requirements etc.
5	Supply and construction of fencing and gate for 220 kV switchyard at GSECL SUB STATION as per approved Drawing..
6	Supply, erection & commissioning of LED Lights along with poles for 220 kV switchyard at GSECL SUB STATION as per approved Drawing..
7	Supply and installation of 1 No. ABT metering panel meter at GSECL substation 220kV Switchyard consisting of two ABT meters (main, check), together with necessary ACDB/DCDB boards to provide aux AC/DC supply to the panels. Note: Outdoor ABT metering panel in weatherproof MMB/SMC box shall be installed nearest to the metering CT/PTs. ABT Meters & Metering panel shall be as per GETCO requirement. ABT meters shall be procured as per GETCO approved make.
8	Construction of cable trenches of precast section/brickwork with RCC lids, GI cable trays etc. and laying of HT/ LT/ control cables from "220kV switchyard equipment's / marshalling boxes/ kiosks/ 33kV & 33kV side Neutral CTs/ 90MVA, 33/220kV transformer / Transformer NIFPS system etc." to "C&R panels/ ACDB/DCDB boards in control room" at 1 KM away as per relevant standards. Supply of all items necessary for this civil activity shall be in vendor scope.
9	Other switchyard related activities such as (a) supply and laying of stone jelly of appropriate size to a layer thickness of 100 mm minimum (b) marking / installation of all the switchyard equipment's and earthing locations, (c) all relevant danger and sign boards, (d) painting of steel structures etc. for protection against erosions and corrosions.
10	**Civil works:** All civil works required for 220 KV switchyard is in vendor's scope. Civi work details as follows: A) Construction of foundations for mounting of Transformer, NIFPS panel, LA, CT, PT, Breaker, Isolator, BPI etc. Separate one foundation is required at low level area on southern side of switchyard for hooking up of one phase to the 220 KV bus. B) Construction of Oil pit for Transformer and NIFPS system is in vendor's scope.

11	Communication System as per GETCO requirement: Communication system between the Plant/Substation & GETCO, SLDC as per the requirements of GETCO / R&C / SLDC department shall be in the scope of the GETCO licensed contractor including hardware and software required for establishing the communication link.
12	Fire protection and fire-fighting equipment and other safety equipment for protection of the entire 220kV switchyard as per CEIG requirements

Equipment description	Quantity Nos
CO2 type fire extinguishers	As required
Foam type fire extinguishers	As required
Dry chemical power type extinguishers	As required
Sand buckets: The bucket should be wall-mounted /stand made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546. Note: Quantities shall be decided as per site and CEIG norms.	As required

13	Sign boards, danger boards with inscriptions in three languages, Gujarati, Hindi and English as per Customer requirements.
14	Supply shall be as per final approved technical specifications / datasheets/drawings as approved by GSECL / GETCO.

(b) Design, drawings, guaranteed technical particulars, quality plan, manuals for 220kV switchyard.

Vendor shall submit the following documents for BHEL/GSECL for approval within 7 days after receipt of purchase order or at every stage of project implementation as applicable and as mutually agreed with BHEL/GSECL.

1	Design calculations, as per relevant standards, together with drawings, layout and bill of materials shall be submitted for underground earth mat grid required for earthing of 220kV switchyard equipments for BHEL/GSECL approval. Vendor shall also obtain approval from concerned state / central approval agency such as GETCO/ DISCOM/ CEIG etc. as applicable before commencement of supplies and works.
2	Layout drawing of the complete 220kV switchyard, showing locations of various electrical equipment (including transformers), earth chambers, earthing of all structures cable trenches, marshalling boxes, other panels (if any), chain link fencing, stone jelly, steel gates etc.
3	Cross section diagram of 220kV switchyard, showing the overall dimensions (such as height, width, clearances etc.) of various electrical equipment mounted on the structures, gantries / beams etc.
4	The switchyard shall be suitable for outdoor application having saline atmosphere and shall have tropical and fungicidal treatment.
5	Detailed bill of materials of 220kV switchyard, with item description, rating, make, model number, item quantity shall be submitted.
6	The stringing Conductor tensions shall be 2000 Kgs per conductor. All tension

	insulator strings shall have double tension string arrangement.
7	Manufacturing quality plan with routine/ type / acceptance tests, sampling plan, applicable test standards shall be submitted for BHEL/GSECL approval for all the vendor-supplied items including but not limited to 220kV switchyard equipment's (SF6 breaker, CTs, PTs, GOS isolators, Earth switches, BPI etc.), Control panel, Relay panel, marshalling boxes of individual electrical equipment, bay marshalling kiosks, other panels (if any applicable), HT/LT/ control cables, ACSR conductors, steel structures, cable trays, towers, gantries, beams, motors & motor control boxes/panels and all related accessories such as insulators of all types, clamps, connectors etc.
8	The 220kV switchyard shall be designed for a short circuit current of 40kA for 3 Seconds. The dynamic rating of switchyard shall be 100kA.
9	All structural steel and steel components in the switchyard equipment shall be hot dip galvanized.
10	Switchyard insulators shall be suitable for hot line washing.
11	The complete 220kV switchyard shall be controlled through SCADA as well as Control panels from the main plant unit control room located at 1 KM away.
12	The switchyard main buses, transfer Bus & other bay buses shall be designed for continuous rating of 1250A minimum.
13	The conductor size of tubular bus and stranded conductors shall also be sized considering short circuit conditions, corona / voltage gradient and effect of solar radiation.
14	The final temperature of the conductor when carrying full load current shall not exceed 85°C considering maximum design ambient temperature.
15	Complete Switchyard shall be designed to withstand the Seismic acceleration as per relevant IS.
16	Submission of Guaranteed technical particulars, datasheets, GA drawings, O&M manuals of all the electrical equipment's/panels/boxes, structures, towers, beams, cables, cable trays, other accessories such as insulators of all types, clamps, connectors etc.
17	The following design calculations shall be provided for BHEL for review during detailed engineering of the switchyard. • Sag tension calculation • Earthing calculation • Lightning protection system calculation • SC forces for sizing conductor • Bus bar sizing calculation • Short circuit forces on support insulators • Design calculation for spacer Span • CTs, PTs, CVTs & EMVTs burden calculation • Relays settings calculations 220V DC & 110V DC Battery sizing calculation supported with DBR.

4.3 33kV Underground Cable from SPV power plant to GSECL substation

Distance: 3500m approx. The exact distance and cable route map will be provided during switchyard work commencement.

4.3.1 BHEL scope

#	Scope description
1	Supply of 1C x 630 sq.mm. 33kV AL, Armoured Cable

4.3.2 Vendor scope

(a) Installation, testing and commissioning as per relevant standards, Indian electricity rules (1956), CBIP, GETCO/ DISCOM/ CEIG/GEDA regulations etc. and as shall be approved by BHEL/GSECL/GETCO

1	Supply 33 KV termination kits, straight through cable jointing kits, Cable clamps & spacers of 45 CM and other cable accessories and hardware required for laying and termination of cable at SPV Plant end and GSECL substation end. HT termination shall be carried by **HT termination certified person** only. He should produce certificate at site while work being carried.
2	Laying and Installation works for 33kV Grade, XLPE, 1Cx630 sq.mm, AL, Armoured, earthed, Underground Cable, 3 + 1 run spare from 3 Nos of 25 MW pooling station till 220 KV sub-station as per relevant standards, along with termination kits, straight through cable jointing kit and other cable accessories and hardware required for laying and termination of cable at SPV Plant end and GSECL substation end. Installation of underground 33kV cable from 75MW SPV Plant end to Switchyard at 220kV GSECL substation. The cable shall be laid from outgoer breaker of 25 MW pooling stations (two pooling stations at 220 Acres plot & one pooling station at 74 acre plot). Cable shall be laid as per IS standards and cable trench drawing approved by GSECL/BHEL. All civil works for digging from solar plant till sub-station , laying of cables, closing of cable trench as per approved drawing, installation of cable route marker for every 50 meters is in vendor's scope.As per design of cable, minimum space of 45 cms shall be maintained for each cable. In view of this, cable clamps with 45 CM spacers shall be provided for every 20 meters so that cables will not touch each other. Along with this cable, one spare cable also shall be laid from the farthest 25 MW pooling station located at 220 acres plot. Cable shall be laid by maintaining 45 CMs distance apart (cable touching not allowed) by providing clamps and spacers between R, Y, B and one spare cable at every 20 Mtrs apart. I. Cable installation shall be carried out generally as per applicable standard/ manufacturer guidelines under BHEL/GSECL supervision. Cable shall be laid in such a way that minimum 45 cms distance between the cables by providing suitable clams & Spacers and buried. All necessary work like cable tagging, marking, dressing etc. as required shall be in contractor's scope. II. All Hume pipes, precast RCC slabs, trefoil clamps, spacers, cable route markers etc required for cable laying shall be in vendor's scope of supply. III. All road crossing of cable shall be done through Hume pipes as per GSECL approved

	grade. IV. The cable termination and jointing work shall be carried out by an experienced cable jointer who shall have adequate experience in jointing and termination of 33kV or higher grade XLPE cables. The successful bidder shall submit, sufficiently in advance, the bio-data of the cable jointer giving the details of his qualification and experience for employer's approval. V. The above activities are indicative and all works shall be done as per GSECL/BHEL requirements. Cable identification markers shall be supplied & installed at every 50 Meters apart from Solar plant till Sub-station. Technical specifications of the items for completion of the cable laying works shall be as per relevant standards and as per GSECL requirements.
3	During the execution of the cable laying, statutory permissions, if any, required from GSECL shall be obtained.

(b) Design, drawings, guaranteed technical particulars, quality plan, manuals

Vendor shall submit the following documents for BHEL/GSECL/GETCO approval within 7 days after receipt of purchase order or at every stage of project execution as applicable and as mutually agreed with BHEL/GSECL/GETCO.

1	Design calculations as per relevant standards, results, together with GA drawings and bill of materials shall be submitted for the cable accessories. BoM shall include all with item-wise particulars such as item description, quantity, rating, type, make etc for GETCO approval.
2	Guaranteed technical particulars, datasheets, GA drawings, O&M manuals
3	Test reports of all the supply items – type / routine / acceptance test reports as per manufacturing quality plan approved by GETCO.
4	Inspection call to GETCO and GSECL for witness of all tests as per approved MQP.
5	Pre-dispatch clearance shall be obtained from GETCO / BHEL/GSECL
6	Tests as required at site for the underground cable works shall be offered for witness by GSECL / BHEL.

4.4 General conditions applicable during supply, installation and commissioning phase

1	Vendor shall arrange for safe storage of all the vendor/BHEL supplied materials. For this purpose, vendor shall construct appropriate storage shed with gates, locks and keys. Security watch and ward shall be deployed round the clock. Insurance of the vendor-supplied items shall be in vendor scope until the end of trial run following the commissioning of the power plant.

2	Vendor shall organize power supply on their own. Accordingly, DG sets of suitable capacity shall be deployed by the vendor for construction works.
3	Similarly, water required for construction works shall be organized by vendor.
4	All machinery such as cranes, hydra, JCBs, forklifts, transport trucks, trolleys etc necessary for movement and installation of materials / panels / equipment etc shall be organized by the vendor.
5	All necessary tools and tackles such as crimping tool, screw driver set, power screw drivers, cutting pliers, nose pliers, spanner sets, adjustable spanners, hole saw cutter set, bending tools, torque wrenches, hack saw blades, pipe wrenches, flat / round files, HV termination tools, drilling machines, welding machines, concrete mixers, steel bar bending tools / templates for RCC works, spade, shovel, hammer etc shall be organized by the vendor.
6	All necessary measuring instruments such as digital multimeter, electrical testers, digital meggers (1kV, 2.5kV, 5kV) with feature to display, earth resistance meters, weighing machines, water level indicators etc shall be organized by the vendor.
7	Vendor shall make their own arrangements for necessary food, drinking water and accommodation for their labour and employees posted at the site. Similarly, food and drinking water required at the site, during the construction operations, shall also be in scope of vendor.
8	Vendor shall organize all necessary steps to meet statutory requirements such as labour license, PF, ESI etc and also ensure compliance with relevant acts such as minimum wages act, income tax act, employee insurance act etc for their labour deployed at site.
9	Vendor shall maintain updated labour register, with name, age, qualification, salary, attendance details etc at the site.
10	Vendor shall use danger boards, appropriate warning/sign boards, wherever required, to ensure safety of the persons during the work at site.
11	Vendor shall adhere to all necessary safety norms such as use of helmet, goggles, hand gloves, gumboots, aprons etc. It is the ultimate responsibility of the vendor in all respect to prevent accidents at the site and safeguard their labour from accidents.
12	Vendor shall, at the completion of every work, clear off the debris, which resulted out of the work. In case of excavation work such as cable trench etc, vendor shall finish the land neatly with necessary leveling, rolling etc.
13	Vendor shall carry out the work without causing inconvenience to other contractors of BHEL at site. In case of conflicts with other contractors, it is the responsibility of the vendor to ensure that the matter is resolved at once amicably so that the progress of work is not affected.
14	Any damages on the building, structures etc attributable to the acts of labour / employees of vendor shall be rectified and made good by the vendor at their own cost.
15	No child labour shall be employed for execution of the present contract.
16	Any miscellaneous materials, which are found essential for technical completion of the contract but not mentioned explicitly in this specification, shall be deemed to be included in the specification. Accordingly, such materials shall be included by the vendor as part of the offer.
17	BHEL/GSECL shall witness routine/ acceptance/ type tests performed at manufacturer works for the items supplied by vendor. Vendor shall accordingly provide inspection call to BHEL with submission of internal test results in advance.

	For the items bought out from dealers, test certificates, as per relevant IS / IEC standards, as issued by manufacturer shall be submitted to BHEL. However, prior approval shall be obtained from BHEL/GSECL for procurement of the item from dealers.
18	Field Quality Plan / Quality control system Vendor shall set up a field quality control laboratory with full set up to facilitate testing of all civil construction materials in accordance with FQP (Field quality control plan) that shall be submitted to BHEL for approval by BHEL/GSECL. Similarly, FQP for electrical works in respect of switchyards / transmission tower line shall also be submitted to BHEL. Vendor shall deploy a well experienced quality control engineer to monitor all QC activities at site as per approved FQP. Specifically, with reference to civil works, vendor shall submit all concrete mix designs and bituminous mix designs for BHEL/GSECL approval before starting of work. All the third party testing should be conducted in laboratories approved by BHEL/GSECL for which relevant details shall be submitted to BHEL prior to taking up work with the laboratory.
19	Any deviations shall be discussed with BHEL/GSECL site engineers and implementation shall be taken up only after approval from BHEL/GSECL.
20	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL on the progress of the contract.

5.0 SWITCHYARD ELECTRICAL

5.1 SCOPE AND GENERAL INFORMATION The intent of this specification for various electrical equipment's shall cover the following scope:

1. The contractor shall construct and commission 33KV/220KV transformer bay along with adequate rated (with 10% design margin) power transformer, associated systems, equipment, control panel, earthing and lightning protection, SCADA, etc. in existing 220 KV switchyard at Dhuvaran.

2. Contractor shall integrate/hook up/connect the 33/220KV transformer bay with extended 220KV bus bar in the existing 220 KV switchyard. The existing switchyard having three (2 main bus+1transfer bus) bus for power evacuation.

3. This specification covers the design, manufacture, supply, erection, testing and commissioning of 220 kV transformer bay and its all associated accessories & system.

4. It is not the intent to specify completely herein all details of the equipment, nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship. Should the bidder wish to deviate from this specification in any way, he shall draw specific attention to such deviation by listing the deviations in the deviation schedule without which his offer will be considered in conformity with the specification in all respects.

5. The basic design shall include, but not limited to, the following:

a) Development of general arrangement of switchyard.
b) Development of detailed layout (plan & section/elevation) drawings.

c) Development of single line diagram with parameters of equipment and details of Protection.
d) Protection and control philosophy and selection of protection, control and annunciation schemes.
e) Development of interlocking schemes.
f) Development of switchyard structure loading details.
g) Insulation coordination of the EHV equipment.
h) Calculation of static and dynamic force load, and selection of spacer spans and equipment terminal loading.
i) Development of clearance diagrams.
j) Lighting design, Lux level calculation and conduit wiring diagram.
k) Development of power & control cable laying and termination schedules.
l) Development of erection key diagram with bill of material.
m) Foundation design and construction drawings.
n) Development of cable trench layout and sections and construction drawings.
o) Contractor shall furnish detailed drawings for the various equipment's covered in their scope for BHEL approval. The equipment shall conform to type tests as per specification and applicable standards, and reports of the same shall be furnished for approval.
p) Contractor shall furnish the schematics, general arrangement drawings, cable schedules, interconnection schedules, panel wiring diagrams, etc. for various control and relay panels for BHEL approval. Contractor shall also furnish the recommended relay settings to be adopted.
q) The Contractor shall note that the list of standards specified elsewhere in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specification, IS & IEC. In case governing standards for the equipment is different from IS or IEC, the salient points shall be clearly brought out along with English language version of the same.
r) Exposed live parts shall be placed high enough above ground to meet the requirements of Indian Electricity Rules and other statutory codes. All responsibilities regarding co-ordination with Electrical Inspection Agencies and obtaining clearance certificate from them rests with the Contractor. The necessary fees for such clearances shall be borne by BHEL.
s) All equipment shall be supplied with suitable terminal connectors. The terminal connector shall be well coordinated with the rating/type/size of equipment to be connected. The conductor terminations for equipment shall be either rigid or expansion type suitable for 3"IPS tube or horizontal or vertical take-off suitable for single ASCR conductor. The type of terminal clamps would be finalized by the Contractor in consultation with BHEL based on layout requirement. The terminal pads shall preferably be capable of taking the required conductor span under normal, short circuit and meteorological conditions, without effecting the performance of the equipment.

6 All the cables used for the switchyard shall be armored type.

7 The Contractor shall cooperate in all respects and exchange the necessary technical data / drawings with other agencies and BHEL's other Contractors under intimation to BHEL to

ensure proper coordination and completion of work in time.

8 The sag tension, conductor spacing, short circuit forces, spacer's location, conductor swing and clearances shall be carried out in accordance with IEC 60865 to achieve the specified clearances.

9 Post insulators shall be provided at line entry so as to avoid mechanical forces on the LA's etc.

10 The towers and gantries shall be suitable for a normal conductor tension of minimum 2T/conductor. The foundations and structures etc shall be designed accordingly. The minimum height of 33kV gantry and equipment shall be as required to match with existing levels / as per GETCO requirements

11 The illumination level shall be 20 lux in general and 50 lux on equipment boxes. No lighting fixture shall be mounted on gantries, they shall be mounted on lighting polls only.

5.2 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING SUPPLIED

All the equipment/materials covered in this specification shall perform all its function satisfactorily without undue strain, restrike etc. under normal operating voltage conditions.

5.3 SITE SUPERVISION OF EQUIPMENTS

The contractor shall ensure that, erection, testing and commissioning of Transformer, Circuit Breaker, Isolator, Instrument Transformer, Surge Arrestor, Substation Automation System & Protective relays is carried out under the supervision of manufacturer of respective equipment.

5.4 SYSTEM PARAMETERS FOR 220 KV SWITCHYARD

The following are the main features, parameters of the 220kV switchyard:

i)	Nominal system voltage	:	220 kV
ii)	Highest system voltage	:	245 kV
iii)	System neutral earthing	:	Effectively earthed.

The following parameters shall be considered for spacing of the equipment, conductors, etc., for the design purposes. The values of clearances to be furnished by VENDOR, complying with the necessary Electrical / safety considerations.

	Clearances in air:	Vendor to furnish
i)	Between phases	: 2100mm
ii)	Phase to earth	: 2100mm
iii)	Section clearance to the live parts	: 5000mm
iv)	Ground clearance to the live parts	: 5500mm

	Voltage/current withstand levels:	
i)	One-minute power frequency	: 460kV(rms)
ii)	1.2/50 micro second impulse	: 1050kV peak
iii)	Creepage distance for equipment	: 31kV/mm

iv) No. of phases : 3
v) Frequency : 50Hz
vi) Short circuit current : 40kA for 3 sec
vii) Co-efficient of seismic
a) Acceleration in horizontal : Vendor to be furnished.
b) Acceleration in vertical : Vendor to be furnished.

5.5 TYPE TEST REQUIREMENTS FOR EQUIPMENTS AND TRANSMISSION LINES

(i) All equipments to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for BHEL/GSECL approval the reports of all the type tests as listed in this specification and carried out within last 5 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.

(ii) However if contractor is not able to submit report of the type test(s) conducted within last 5 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 and within the scheduled contract time) to BHEL either at third NABL party lab or in presence of client/ BHEL representative and submit the reports for approval.

(iii) 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.

5.6 RATING AND TECHNICAL SPECIFICATIONS OF 220kV switchyard EQUIPMENT:

All 220kV Equipment Ratings shall be as per attached Single Line Diagram.

Technical specifications shall be as detailed below:

5.6.1 220 KV CIRCUIT BREAKER:

The Circuit breaker shall be of Sulphur hexafluoride SF6 type and comply with the requirements of latest issue of IEC: 62271-100 (latest edition) and any other equivalent International Standards. The circuit breaker shall be suitable for outdoor operation.

GENERAL:

i) The circuit breaker shall be of modular construction with all components manufactured to assure the maximum inter-changeability of standard basic elements. All parts of the breaker unit shall be mechanically designed to withstand all electrical, mechanical and other stresses which may be experienced in the operation of the unit including those under short circuit conditions. Suitable lock nuts and locking plates shall be provided for bolts and nuts inside the mechanism housing to avoid loosening of the bolts & nuts due to vibrations.

ii) The breaker shall comprise of three identical single pole units, ganged together mechanically, complete in all respects with the associated accessories including fittings.

iii) The design and construction of the equipment valves, couplings, connections shall be such that leakage of any SF6 gas shall be limited to a minimum. Similarly, valves, couplings and pipe work shall be so arranged that accidental loss of gas to the atmosphere shall also be limited to a minimum.

iv) Two trip coils shall be provided for greater reliability. The trip coils shall have sufficient continuous rating to cater to the trip coil supervision relay current. Disagreement circuit shall be provided for line and bus coupler circuit breakers which shall detect pole position discrepancy. A mechanical indicator and an operation counter shall also be provided. Necessary auxiliary contacts shall be provided for control, indication, interlocking and protection. At least 20% spare auxiliary contacts shall be wired out.

v) All fittings and accessories which may not have been specifically mentioned, but which are necessary and essential for the efficient working, shall be deemed to be included in the contract.

vi) Circuit breakers shall be capable of clearing short line faults with the same impedance behind the bus corresponding to the rated fault current. Circuit Breakers shall be capable of breaking 25% of rated fault current at twice rated voltage under out of phase conditions as per IEC.

vii) Circuit breakers shall be power operated by a motor charged spring operated mechanism / pneumatic operation. It shall be anti-pumping type and trip free. One O-CO operation shall be possible with failure of AC supply.

viii) The duty cycle of the auto re-closing breakers for lines, bus couplers & transfer Bus coupler shall be O-t-CO-'t'-CO, where the dead time interval 't' shall be adjustable. Circuit breakers shall be re-strike free and shall be rated for 40 kA for 3 sec.

ix) A closing release shall operate correctly at all values of voltage between 80% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage

x) The duty cycle of the auto re-closing breakers for lines, bus couplers &transfer Bus coupler shall be O-t-CO-'t'-CO, where the dead time interval 't' shall be adjustable. Circuit breakers shall be re-strike free and shall be rated for 40 kA for 3 sec.

xi) Circuit breakers shall be capable of clearing short line faults with the same impedance behind the bus corresponding to the rated fault current. Circuit Breakers shall be capable of breaking 25% of rated fault current at twice rated voltage under out of phase conditions as per IEC.

xii) Design of circuit breaker shall be such that contacts shall not close automatically upon loss of gas/air pressure. SF6 breakers shall be provided with temperature compensated SF6 density switches for individual poles with separate trip, alarm and blocking contacts.

xiii) Main poles shall operate simultaneously. There shall be no objectionable rebound and the mechanism shall not require any critical adjustment. It shall be strong, rigid, positive and fast in operation.

DUTY REQUIREMENTS

a) The circuit breakers shall be totally re-strike free under all duty conditions and shall be capable of performing their duties.

b) The circuit breakers shall be capable of rapid and smooth interruption of currents under all conditions completely suppressing all undesirable phenomena even under the most severe and persistent short circuit conditions or when interrupting small currents or leading or lagging reactive currents. The circuit breakers shall be 'Restrike-Free' under all operating conditions. The details of any device incorporated to limit or control the rate of rise of restriking voltage across, the circuit breaker contacts shall be stated. The over voltage across, the circuit breaker contacts shall be stated. The over voltage caused by circuit breaker while switching inductive or capacitive loads shall not exceed 2.5 times the highest phase to neutral voltage. The actual make and break times for the circuit breakers throughout the ranges of their operating duties shall be stated in the offer and guaranteed.

c) The circuit breaker shall be capable for breaking the steady& transient magnetizing current corresponding to 220 kV transformers. It shall also be capable of breaking line charging currents as per IEC- 62271-100 with a voltage factor of 1.4.

d) The critical current which gives the longest arc duration at lock out pressure of extinguishing medium and the duration shall be indicated.

e) The circuit breakers shall be so constructed that they would fail safe in the event of loss of SF6 gas pressure below a certain level.

f) The circuit breaker shall meet the duty requirements for any type of fault or fault location.

g) The circuit breaker shall be capable of carrying, continuously under site conditions, the rated rms value of the current without deterioration at its rated frequency with the temperature rise of the various parts not exceeding the values specified in IEC-62271-100 latest edition.

h) The circuit breaker shall be of single break and the breaker shall satisfactorily withstand the high stresses imposed on them during fault clearing, load rejection and re-energisation of lines with trapped charges. The breaker contacts (Main & arcing) shall be of high erosion resistant and the erosion of contacts shall be limited to a minimum.

CONSTRUCTIONAL FEATURES

The features and constructional details of circuit breakers shall be in accordance with requirements stated here under.

a) Mounting and supporting structure for Circuit Breaker. The circuit breakers should be self-supporting type. However, if necessary for the purpose of minimum ground clearance the circuit breakers should be mounted on raised steel structures which should be included in the scope of supply of circuit breaker.

b) Operating mechanism and all accessories shall be in local control cabinet. A central control cabinet for the three poles of the breaker shall be provided along with supply of necessary tubing, cables, etc.

c) Following information and data for design of foundations from the supplier of the circuit breaker be obtained.

1. Dead weight per pole for complete circuit breaker
2. Static bending moments above the feet of each pole and for complete circuit breaker.
3. Static shear force at the foot of each pole and for complete circuit breaker.
4. Maximum height of the steel supporting structure.
5. Maximum diameter of the pole.
6. Maximum horizontal force acting at upper terminal of each pole due to impact of closing/opening of the circuit breaker.
7. Max. Impact loading in terms of equivalent static load both compression and upward due to opening/closing of the breakers. It shall be clearly stated whether these forces shall act simultaneously or at different timing.
8. No. of steel supporting columns provided for mounting the equipment.
9. The above data should represent static reactions for the worst windage or operation conditions. Circuit breakers whether of self-supporting type or on raised steel structure should ensure minimum sectional clearance.
10. Necessary connecting materials such as clamps, bolts, nuts, washers etc. and fixing bolts for mounting the equipment on the supporting structures wherever required should be obtained from the circuit breaker supplier

i) CONTACTS

a) All making and breaking contacts shall be sealed and free from atmospheric effects. The contacts shall be permanently under the pressure of SF6 gas. The gap between open contacts shall be such that it can withstand the rated dielectric stresses at zero-gauge pressure of SF6 gas due to its leakage.

b) Main contacts shall be the first to open and the last to close so that there will be little contact burning and wear.

c) Arcing contacts shall be the first to close and the last to open and shall be easily accessible for inspection and replacement. If there are no separately mounted arcing contacts, the main contacts shall be accessible for inspection and replacement.

d) Main contacts shall have ample area and contact pressure for carrying the rated current and the short time rated current of the breaker without excessive temperature rise which may cause pitting or welding.

e) Tips of arcing and main contacts shall be silver plated or have a tungsten alloy tipping.

INSULATING SUPPORTS AND HOUSING

Porcelain used in the manufacture of insulating supports / housing shall be homogenous, free from cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Glazing of the porcelain shall be of uniform brown colour, free from blisters, burns and similar other defects. Porcelain supports / housings shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which these will be

used. All insulator housings of identical ratings shall be interchangeable. The puncture strength shall be greater than the dry flashover value. When operating at normal rated voltage, there shall be no electric discharge between the conductor and the porcelain parts which may cause corrosion or injury to conductors / insulators or supports by the formation of substances produced by chemical action. The insulating supports / housings shall be free from radio disturbances when operating at rated voltage and shall also be free from external/internal corona. The insulating supports / housing shall satisfactorily withstand the insulation level specified for circuit breakers.

SULPHUR HEXAFLOURIDE GAS (SF6 GAS)

a) SF6 gas shall comply with IEC: 60376 and be suitable in all respects for use in the switch gear under the operating conditions. The necessary test certificates shall be furnished during inspection of breakers.

b) The high pressure cylinders in which the SF6 gas is shipped and stored at site shall comply with requirements of the following standards and regulations:

   IS: 4379 - Identification of the contents of Industrial Gas Cylinders.
   IS: 7311 - Seamless high carbon steel cylinders for permanent and high pressure liquefiable gases.

c) Absorbent shall be provided in the interrupter unit of each phase (where SF6 gas is used) to absorb any traces of moisture. These shall be permanent facilities.

d) The precise procedure to be adopted by maintenance personnel for handling equipment, who are exposed to the products of arcing in SF6 gas, so as to ensure that they are not affected by possible irritants of the skin and respiratory system.

SUPPORT STRUCTURE

The contractor shall supply the SF6 breaker along with support structures of self-supporting type and foundation bolts required. Support structure and foundation bolts shall be supplied along with each breaker.

OPERATING MECHANISM

GENERAL

a) Circuit breaker shall be spring operated for both opening and closing operations. The mechanism shall be strong, positive, quick in action and shall be removable without disturbing the other parts of the circuit breaker. The mechanism shall operate simultaneously without requiring any critical adjustment.

b) The operating mechanism shall be suitable for high speed re-closing of the breaker over a wide range of parameters. It shall be anti-pumping and trip free. In case of failure of a pole to close properly, all the three poles should trip.

c) A mechanical indicator along with operation counter shall be provided in addition to facilities for remote electrical indication to show open and close position of breaker. It shall be located in a position where it will be visible to a man standing on the ground with the mechanism housing closed and easily accessible from the ground for the O&M

personnel to operate and maintain locally.

d) The control circuit shall be designed to operate on 220 V DC +/- 10%. Closing coil and trip coil shall operate correctly at all values of voltage between 85% to 110% and 70% to 110% of the rated voltage respectively. Arrangements shall be made for providing two sources of control supply to the 2 trip coils.

e) Working parts of the mechanism shall be of corrosion resisting material. Bearings which require grease shall be equipped with pressure type grease fittings. Bearing pins, bolts, nuts and other parts shall be adequately locked by split pins, lock nuts, plates wherever required to prevent loosening or changing adjustment with repeated operation of the breaker.

f) Operating mechanism shall normally be operated by remote electrical control. Electrical tripping shall be performed by shunt trip coils. Provisions shall be made for local electrical control. `Local/remote' selector switch and close and trip push buttons shall be provided in the breaker control cabinet on a hinged panel with position locked with bolt and nuts to provide access to the rear of panel for maintenance purpose. The relay trip should act independent of the position of local/remote selector switch. In the event of failure of auxiliary supply, manual emergency trip lever shall also be provided to trip the circuit breaker.

g) The circuit breaker shall be gang operated and mechanically linked for tripping and closing. The Group operating mechanism housing along with all pressure switches, gauges, indication and other equipments and all the necessary controls are housed in a marshalling box, which is common for all three phases. The operating mechanism housing / marshalling box shall be of outdoor type and weather proof. The box shall be fabricated out of not less than 12 SWG thick mild steel cold rolled sheet of tested quality complying with the latest edition / amendment of IS 513/1973. The operating mechanism housing / marshalling box shall have hinged door, which could be easily closed without applying excessive pressure on the doors. The door hinges shall operate at ease and strong enough to withstand the self-weight of the door and to keep the door properly aligned. The complete box shall be fabricated in such a way that when closed it shall be perfectly water tight, dust proof and vermin proof and conform to IP55 as per IS:2147. All Marshalling box shall be provided with necessary fixtures for fixing the cable entry and exit pipes with check nuts on all the sides of the marshalling box. Thermostatically controlled space heaters, a light point with a door switch shall be provided and MCBs shall be used for protection of supply to space heaters. The mounting height of the box shall be easily assessable for a person standing on the ground for operation and maintenance.

h) Provisions shall be made on breakers for attaching an operation analyser to perform speed tests after installation at site to record contact travel against time and measure opening time.

i) The circuit breaker shall be provided with pole position discrepancy detector with an associated timer of 0.1 Sec. to 2 minutes' adjustable time delay.

j) The contractor shall furnish along with Test Certificates, curves supported by test data indicating opening time under close-open operation with combined variation of trip coil voltage and operating pressure.

SPRING OPERATING MECHANISM FOR BOTH CLOSING AND TRIPPING

a) Closing and tripping operations shall be by spring charging. When the closing signal energises the Closing coil, the trigger shall release and the charged closing spring shall close the Breaker and also recharge the opening spring. When opening signal is given, the energy accumulated in the opening spring shall be released and cause the main contacts of the breaker to separate.

b) The spring operating mechanism shall have adequate energy stored in the operating springs to close/open and latch the Circuit Breaker against the rated making current and also to provide required energy for both closing and tripping mechanism.

c) The spring charging motor shall not take more than 10 seconds for fully charging the closing springs and provision shall be made for automatic charging of the closing springs as soon as they are discharged in a closing operation. For this, the mechanism shall be such that the charging of the springs by the motor does not interfere with the operation of the Breaker.

d) The motor shall be adequately rated to carry out a minimum of 5 close and open operations continuously. Also provision shall be made to protect the motor against over loads. The motor shall be rated for 230VAC.

e) Mechanical inter locks shall be provided in the operating mechanism to prevent discharging of the closing springs when the Breaker is already in the closed position. Provision shall also be made to prevent a closing operation to be carried out with the spring partially charged.

f) Facility shall be provided for manual charging of the closing springs and it shall be possible to operate the same standing on the ground.

g) The pole units shall be filled with SF6 gas at atmospheric pressure of 0.5-1 kg/sq. cm before despatch and sufficient SF6 gas shall be supplied with the breaker to fill all the circuit breakers installed to the required pressure plus an additional 20% of the quantity to compensate for losses. Vendor shall arrange for the necessary tools and tackles such as adaptor for lock out test, tools for refilling of SF6 gas at site etc.

h) Breaker OPEN/CLOSE shall be operated either from Local and Remote through C&R panel and SCADA. Suitable no. of contacts of main breaker shall be provided and termination done accordingly.

RATING PLATE

Weather proof and corrosion proof rating plates showing year of manufacture and other values as per IS: 2516 shall be provided on all circuit breakers and its operating devices.

TERMINAL CONNECTORS AND EARTHING TERMINALS

The terminal connectors shall be either bi-metallic or aluminium as the case may be and shall be suitable for ACSR conductor for both vertical and horizontal take off. Suitable terminals for earthing connectors for earthing connections shall also be provided for the structures, operating cubicles and marshalling boxes. The grounding conductors shall be 50 x 6 mm steel flat.

TERMINAL BLOCKS

Terminal blocks shall be 1100 V grade and of current capacity 10 Amps with insulated barriers and stud type terminals, spring washers, nut and lock nuts and identification strips.

All wiring terminations shall be with suitable tinned copper crimped lugs. All wiring shall be carried out with flameproof insulated wires made up of tinned or annealed copper conductor.

AUXILIARY SWITCHES

Positively driven (in both directions) auxiliary switches (contacts) each of the normally open and normally closed types and a continuous current carrying capacity of at least 10 Amps shall be provided on each circuit breaker for use in the remote indication for control of the circuit breaker and for providing safety interlocking.

They shall be capable of breaking at least 2 Amps at 220V DC with circuit time constant of not less than 20 mili seconds. If installed on the frame of breakers, it shall be suitably protected against accidental arcing from the main circuit. The insulating materials of the switches and terminals shall be of ceramic or other non-tracking and non-hygroscopic materials.

Special contacts for use with trip coils and single shot re-closing operation which permit relative adjustment with respect to the travel of the circuit breaker shall also be provided wherever required. Required number of auxiliary switches shall be provided.

INTERLOCKS

Necessary interlocks to prevent the closing of the breaker (manual and remote) under low gas/air pressure and devices for initiating alarm for low gas pressure shall be provided. Provision shall also be made to enable electrical interlocking with the opening or closing of the isolator when the breaker is closed with the spare auxiliary contacts wired up to the terminal block.

FITTINGS AND ACCESSORIES

The vendor shall furnish the following fittings and accessories as an integral part of the equipment:

a. Operating Mechanism Housing
b. Pad locks and duplicate keys
c. Local/remote change over switch
d. Operation counter
e. Terminal board with minimum 10% spare terminals
f. MCB/MCCB to cut off control power supply, wherever required.
g. Two earthing terminals
h. Auxiliary relays required for satisfactory operation
i. Breaker local control switch for opening and closing of breaker Terminal connectors
j. 3 pin 15A socket outlet
k. Earthing pads
l. Foundation bolts
m. Galvanised steel structures/Steel frames for mounting of the breakers.
n. Necessary cables from respective Control cubicles to marshalling box/Central control cubicle of the Breaker.

o. Apart from the above, one set of SF6 Gas regulator along with hose for Gas filling/evacuating shall be supplied.

TESTS:

i) The circuit breaker shall comply with the type test and the routine tests prescribed in IEC-62271-100. The routine acceptance tests shall be carried out on each breaker before despatch.

ii) Report of all type tests as stipulated in IEC and the line charging current and transformer charging current, interrupting tests shall be furnished if already carried out within the last 5years as on date of bidding. Otherwise, the type tests shall be carried out at no additional cost to BHEL.

iii) No equipment shall be despatched without prior approval of the test certificate and despatch instructions are conveyed by the purchaser.

iv) Routine acceptance tests shall be carried out on each breaker in the presence of BHEL representative if so desired. Test certificates in six sets shall be furnished to BHEL for approval. Also BHEL/GSECL representative shall have access to the manufacturer's works for the purpose of inspecting the manufacture of the equipment.

SITE TESTS ON CONTROL AND AUXILIARY CIRCUITS

The following site tests shall be carried out at the time of commissioning of the breakers:

i) Voltage tests on control and auxiliary circuits
ii) Measurement of resistance in the main circuit.
iii) Mechanical operating tests.
iv) Speed curves shall be obtained with the help of a suitable operation analyser to determine breaker contact movement during opening, closing, auto-re closing and trip free operation under normal as well as limiting operating conditions (control voltage, gas pressures etc). The tests shall show the speed of contacts at various stages of operation, travel of contacts, opening time, closing time, shortest time between separation and meeting of contacts at break-make operation etc.

v) Tests to measure the difference in the instance of closing/opening of contacts between poles.

TEST ON SF6 GAS

The test certificates as obtained from the SF6 gas supplier shall be furnished during inspection of the circuit breakers.

PAINTING

The operating housing mechanism, Control cubicle shall be painted both inside and outside as per standard "seven tank" method with one coat of French grey paint in the inside and light grey paint to shade 635 of IS:5 on the outside surfaces as per relevant standards.

GUARANTEED TECHNICAL PARTICULARS

The SF6 gas circuit breaker supplied shall comply with the guaranteed technical particulars as indicated below.

1	Number of poles	3
2	Class	SF6Out Door, Gas Puffert Type, Electrically Trip free
3	Nominal System Voltage	220 kV
4	Highest Rated Voltage	245 kV
5	Rated Insulation Level	Vendor to furnish the details.
6	Rated Frequency	50 Hz
7	Rated normal current	1250 Amps.
9	Rated Cable Charging breaking current	As Per IEC.
10	Rated S.C. breaking current	50 kA
11	First pole to clear factor	1.3.
12	S.C. making current	100 kA.
13	Rated Operating Sequence	O-0.3sec-CO-3min.-CO
14	Duration of short circuit	3 sec.
15	Rated out of phase breaking current	As Per IEC.
16	Automatic rapid re closing	3 Ph.
17	Total break time for any current up to the rated breaking current with limiting conditions of operating coil voltage, operating &quenching media pressures.	< 40 ms
18	Total Make time(max)	100 ms.
19	No. of auxiliary contacts for purchasers use	10 NO & 10 NC on each pole
20	System neutral earthing	Effectively earthed
21	Closing time (max.)	<150 ms
	Opening time (max.)	<50 ms
22	Trip & Closing coil Voltage	220 V+/-10% DC
23	Arcing time	<=25 micro sec.
24	Creepage distance (min.)	31mm/kV
25	1.2/50 micro sec. lightning impulse withstand voltage.	+/- 1050 kVp
26	Power frequency withstand voltage	460kV rms
27	Type of operation	Spring
28	Rated values of transient recovery voltage for terminal faults	As per IEC:62271-100

29	Rated values of transient recovery voltage for short line faults	As per IEC:62271 - 100
30	Rated characteristics for out of phase breaking current	As per IEC:62271 - 100
31	Small inductive current interrupting capacity	To switch the associated Transformers magnetizing currents
32	Rated terminal load	As per IEC:62271 - 100
	i) within a pole	Vendor to furnish the details.
	ii) between poles	Vendor to furnish the details.
34	Insulation level of bushings	
	i) 1 min. p.f. withstand voltage	460 kV rms.
	ii) 1.2 /50microsecond lightning impulse with standing voltage	1050 kVp.
35	Partial discharge level	As per IEC:62271 - 100
36	Controls of switching surges	Vendor to furnish the details.
37	Noise level of equipment	Vendor to furnish from 50 to 150mm from base of the breaker.
38	Auxiliary power supply	415V+/-10%,3ph,50Hz+/-5%,AC
		240V+/-10%,1ph,50Hz+/-5%,AC
		110V +/-10% DC

NOTE: The above details are tentative. Vendor shall submit complete details to BHEL for approval during detailed engineering.

5.6.2 220 KV ISOLATORS WITH EARTH SWITCH:

TYPE AND RATING

Isolating switches are used to isolate the equipment. The Isolators shall be suitable for outdoor operation.

STANDARDS

The isolator switches shall comply in all respects with IS:9921 Part I to IV or IEC publication No.129 latest edition.

CONSTRUCTIONAL FEATURES OF HORIZONTAL DOUBLE BREAK TYPE

i) The Horizontal double break type, three phase isolators shall be Horizontal Upright Mounted,gang operated through **motor operated mechanism**. The design of the isolators shall be such that the switch can be changed to right or left hand operations. The live parts shall be designed to eliminate sharp points, and other surfaces likely to produce corona and adequate shield shall be provided. Live parts shall be manufactured from non rusting,

non corroding metal. Current carrying parts shall be of hard drawn electrolytic grade copper. Bolts, screws and pins shall be provided with lockwashers, keys or other equipment locking facilities and if used on current carrying parts, shall be made of copper silicon alloy or equivalent material. The isolator shall not require lubrication of any part at freequent intervals.

ii) The isolators shall be suitable for being mounted in upright positions (with blades moving in the horizontal plane) on the steel support structures and also suitable for mounting on the high type structures in the outdoor yard.

iii) Motors shall be totally enclosed, weather-proof, outdoor type. Starters suitable for direct-on- line duty shall be provided for control of motors. A quick electro-mechanical brake shall be fitted on the higher speed shaft to effect rapid braking.

iv) The double break isolator shall consist of three identical pole units. Isolators are required to be double break, three posts per phase, triple pole, single throw, rotating center post through double tandem pipe, silver plated contacts, with horizontally operating blade and insulator posts arranged vertically.

v) The isolators shall have rotating blades feature and pressure relieving contacts with turn and twist mechanism. The isolators shall be **motor operated with emergency manual operating mechanism.** The manual operating mechanisms shall be of robust construction, conveniently located for operation and easily operatable by a single person. The length of the operating rod shall be such that the height of the manual operating handle above the ground is 1500 mm. The isolator shall be so constructed that the switch blades will not fall to the closed position, if the operating shaft gets disconnected.

vi) Limit switches for motor control shall be fitted on the isolator shaft, within the cabinet, to sense the open and close positions of the isolator.

vii) The rated peak short circuit current and the rated short time current, of the earthing switch shall be at least equal to those specified for the isolator. The earthing switch shall be capable of making on a dead short circuit current without damage or endangering the operator.

viii) Main blades of the isolators shall be 415V,3 Phase Motor operated. However, it shall also be possible to operate them manually in the event of failure of power supply or outage of the drive motor. The earth blades shall be manually operated type. Tripping of drive, loss of AC drive supply and DC control supply shall be detected for giving alarm.

ix) The design and construction shall be such as to provide positive control of blades in all positions with minimum mechanical stress on insulators. Fixed guides shall be provided so that proper seating of contacts shall be obtained.

CLEARANCES

Clearances between live parts and grounded structures shall not be less than those specified in the latest edition of IS(Standard followed to be indicated in the offer). Length of break in full open position shall be such that there is absolutely no possibility of arc over from the live parts to the de-energised parts on which any maintainance works may have to be done. The speed of opening or closing the switch shall be designed to ensure that the arcing during the operation is reduced to the minimum. The necessary arcing contacts shall be provided on the moving blades.

ISOLATOR INSULATION: The isolator shall be provided with solid core insulators.

i) Insulation to ground, insulation between open contacts and the insulation between phases of the completely assembled isolator shall be capable of withstanding the di-electric test voltages specified in the data sheets enclosed. Insulation between open contacts of a pole shall be atleast be 15% more than the insulation between live parts of a pole to ground so that if any flash over occurs when isolator is open, it shall be to the ground.

ii) The post type insulators, which should be solid core of multiple stack, shall conform to IS:2544 or other internationally recognised standards. The insulators selected shall be for use in heavilly polluted atmosphere and shall be specifically suited to meet the particular requirements of ultimate torsional strength and cantilever loads, which they will be called upon.

iii) The porcelain shall be homogenous and free from all cavities,Laminations and flaws. Design of the insulators shall ensure ample insulation, mechanical strength and rigidity for satisfactory operation under site conditions. The design, shall also ensure that the losses caused by capacitive currents or conduction through dielectric are minimum and that the leakage due to moist and dirty insulators surface is least.

iv) All metal caps and supports shall be connected to the porcelain where as the blades and contact blocks shall be bolted to the metal parts of insulator thus making the replacement of damaged insultor easy.

v) These shall be of stacking type to be used. The dimensions and other parameters unless otherwise specified shall generally conform to IS - 5350-Part-11 & IEC 273.

vi) The cylindrical type post insulators shall be of solid core type and shall consist of single unit only. Insulators of similar type shall be interchangeable. The mechanical strength class for outdoor cylindrical post insulators shall be of strength class 6, corresponding mechanical strength in tension, compression and torsional shall be as per IS: 53550 Part - II. When operated at maximum system voltage, there shall be no electrical discharge. Shielding rings, if necessary shall be provided.

vii) The insulator shall be provided with a completely galvanized steel base designed for mounting on the support. The base and mounting arrangement shall be such that the insulator shall be rigid and self-supporting and no guying or cross bracing between phase shall be necessary.

OPERATING MECHANISM

i. The design of operating mechanism shall be such that minimum of energy is required for operation and one man shall be able to operate the switch without undue effort. The operating mechanism and its controls shall be so designed that under no circumstances the switch blade travel is interrupted before it reaches the fully close or open position.

ii. Isolators shall be interlocked with the circuit breakers in accordance with the switchyard safety interlocking scheme. Interlocks necessary for earth switches shall also be provided. Necessary auxiliary switches shall be provided for control, indication & protection including CT and VT switching as required. At least 20% spare auxiliary contacts shall be wired.

iii. The isolator design shall be such that it is free from visible corona discharge in both closed and open positions at the visible discharge test voltages as per applicable standards. Necessary stress relieving rings or shields shall be provided to meet this requirement.

iv. Isolators and earthing switches including their operating mechanism shall be such that they cannot be dislodged from their open or closed positions by gravity, wind, pressure, vibrations, shocks or accidental touching or seismic forces or breaking of the connecting rods or the operating mechanism.

v. **Each isolator shall be remote controlled from the control room**. **Provision shall also be made for local electrical control**. The operating mechanism shall also be equipped with local manual operating device intended for emergency operation in case motor operating mechanism fails. It shall be possible to padlock the manual operating handle both in open and closing positions of the isolators. Additional electro-magnetic type interlock shall be provided on the manual operating handle and control cubicle for motor so as to prevent the operation of the isolator manually and locally when the corresponding circuit breaker is 'ON'. Isolator inclusive of their operating mechanism should be such that they cannot come out of their open and close positions by gravity, wind pressure, vibration and shocks etc.

vi. The motor operating mechanism shall actuate 3 pole group operated double break isolators. The operating mechanism shall be capable of providing a quick, simple and effective operation. The motor mechanism shall be connected to the torsional control of isolator through a suitable coupling assembly. Suitable means to limit over travel shall be provided. Motor shall conform to IS: 325 and shall develop a starting torque equal to atleast 2.5 times the torque required to operate the isolator. The local/remote selector switch and set of open/ close push button shall be provided on the control cabinet of the isolator to permit local and remote operation.

vii. Two Nos. of earthing terminals shall be provided on the motor operating mechanism, to enable proper grounding. Flexible conductors of adequate cross section shall be provided at the lower end of the vertical operating shaft for connection to the station ground.

viii. Push button for local control shall be provided on the mechanism housing and the control switch for remote control from the main control board shall be provided by the control panel manufacturer. A local/remote change over switch shall also be provided in the mechanism cubicle.

ix. The gear shall be made of aluminium and bronze alloy or EN8 material and lubricated for life with graphite or non drying and non hardening grease.

x. In the operating mechanism, mechanical stoppers shall be provided during both opening and closing operations of the driving motor shaft, in order to prevent over travel of the switch blade. This has to be demonstrated at the time of inspection/testing.

xi. A lamp with a door switch and single phase preventer shall be provided on the motor operated mechanism. The space heater with thermostat control supply, On & Off switches as shall be provided.

xii. One set of extra NO/NC contacts for local/remote status shall be provided.

xiii. One set of contacts for thermal overload relay and single phase preventer shall be provided. A power socket of Industrial type shall be provided.

xiv. Gland plates shall be provided at the bottom of the motor operated mechanism box for cable connections. The required cable glands shall be supplied.

xv. The limit switches to be provided in the isolator covered under this order shall be of reputed make which are sturdy and moisture proof and reliable. The contacts of the limit switch shall

be silver plated, sturdy and free from rusting.

xvi. Operating mechanism housing box shall be outdoor type and weather proof to IP55 and fabricated out of not less than 12 SWG MS sheet tested quality with hinged doors. The housing shall be painted with inside and out side with two coats of enamel paint shade after treatment with 7 tank process. (Min. 70 microns).

TEMPERATURE RISE

The temperatuer rise for various parts shall be tested according to IS:2705(part I to IV) and IEC publication No.129.

INSULATION LEVEL

The isolators shall have minimum insulation levels as per IS:9921 and IEC publication No. 129.

CONTACTS

i) The isolator shall be provided with high pressure self aligning adjustable silver plated copper contacts. The contacts shall be designed such that the contact pressure is released before any movement of the blades in the opening direction takes place and is applied after the closing travel is completed. The blades shall have a turn and twiist movement in case of double break isolators so that there shall be sufficient wiping action of the contacts to make them self cleaning.

ii) The earthing switches should be provided with three sets of suitable type of fixed contacts below the fixed contacts assemblies of the main switch on the incoming supply side and three sets of moving contacts having ganged operation. These contacts too should be fabricated out of electrolytic copper and dimensioned to withstand the rated currents.

iii) The temperature rise of the contacts and other current carrying parts shall not exceed value specified in IS:9921 at an ambient air temperature of 40 Deg. C while carrying the rated current continuously. The temperature rise due to the passage of the rated short circuit current for a period of 1 sec shall not cause any annealing or welding of the contacts.

iv) <u>ARCING CONTACTS:</u>

Arcing contacts provided shall close first and open last so that no damge due to arcing shall be caused to the main contacts.

TERMINAL CONNECTORS

Each isolator shall be provided with rigid type aluminium / bimetallic alloy connectors suitable for ACSR Aluminium conductor. The terminal connectors shall be suitable for horizontal or vertical take off. The required quantity of terminal connectors shall be supplied.

ISOLATOR BLADES AND JAWS:

i) The isolator blades shall be HDEC (hard drawn electrolytic copper) tube of suitable thickness or one solid copper piece with contact surface silver plated. Construction shall be so designed that no part of the blade can move relative to the other parts. The thickness and section of the blade shall be such that it retains its form and straightness under all conditions of operation including the flow of system fault current for the specified period. It shall also be capable of withstanding all torsional and bending stress due to operation of the isolators. Wherever necessary, the blades shall be counter balanced by weights or springs. Fixed guides shall be provided so that proper seating of contacts will be achieved

while closing even when a blade is out of alignment by 3 cm or less. The isolators to be supplied aginst this contract shall be employed with turn and twist motion and shall have no problem with the contact alignment. Further the main blade shall pass through the main actuator assembly without any joints so that there is no necessity of shunting by flexible copper conductors.

ii) The sharp edges in the fixed contact terminal casting and bolt heads have to be rounded off to minimize the corona discharges. The ends of the blade arm pipes shall be suitably plugged by metal or nylon plugs to prevent entry of water or insects and corona discs shall be provided where ever necessary.

AUXILIARY SWITCHES

Auxiliary switches with a continuos current carrying capacity of 10 Amps and adequate thermal and breaking capacity shall be provided for all isolators and earthing switches for the remote position indication on the control board and for electrical interlocking with other equipments. The auxiliary switches shall be positively driven in both directions by rigid members. Ten pairs each of the normally open,nomally closed contacts each for the main/earthing switches shall be provided. All contacts should be brought out on terminals. Provision shall be made for adding auxiliary switch contacts at a later date for isolators and earth switches. Separate auxiliary switches shall be provided for isolators and earth switches. The auxiliary switches shall be of robust construction and housed in weather proof and dust tight covers mounted on the respective operating mechanism and accessible even when the isolator is live.

INTERLOCKS

i) For the purpose of making the operation of the isolator depending upon the position of the associated circuit breaker or other equipment as may be required at site, a suitable interlock should be provided on each isolator. The interlocks should be of robust design and contained in a weather proof and dust tight housing. The line isolator should close only when the corresponding circuit breaker and the earthing switch of the corresponding line are open. Electro magnetic type interlocking should also be provided to avoid wrong local operation of the isolator (manual or motor) when the corresponding circuit breaker is in closed position.

ii) Besides the electrical interlocks, the earthing switches should be provided with mechanically operated interlock so as to ensure that: -

a) It should be possible to close the earthing switch only when the isolating switch is in the fully open position.
b) It should be possible to close the isolating switch only when the earthing switch is in the fully open position.
c) The earth switch should not open automatically while attempting to close the isolator.
d) The operation of the earth switches should also be interlocked with the PTs/CTs supplies from the transmission line i.e. it should be possible to close the earth switch only when the line is dead from the feeding end, and there is no supply from the secondaries of the line PTs/CTs.

e) The operation of earth/isolating switch should not take place when the corresponding isolator/earth switch is in operating stroke.

BEARINGS

The design and construction of the various bearings shall embody all the features required to withstand climatic conditions specified so as to ensure dependable and effective operations even after long periods of inaction of these isolators and switches. Facilities should be provided for lubrication of the bearings. All bearings shall be filled with first filling of grease and provided with grease nipples for greasing during servicing.

GALVANISED SUPPORT STRUCTURES

The required quantity of galvanized steel support structures for mounting the isolator on the ground shall be supplied for mounting the isolators in upright positions.The galvanized steel support structures shall in general conform to the latest issue of IS2629.

DESIGN, MATERIALS & WORKMANSHIP

The contractor shall assume full responsibility for co-ordination and adequate design. All materials used in the construction of the equipment shall be of the appropriate class, well finished and of approved design and make. All similar parts should be accurately finished and interchangeable.

All ferrous parts shall be hot dip galvanized. Bolts, nuts, pins and washers etc., used on the isolators shall also be galvanized. Special attention shall be paid to give tropical treatment to all the equipment as they will be subjected during service to extremely severe exposure to atmospheric moisture and to long period of high ambient temperature. All current carrying parts shall be of non-ferrous metal or alloys and shall be designed to limit sharp points, edges and similar sharp faces.

FASTENERS

Nuts, bolts, studs and washers for use in the plant shall conform to the requirements of the appropriate standards, where the contract includes nuts and bolts of different standards, the necessary tools shall be provided in compliance with this specification and shall include spanners, taps and dies for these nuts and bolts.

TESTS

Each isolator and earth switch shall strictly comply with the requirements of all the approved type tests and shall be subjected to all routine/acceptance tests stipulated in the relevant standard.

GUARANTEED TECHNICAL PARTICULARS

The isolator supplied shall comply with the guaranteed technical particulars as indicated below.

1	Rated voltage	245 kV
2	Nominal System voltage	220 kV
3	Rated frequency	50 Hz
4	System neutral earthing	Effectively earthed
5	Installation	Out door
6	Type of disconnect	Horizontal double break

		*Type of disconnect is indicative and shall be as per final dwg approval by BHEL/GSECL
7	Number of poles	3
8	Rated normal current	1250 A.
9	Rated short time with-stand current (KA rms)	40 kA for 3 sec.
10	Rated peak withstand current for both main and earth switch (KA) peak	100 kAp
11	Rated insulation level 1.2/50 micro second lightning impulse withstand voltage (kV) peak	1050kVp
12	One minute dry/wet power frequency withstand voltage for complete assembled isolator / isolator cum earthing switch.	460 kV RMS
13	Minimum clearance in open air (mm)	
	a) Between phases	2100mm.
	b) Live parts and ground	5500mm.
14	Rated magnetizing current/ capacitive current make/break capacity	To be furnished by vendor as per design requirement.
15	Rated mechanical terminal load	
	a) Straight load (Kg)	To be furnished by vendor as per design requirement.
	b) Across load (Kg)	To be furnished by vendor as per design requirement.
16	Operating mechanism	Motor operated(emergency manual)
17	Operating time	10 – 12 sec
18	Particulars of insulators	
	a) Creepage distance (mm)	31mm/kV
	i) Total	To be furnished by vendor
	ii) Protected	At least 50% of total Creepage distance
	b) Dielectric strength(kV)	Wet: and Dry: To be furnished by vendor
	i) Minimum one minute power frequency withstand voltage (kV) rms	460 kV RMS
19	No. of auxiliary switch contacts (NO , NC)	10 nos. each

NOTE: The above details are tentative. Vendor shall submit complete details to BHEL for approval during detailed engineering.

5.6.3 INSTRUMENT TRANSFORMERS (CURRENT TRANSFORMERS, POTENTIAL TRANSFORMERS, MARSHALLING BOXES)

5.6.3.1 CURRENT TRANSFORMERS

A) TYPE AND RATING

The 245 kV Current transformers shall be Outdoor, Dead tank type, Copper wound, single phase, 50 Hz, oil immersed, self-cooled and suitable for operation under site climatic conditions without any protection from sun and rain.

B) STANDARDS

The Current transformers shall comply with the latest issue of IS 2705 (Part I, II, III and IV) or IEC 185 or the latest revised standards such as IEC61869 Part2 except where specified otherwise. Equipment meeting any other authoritative standard, which ensures an equal or better quality than the standard mentioned above, is also acceptable.

C) GENERAL

i) 220 kV hermetically sealed Current transformers shall be of single phase, oil immersed and self-cooled, suitable for the services indicated, complete in all respects, conforming to the modern practice of design and manufacture. The CTs shall be of multi-ratio type and secondary current shall be 1Ampere.

ii) CTs for differential protection and distance protection shall be provided with PS class. 5P20 protection class shall be used for over current/earth fault protection. For metering Cl.0.5 accuracy class CTs shall be used. For Tariff metering and PG testing 0.2s class accuracy shall be used.

iii) The rated burden for the metering and protection cores shall be decided considering all the loads/relays connected, lead burden and design margin. The knee point voltage for PS class cores shall be decided considering the connected protection equipment with adequate margin. Terminal and polarity marks shall be indelibly marked on each CT on the associated terminals and these marks shall be in accordance with relevant standards.

iv) In the case of multi-core CTs, it shall be possible to adjust the tap settings on any core independent of the setting on the other cores, for which purpose these tapings will have to be provided on the secondary windings.

v) The core shall be of high grade, non-ageing, electrical grade silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and over-currents or voltages.

vi) The current transformers shall be sealed to eliminate breathing and prevent air and moisture from entering the tank. These shall be provided with oil level gauge and a pressure relieving device capable of releasing abnormal internal pressure. The temperature rise shall be as specified in the latest IS 2705.

vii) Secondary terminals of current transformers shall be brought out in a weatherproof terminal box. Glands and lugs for terminating cable connections shall be provided.

viii) Terminal and polarity marks shall be indelibly marked on each current transformer on the associated terminals and these marks shall be in accordance with relevant standards.

ix) The current transformers shall be provided with the following accessories.
   a) Primary terminal connectors suitable for ACSR conductor.
   b) Two earthing terminals on tanks on opposite sides for connecting earthing conductors.
   c) Oil level gauge.
   d) Filling and draining plugs.
   e) Power factor testing terminal
   f) Facility for lifting bushings and tank.
   g) The quantity of insulating oil required for first filling. Di electric dissipation factor of the oil shall not exceed 0.005. Insulating oil shall comply with applicable standards.
   h) Rating and diagram plate as per relevant standards.
   i) Pressure relieving device.

x) Current transformers shall be given tropicalized treatment for satisfactory operation in hot and humid condition.

xi) The temperature rise shall not exceed the figures given in applicable standards for operation under ambient temperature conditions.

xii) The tanks/bases and all exposed ferrous parts shall be hot dip galvanized and painted conforming to applicable standards.

xiii) In the case of multi-core CTs, it shall be possible to adjust the tap settings on any core independent of the setting on the other cores, for which purpose these tapings will have to be provided on the secondary windings.

xiv) In case of multi-ratio current transformers, min specified requirements for VA, accuracy, knee-point voltage and max secondary resistance shall be met at all taps.

xv) Magnetizing characteristics (extending well beyond knee point voltage) and secondary impedance values shall be furnished for all protection cores.

xvi) Termination: No scissor type lugs to be employed. Only round lugs shall be used.

D) INSULATORS/BUSHINGS

i) Insulators / bushings shall conform to applicable standards and shall be made of homogeneous vitreous porcelain, the glazing of which shall be of uniform brown or dark brown in colour.

ii) Oil filled insulators/bushings shall be hermetically sealed to prevent ingress of moisture. Metallic bellows/Nitrogen gas shall be used for cushioning and to allow for expansion.

E) TESTS:

i) The following routine tests shall be carried out on all the current transformers in the presence of BHEL / BHEL customer representative as per the relevant latest IS and 6 sets of test certificates shall be furnished for approval before despatch. No equipment shall be despatched before the approval of test certificates and

despatch instructions are conveyed by the purchaser.

a) Verification of terminal markings and polarity.
b) Power frequency voltage with stand test on primary windings.
c) Power frequency voltage with stand test on secondary windings.
d) Over voltage inter turn test.
e) Determination of errors according to the requirements of the appropriate accuracy class.
f) Partial discharge test.

ii) The following type tests shall be carried out on one of the current transformers. If the contractor has already carried out type test on similar equipment in last 3 years, a copy of the same shall be furnished for purchaser's reference. If type test is not carried out, the same shall be conducted free of cost and test certificates furnished for purchaser's approval.
a) High voltage power frequency test on primary windings.
b) High voltage power frequency test on secondary windings.
c) Determination of errors according to the requirements of the appropriate accuracy class.
d) Short time current test.
e) Temperature rise test.
f) Impulse voltage test.

iii) A copy of the type test certificate for the following type tests carried out on one of the bushings shall be furnished for BHEL / BHEL customer reference.
a) Power frequency visible discharge test.
b) One-minute power frequency withstand test.
c) Full wave impulse voltage withstand test.
d) Under oil flash over or puncture withstand test.

F) GUARANTEED TECHNICAL PARTICULARS:

The current transformers supplied shall comply with guaranteed technical particulars as below.

#	Particulars	Guaranteed values
1	Nominal system voltage	220KV
2	Rated Voltage	245KV
3	Rated frequency	50 Hz
4	System neutral earthing	Effectively earthed
5	Grade of oil	As per IEC:71
6	Installation	Out-door hermetically sealed.

7	Rated short circuit current	40 KA				
8	Temperature rise	Asper IEC:60044				
9	Type of Insulation	Oil Immersed				
10	Rated insulation level					
	i)Impulse With stand voltage	+/- 1050 kVp				
	ii)1 min power frequency withstand voltage	460 KV rms				
11	Continuous current rating	120% of rated primary current				
12	Secondary Terminal Box	Weather-proof,IP55DOP				
	Description	**CORE1**	**CORE2**	**CORE3**	**CORE4**	**CORE5**
	Ratio	As per SLD				
	Rated primary current					
	Rated sec. current					
	Purpose					
	Adopted ratio					
	Accuracy Class					
	Rating of VA burden					
	Min Knee point voltage					
	RCT @ 200/1A					

NOTE: The above details are tentative. Vendor shall submit complete details to BHEL for approval during detailed engineering.

5.6.3.2 CAPACITOR Voltage TRANSFORMER (CVT)

A) Potential transformer, design, Temperature rise and testing etc. should be in accordance with IEC: 186 or the latest revised standards such as IEC61869/ IS:3156.

B) CVTs of ratio 220 kV / √3, 110 V /√3 , 110 V/√3 shall be provided on each phase of each line feeder CVTs of ratio 220 kV / √3, 110 V /√3 , 110 V/√3 shall be provided on each phase of each line feeder

C) An automatic high speed 3-pole miniature circuit breaker with micro-switch complete with sensing relays and operating mechanism shall be provided on each secondary output leads of each VT to protect the VT secondary branch circuit from the abnormal voltage surges that may occur on the VT. The switch(es) with its accessories shall be mounted inside the secondary terminal box. The secondary shall also include suitable number of links for each secondary as per the requirement of fuse failure detection relays. The burden of the CVTs shall be adequate for the connected load with design margin.

D)The coupling capacitors/capacitor dividers shall be suitable for use in a high frequency range of 40 kHz to 500 kHz, the rated power frequency being 50 Hz.

E) The accuracy class of CVT shall be Cl.0.2

F) The PTs should be single phase oil immersed self-cooled type suitable for outdoor installation of kV class required. The core should be of high grade non ageing electrical silicon laminated steel of high permeability. The PTs should be hermetically sealed to eliminate breathing and prevent air and moisture entering the tank. Oil level and pressure releasing device etc. should be provided.

G) Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block. The insulators shall have cantilever strength of more than 500 kg.

H) The high frequency capacitance values shall be within the limits of 80% and 150% of rated capacitance, for a frequency range from 40 to 500 kHz.

I) The values of stray capacitance and conductance of the low voltage terminal, with respect to the earth terminal, shall be as low as possible. The terminal design and arrangement shall be such that adverse atmospheric effects of humidity, dust, etc. do not increase the generally recommended limiting values of the stray capacitance and conductance, for coupling capacitor/capacitor voltage transformer, as stated in the applicable standards.

J) The insulator shall be hermetically sealed by metallic flanges at its ends with gaskets of neoprene or equivalent material which will not deteriorate in tropical climate. A nitrogen gas-cushion shall compensate for changes of oil volume.

H) Temperature Rise

The maximum temperature of the windings, cores etc. should not exceed 45°C, over ambient, while max. Temperature of oil at top should not exceed 35°C, over ambient. The PTs should be suitable for mounting on steel structures. All nuts, bolts, flanges and base should be hot dip galvanized. The terminal connectors should be such as to give intimate contact between conductor & terminal and offer protection against and effects of electrolytic and atmospheric corrosion and should also have sufficient mechanical strength. The connectors should conform IS 5556: 1970/IEC:60044.

I) Termination: No scissor type lugs to be employed. Only round lugs shall be used.

E) GUARANTEED TECHNICAL PARTICULARS:

The potential transformers supplied shall comply with Guaranteed technical particulars as indicated below.

1	Rated voltage	245 kV
2	Rated frequency	50 Hz
3	Accuracy class of Winding	0.2 For metering as per attached single line diagram
	Class of winding insulation	Oil immersed Class-A
4	Number of cores	2
5	Voltage ratio	220 kV/√3,110V/√3, 110V/√3
6	Grade of oil	As per IS: 335/1983 or latest,
7	Max phase angle error with 25% and 110% of rated burden at 0.8 p.f. lagging at any voltage between 80% and 120%	To be furnished by vendor as per design requirement.
8	Temperature rise at 1-1 times rated voltage with rated burden (OC)	As per IEC:60044.
9	Rated voltage factor & time (based on system studies) Continuous & 30 seconds:	1.2 continuousand1.5 for30 sec
10	1 minute power frequency (wet/dry) withstand test voltage	460kVrms
11	1.2/50 micro seconds impulse withstand test voltage: To be furnished by vendor as per design requirement.	1050kVP
	Secondary Terminal Box	Weather-proof,IP55DOP
12	Rated Power Factor	0.8 lag
11	One minute power frequency withstand test voltage on secondary winding.	2kVrms
12	Minimum creepage distance of bushings	31kV/mm.

NOTE: The above details are tentative. Vendor shall submit complete details to BHEL for approval during detailed engineering.

5.6.3.3 MARSHALLING BOXES:

i) The Marshalling boxes shall be suitable for mounting on the support structures. The Marshalling box is required for connecting the secondary windings of the corresponding individual core of the CTs and PT's of the three phases in star or delta as the case may be and to take leads from the marshalling box to the Control and Protection Panel. The quantity of marshalling boxes shall be supplied to meet the requirement. The size of cables used for connecting CT and PT leads upto the marshalling box shall be of 16 mm^2, copper cable.

ii) The Potential transformers i.e. current and voltage transformers shall be single phase transformer units and shall be supplied with a common marshaling box for a set of three single phase units. The tank as well as top metallics shall be

hot dip galvanized or painted Grey color as per RAL 9002.

iii) STANDARDS:

The marshalling boxes shall conform to modern design practice and shall be strictly in line with the specification described here in below.

iv) DETAILED TECHNICAL SPECIFICATION**:**

The marshalling boxes shall consist of completely enclosed cubicle type steel boxes suitable for outdoor mounting. These boxes shall be fabricated out of not less than 12 SWG thick mild steel cold rolled sheet of tested quality complying with the latest edition/ amendment of IS: 513/1973.

The marshalling boxes shall have a single door hinged at two places. The hinges shall be of such construction that the door can swing open by not less than 150 deg. The door shall also be provided with suitable size best quality mortise lock. The complete box shall be fabricated in such a way that when closed it shall be perfectly water tight, dust proof and vermin proof and enclosure shall conform to IP 55 as per IS: 2147.

All marshalling boxes shall be provided with necessary fixtures for fixing the cable entry and exit pipes with check nuts on all the sides of the marshalling box and accessories.

v) **TERMINAL BLOCKS**:

The materials used for the terminal blocks shall possess excellent mechanical and electrical properties. The terminal blocks shall be rigid and shall withstand handling while making repeated terminations. The terminal blocks shall be of stud type (Bolt and nut type) and shall be suitable for 16 sq. mm cable of reputed make. Each unit shall be complete with copper terminal studs, nuts and washers together with label carriers, with blank label strips and suitable cable lugs. The terminal block shall be mounted on galvanized rolled steel strip of sufficient length and size which acts as a support bar for fixing on hylem sheet of 10 mm thick brass studs. Each terminal block shall be suitably numbered. Spare terminals shall also be provided for future use.

Then terminal studs, nuts, washers and links shall be made of best quality copper and shall be suitable for copper conductor of size 16 sq. mm.

Sufficient quantity of suitable size cable lugs for copper conductor of size 16 sq. mm shall be supplied.

All terminal blocks shall be designed for voltage rating of 1100 volts and continuous current rating of 25 A, AC or DC.

The terminals shall be of good mechanical construction providing adequate electrical contact for the appropriate size of the copper cable used.

Terminal connectors shall be such that the conductors may be connected by screw or other equivalent means to maintain the necessary contact pressure permanently.

Terminals shall not run or be displaced when the connecting screws are tightened and the

conductor shall not become displaced.

Terminals shall be so mounted that the appropriate wire or cable may be connected without impairing the normal performance of the unit. No contact pressure shall be transmitted through insulating material and the gripping of the conductor shall take place between metal faces.

vi) **EARTHING TERMINAL:**

Two numbers of 12 mm diameter brass bolts and nuts with spring washers for each box shall be provided by the side of the body of the marshalling box for fixing copper / GI 50x6 mm flat. The earthing terminal shall be identified by means of the sign marked, in a legible and indelible manner on or adjacent to the terminal. The terminals shall be provided inside the marshalling box for connection of earthing leads. Earthing terminal shall have provision for terminating the earthing leads from neutral connection at the inside of the box.

Suitable size cubicle heater and illuminating lamp with independent control switch shall be provided inside each marshalling box. The illuminating lamp shall be automatically switched on when the door is opened.

The auxiliary supply voltage available is 240 +/-10% V, AC.

The general arrangement and other drawings pertaining to the marshalling boxes shall be submitted. The Bill of materials shall be indicated in the general arrangement drawing of marshalling box.

vii) **TESTS AND TEST CERTIFICATE:**

The marshalling boxes shall withstand the insulation test of 2kV AC(RMS) between terminals and earth or between adjacent terminals for one minute.

All tests shall be conducted on the CT marshalling boxes in accordance with relevant IS (IS standard considered to be furnished in offer) in presence of the purchaser or his representative or else reports of the tests conducted on similar type of marshalling boxes in the last 3 years shall be submitted.

viii) PAINTING:

The marshalling boxes shall be painted both inside and outside so as to with stand highly humid atmosphere. The tank as well as top metallic shall be hot dip galvanized or painted Grey color as per RAL 9002.

GENERAL NOTES FOR METERING CTs/PTs AS PER GETCO REQUIREMENTS

a) All CTs and EMPTs must be provided with stainless steel bellows and no nitrogen gas filling or rubber gasket will be acceptable in case of 220kV class of voltage.

b) Copies of all type test certificates in respect of sample CT and EMPT as specified under

Cl. No. 9.1.1 of IS: 2705 (Part-1) for CTs and Cl. No. 9.1.1 of IS:3156 (Part-1) for PTs, of similar class of accuracy, similar design, rating and technical specification conducted on prototype sample by the supplier at any Govt. or Govt. approved test house (within 5 years) shall have to be submitted for approval at DISCOM Corporate Office before procurement/ placement of procurement orders.

c) All the CTs procured and to be installed for tariff metering purpose shall have to be tested at ERDA, Vadodara/NABL accredited laboratory for all routine tests as specified under Cl. No. 9.1.2 of IS: 2705 (Part-1) including the test for 'ISF' as per Cl. No: 7.1.2 of IS:2705 (Part-2). The copy of OGA drg, name plate drg and the secondary terminal drgs of the above CTs shall have to be submitted to DISCOM Corporate office for final approval.
The original along with one copy of the ERDA routine test certificates along with the ERDA test certificate for the ISF test shall have to be submitted for final approval before actual commissioning of CTs at site.

d) Routine testing of all EMPTs as specified under Cl. 9.1.2 of IS: 3156 (Part-1) shall have to be arranged at supplier's works provided the supplier has NABL accredited lab facility to ensure all the tests. Otherwise, the EMPTs will have to be tested at ERDA or equivalent NABL accredited lab. The acceptance tests will have to be witnessed by GETCO at supplier's works. The accuracy test on PTs shall not be conducted with simultaneous burden of all cores, instead the tariff metering core shall be tested separately for 10VA and 2.5VA burden, i.e., as per Cl.No.5 of IS: 3156 (Part-II). The original with one copy of the acceptance test certificates (witnessed and signed by GETCO officer) shall have to be submitted for final approval before actual commissioning of the same. Copy of OGA, name plate drg and secondary terminal box drg shall have to be submitted for necessary approval along with the acceptance test certificate.

5.6.4: LIGHTNING ARRESTOR:

Arrestor rating: 198kV, 10kA, Class-3.

(1) Type: Metal oxide Gapless lightning arrestor
(2) Standard: IS 3070 (part-1 to 3) 1993 & IEC 60099-4 of 2004
(3) Minimum acceptance tests that shall be witnessed by BHEL
  (a) Power frequency reference voltage test at 3mA
  (b) Partial discharge test at MCOV x 1.05
  (c) Lightning impulse residual voltage test at 100% NDC
  (d) Functional tests on surge monitor
  (e) Galvanization test on exposed metal parts
    - Uniformity, mass, thickness of Zn coating
  (f) Visual examination and dimensional verification

198 KV ZINC OXIDE LIGHTNING ARRESTERS

TYPE AND SYSTEM DATA

The lightning arresters shall be of 198 KV, gapless zinc oxide and suitable for outdoor operation without protection from sun and rain.

STANDARDS:

The lightning arresters and associated accessories shall conform to the requirement of the latest IS: 3070(Part-I to III), IEC: 60099-4 for the gapless zinc oxide lightning arresters.

DEFINITIONS:

For the purpose of this specification, all technical terms used herein shall have the meaning as defined in IS: 3070 (Part-I to III), IEC: 60099-4 for gapless zinc oxide lightning arresters with latest revision thereof, if any.

CONSTRUCTIONAL FEATURES

i) Surge Arresters shall be of the hermitically sealed type of self-supporting construction. They shall have adequate thermal discharge capacity for severe switching surges, long duration surges and multiple strokes. The surge arresters shall be provided with pressure relief devices and shall be capable of withstanding the internal pressures developed during the above discharges without operation of the pressure relief devices or should safely vent the internal pressures associated.

ii) Insulators shall be of porcelain having adequate mechanical strength and rigidity, for satisfactory operation under climatic conditions at site. Porcelain shall be finely glazed and shall be free from imperfections.

iii) Arrester shall be suitable for installation in effectively earthed system. Surge monitor shall be provided for each phase unit and the same shall be mounted at eye level height to facilitate easy reading of the counter mechanism. A leakage current detector as an integral part of the discharge counter shall be supplied. The value of leakage current beyond which the operation is abnormal shall be clearly marked in red colour on the detector.

iv) Arresters shall incorporate anti-contamination feature to prevent arrester failure, consequent to uneven voltage gradient across the stack in the event of contamination of the arrester porcelain.

v) Grading resistors and/or grading capacitors and grading rings shall be provided for uniform voltage distribution between the units making up the arrester as dictated by the voltage class of the arrester.

vi) The arrester shall be mounted on an insulating base. No radio interference shall be caused by the arresters operating at the normal rated voltages. Insulated copper conductor of adequate size and length shall be used for connecting discharge counter terminal and surge arrester earth terminal. Insulation level of the same shall not be less than 5 kV. Suitably sized bypass copper shunts shall be provided for bypassing the discharge counter for removal/ maintenance of the counter.

vii) Supporting structures, terminal connectors, grading ring and other components shall form part of the arresters. All metal parts shall be of non-rusting and non-corroding metal. Bolts, screws and pins shall be provided with lock washers, keys or equivalent locking facilities. All similar parts, particularly removable ones shall be interchangeable. Self-contained **discharge counter**, requiring no auxiliary battery supply shall be provided for each single pole unit. The terminals shall be robust and shall be located such that incoming and outgoing connections could be made with minimum possible bends. Suitably sized by-pass shunts of copper to facilitate by-passing the discharge counter shall be designed and supplied. The design of the terminal connectors shall permit the connection of these units.

viii) The arresters shall be provided with pressure relief diaphragm at both ends. Corona rings

wherever used shall be of non-magnetic materials.

ix) Lightning arresters shall be gapless metal oxide hermetically sealed type, of self-supporting construction and base mounted suitable for mounting on steel structures. They shall have adequate thermal discharge capacity for various types of surges. The lightning arresters shall be capable of withstanding the internal pressures developed during discharges without operation of the pressure relief devices or should safely vent the internal pressures associated with arrester failure without shattering

x) Insulator housing shall be porcelain having adequate mechanical strength and integrity. Arrester housing shall withstand short circuit, wind, seismic and other forces during operation.

RECTANGULAR WAVE SHAPE CURRENT

The arrester shall withstand surges of low magnitude rectangular wave shape currents of long duration arising from switching surges or accumulation of static charges from atmosphere.

INSULATING CASING:

The insulating casing shall conform to relevant IS standards (IS standard considered shall be indicated in the offer) with latest amendments. Insulating casing shall be made of wet process, non-porous electrical porcelain, free from imperfection and moisture absorption, vitrified and finished with brown glaze and designed to keep the insulator surface from contamination by natural action of wind and rain. The leakage distance along with external surface shall be large to ensure that the surface contamination likely to deposit in the specified weather conditions shall minimize radio interference.

The complete bushing insulator casing per pole of the arrester shall withstand the following insulator insulation tests:

i) Insulation class of bushing : 245 kV
ii) Power frequency withstand
   1 Min dry : 460 kV rms
   1 Min wet : 460 kV rms
iii) 1.2 / 50 micro second wave : 1050 kV peak

NOTE: The insulator of each unit arrester of which the pole arrester is stacked shall withstand pro rata voltage specified above in proportion with the ratio of the number of elements housed in the unit arrester to the total number of them in each pole arresters.

TYPE OF MOUNTING

Lightning arresters shall be suitable for mounting on steel support structures to be supplied. The necessary flanges, foundation bolts or clamp, nuts washers etc., for the base of arresters shall be supplied and these shall be hot dip galvanized. Insulating bases required for mounting of the arresters with attachment of surge counters shall be supplied.

GALVANISED SUPPORT STRUCTURES

The contractor shall supply along with the LAs all the support structures and foundation bolts, nuts and washers required. The galvanized steel support structures shall in general conform to the latest edition of IS 2629.

FITTINGS AND ACCESSORIES:

i) Arresters shall be complete with insulating base for connection of discharge counter and provision for bolting to the supporting structure (pedestal).

ii) Self-contained discharge counter, suitably enclosed for outdoor use weather and waterproof and requiring no external supply shall be provided for each 60 kV arrester. The discharge counter shall have a glass window. Suitably sized links of copper to facilitate bypassing of discharge counter shall be provided. The terminal connectors shall have provision for connection of these links.

iii) The conductor between lightning arrester earth terminal to the discharge counter terminal shall be insulated for a minimum of 4 kV and required length of insulated conductor shall be supplied along with the arrester. It shall not require sealing ends or plumbed joints at their ends for terminations.

iv) A leakage current detector as an integral part of the discharge counter shall be supplied.

v) Arresters shall be supplied with clamps/connectors on line terminal, earth terminal and the discharge counter terminals along with galvanized steel support structures with bolts, nuts etc., including foundation requirements. Suitable bimetallic type connectors, if any, to receive ACSR conductor shall be provided and shall be suitable for both horizontal and vertical connections.

GUARANTEED TECHNICAL PARTICULARS:

The surge arrestors supplied shall comply with Guaranteed technical particulars as indicated below.

1	Rated voltage	245 kV
2	Nominal System voltage	220 kV
3	Rated frequency	50 Hz
4	System neutral earthing	Effectively earthed
5	Installation	Out door
6	Type of disconnect	Gapless
8	Rated Arrester voltage	198kV
9	Nominal Discharge current of 8/20 Microsecond Wave shape	10 kA
10	Minimum discharge capability	5kJ/kV (referred to rated Arrester voltage corresponding To minimum discharge characteristics.
11	Max. switching Lightning residual voltage (1kA)	500kVp

	Max.residual voltage at nominal discharge Current 5 kA 10kA	60kVp 600kVp
12	Max. steep current impulse residual voltage at 10kA.	650 kVp
	Impulse current with stand	
	a) Low current long duration discharge class (asperIEC99)	Class 3.
	b) High current short duration test value(4/10-microS.Ware)	As per IEC
13	Low current long duration test value	Class 3.
	Virtual duration of rectangular wave	Asper IEC99
	Pressure relief class	Class A
14	Withstand test voltages	
15	One minute power frequency dry& wet	460 kV rms
	1.2/50 micro-second impulse	1050 kVp
16	Accessories for each arrestor • Discharge Counter (Digital type) • Grading Rings • Leakage Current Detector • Insulating Base • Bypass Cushunt for Counter for maintenance	Tobe provided To be provided To be provided To be provided To be provided
17	Particulars of insulators	
	a) Creepage distance (mm)	31mm/kV
	i) Total	To be furnished by vendor
	ii) Protected	At least 50% of total Creepage distance
	b) Dielectric strength(kV)	Wet: and Dry: To be furnished by vendor
	Minimum prospective symmetrical fault current	40kA for 3sec.
	Current for pressure relief test	40 kA rms

5.6.5 REQUIREMENT OF AUXILIARY / MISCELLANEOUS ITEMS:

Clamps and Connectors.

The clamps and conductors shall be made of materials listed below. Clamps &connectors shall be wedge type only.

Bolted Type Connection For connecting ACSR/AAAC/ conductors, Aluminum Terminal: **- Aluminum alloy coating conforming to designate A6 as per IS 617**

For connecting equipment terminals made of Copper or brass to ACSR conductor**: - Bimetallic connectors of Electrolytic grade copper, forged with crimping facility to connect and tinned ACSR/AAAC jumper.**
Crimping Type Connection For connecting ACSR/AAAC/ conductors, Aluminum Terminal: **-** Electrolytic grade aluminum
For connecting GI shield wire: **Malleable iron casting**
Bolts, nuts, plain washers and spring washers and spring washers for above: - **Hot dip galvanized mild steel of ultimate strength**
For copper to copper, copper to brass or brass to brass conductors: - **Copper alloy**

Hardwares:-

Except where otherwise specified nonmagnetic bolts shall be used. Bolts shall be of sufficient strength to withstand without bending, the stresses introduced in them, when they are stressed to their rated strength. The bolts shall be readily removable after the fittings have been so stressed. Locking and split pins shall be of hard drawn brass, bronze or stainless steel. All castings shall be free from blow holes, cracks and other casting defects.

All current carrying parts shall be designed and manufactured to have minimum contact resistance.

Fittings intended to connect two dissimilar metals, shall be designed to avoid harmful bimetallic corrosion under service conditions. Minimum breaking strength of insulator hardware shall not be less than that of insulator connecting string. Where parallel insulators are used, base plates at the top and bottom shall be of sufficient strength.

Insulators / Bushings

Insulators/bushings shall conform to applicable standards and shall be made of homogeneous vitreous porcelain, the glazing of which shall be of uniform brown or dark brown colour. Oil filled insulator/bushings shall be hermetically sealed to prevent ingress of moisture. A cushion of nitrogen gas shall be provided to allow for expansion. Bushings systems shall be provided with grading rings and arcing horns.
The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed.

Under surfaces and grooves shall be shaped for easy cleaning. Shells shall be substantially symmetrical in shape without appreciable warping. Tie wire grooves of pin insulators shall be formed to provide a firm support for the conductor and permit the making of a secure tie.

Insulators shall have compression type glaze with a good lustre and of uniform brown colour. The glaze shall be unaffected by sudden changes in temperature and by atmospheric pollution of ozone, acids, alkali, dust etc.

Insulators shall be designed to avoid excessive concentration of electrical stresses in any section or across leakage Surfaces. Design features which increase radio interference level shall be avoided.

Strain and suspension strings shall comprise of the conventional ball and socket type disc insulators. Individual insulators as well as strings of the same type shall be interchangeable with one another and it shall be possible to form either suspension or strain strings using the same disc. The locking clips shall be made of phosphor bronze and shall provide positive locking of the coupling.

Bus bars

a) Aluminum tubes shall comprise hard drawn aluminum with minimum 61% IACS conductivity Copper tubes shall comprise hard drawn copper with minimum 98% IACS conductivity at 20 Deg C.

b) The tube size offered shall be as per standard metric Extra Heavy pipe size.

c) The tubular bus conductors shall have adequate strength to withstand mechanical forces due to short circuit currents. The tubular bus conductor temperature when carrying full load current shall not exceed 75 Deg C for aluminum tubes and 80 Deg C for copper tubes, for the specified ambient temperature.

d) For corrosive atmosphere necessary treatment for the tubular bus conductor to make it free from corrosion shall be provided.

Bus bar Protection

Contractor shall consider Bus bar protection of the transformer bay and same to be integrated/hook up with existing Bus bar protection scheme/system. Bidder to match this protection with existing protection scheme and accordingly detailed engineering shall be carried out.

Lockout relays one per feeder for tripping the feeder on operation of bus bar protection and breaker fail protection shall be provided.

CIRCUIT BREAKER PROTECTION

- Over Current
- Earth fault
- Under voltage & over voltage protection
- Under frequency & over frequency
- SF6 gas pressure low (where applicable)
- DC supply failure

Protection System

I) A separate relay panel housing all the protective relays, auxiliary relays, timers shall be provided.

ii. All the protective relays, auxiliary relays, timers etc. for protection system of each feeder shall be housed in simplex type of relay panel meant for each switchyard feeder.

iii) All relays shall be of numerical feeder management relays with programming and communication facility with IEC 61850 protocol.

iv) The relays shall be suitable for communication with SCADA and shall be provided with required hardware/ software. All auxiliary relays, timers, supervision and monitoring relays, auxiliary voltage transformers, auxiliary current transformers DC power supply and any other equipment/ components required for making the offered scheme complete shall be provided. The protection system shall be coordinated with local Electricity board. Minimum requirements of protection.

v) The numerical relays shall have built in event recorder and disturbance recorder. Relays shall have continuous self-monitoring and diagnostic feature.

vi) For numerical relays, necessary software and hardware to up/down load the data data to from the relay from/to the personal computer shall be installed in the substation.

vii) The protection system shall be coordinated with GETCO also.

Transformer Protection: -

Triple pole, high speed, biased differential numerical protection relay with restraining features to prevent mal-operation due to second & fifth harmonics. The relay shall also offer restricted earth fault protection. Relay shall be provided with required number of bias inputs and internal vector group compensation & ratio correction. A triple pole high set instantaneous overcurrent relay shall also be provided.

Single pole IDMT relay for over fluxing protection with an adjustable setting to match the V/Characteristics of transformer shall be provided.

A multifunction numerical 3 phase and earth fault over current relay (50/51 and 50/51N), circuit breaker fail protection, output latching relay, selective relay scheme logic, event records, disturbance records & communication facilities shall be provided for back-up protection of transformer feeders. Main and back up protection shall be offered in separate relays.

Minimum protections required are listed as below:

Power Transformer

- Overall differential protection for generator and transformer
- HV restricted earth fault protection
- HV backup directional over current protection
- HV backup directional earth fault protection
- Bucholz protection
- Oil/winding temperature protection
- Over fluxing protection
- Pressure Relief Valve
- Oil surge protection
- Fire protection

Protective Relays

i. The Solar PV system and the associated pooling system, interconnections should be protected as per IEC 61727 Ed.2, norms. Over current relays, reverse power relays, differential protection relays and earth fault relays have to be essentially provided. All relay should be numerical type & should be remote operating and controlling facility from the control room.

ii. The numerical relays shall have RS 485 port for communication.

iii. The operating voltage of the relays shall be 110 V DC/220 V DC as per battery bank rating.
iv. The power transformer and its Bay shall have 220 V DC control supply system.
v. Detailed Design calculations shall be provided on fault power computations and the philosophy of protective relaying with respect to short circuit kA calculations. Design, drawing, relay coordination and model of protection relay shall be approved by the Company/Electricity Authority (GETCO).

Control panel & Relay Panel Specifications

i. The control panel & relay panel shall be free standing, simplex type, floor mounting type, fabricated from 2 mm thick MS sheet for main enclosure and 1.6 mm thick MS sheet for internals and partitions. The main enclosure shall be mounted on a base frame fabricated out of 100x50 ISMC mild steel section.
ii. The enclosure external finish color shade shall be decided by the Company; the internal surface shall have a glossy white finish all over.
iii. The control & relay panel shall contain the following metering and protection devices:
 Metering, Indications & Controls
 Ammeter – 0 – ……..A
 Ammeter selector switch
 Voltmeter – 0 – 12/36/250 kV
 Voltmeter selector switch
 Load manager to display the following parameters: MW, MVA, MVArh, MVAr Cos Ø, Hz,
 Indication lamps for R, Y, B phases, Breaker ‘ON’ (R), Breaker ‘OFF’ (G), Breaker ‘TRIP’ (A), Spring charged (W), Trip Circuit Healthy (B)
 TNC switch, spring return to neutral position shall be provided for circuit breaker operation.
 Local / Remote selection switch for circuit breaker operation
 Semaphore indicators (LED type) for CB and Isolator ‘Open’ & ‘Close’ positions
 Mimic diagram for the 220KVand 33kV systems with aluminum strips and ‘ON’ ‘OFF’ indications for isolators

BAY MARSHALLING BOX

Bay Marshaling Box located at a convenient location to receive and distribute cables shall be provided as required. It shall meet all the requirements as specified for cabinets/boxes.

It shall have three separate distinct compartments for following purposes:
-To receive two incoming 415V, three phase, AC supplies controlled by 100A four pole MCBs with auto changeover provision, and to distribute five (5) three phase ac supplies controlled by 32A four pole MCBs. It shall also be provided with 63A, 3 phase 4 pin industrial grade receptacle with rotary switch. Ratings are indicative and shall be finalized during detailed engineering.
-To receive three phase incoming from first compartment and to distribute ten (10) single phase ac supplies controlled by 16A two pole MCBs.
-150 nos. terminal blocks in vertical formation for interlocking facility.

AUXILIARY SWITCH FOR CIRCUIT BREAKERS

The auxiliary switch shall conform of following type tests:

Electrical endurance test - A minimum of 1000 operations for 2A. D.C. with a time constant greater than or equal to 20 milliseconds with a subsequent examination of mV drop/ visual defects/ temperature rise test.

Mechanical endurance test - A minimum of 5000 operations with a subsequent checking of contact pressure test/ visual examination

Heat run test on contacts

IR/HV test, etc.

Type tests

All equipment with their terminal connectors, control cabinets, main protective relays, etc. as well as insulators, insulator strings with hardwares, clamps and connectors, marshalling boxes, etc., shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with the requirements stipulated under respective equipment sections.

5.7 INSTALLATION

1) EARTHING & Lightning Protection

The switchyard grounding system shall be in accordance with IEEE Standard 80, "Safety in Substation Grounding", and will have a buried ground grid consisting of copper or copper clad steel conductors or MS conductor and ground rods, as required. Soil Resistivity measurement at Switchyard is in the scope of the Contractor

The earth mat shall be extended 2 m. beyond fence for the switchyard. The earth mat of main plant shall be interconnected with 220kV switchyard as well as with outdoor plants.

The earth mat shall be designed for short time rating of 3 second rating and shall be considered for calculation of step & touch potential. System fault current to be considered is 40 kA.

4Auxiliary earthing mat of 1500mm x 1500 mm size comprising of closely spaced conductors at 300 mm x 300 mm spacing and at 300 mm below ground shall be provided under the operating handle of 220 KV isolators. Operating handle shall be directly connected to earthing mat.

Lightning protection shall be provided by shield wires and/or lightning masts. The lightning protection system shall be designed in accordance with IS:2309/ IEEE guidelines.

The CVT and LA shall be connected to earth pit through pipe electrodes.

Lightning protection shall be provided by shield wires and/or lightning masts. The lightning protection system shall be designed in accordance with IS:2309/ IEEE guidelines.

The earthing shall be done in accordance with requirements given in Annexure-I of this section and drawing enclosed with the specifications. Earthing of panels shall be done in line with the requirements given in respective equipment section of this specification.

2) STRUCTURAL STEEL WORKS

The structural steel works shall be done in accordance with requirements stipulated elsewhere in the specification.

3) BAY EQUIPMENT

The disposition of equipment to be supplied is shown in enclosed tender drawings.

The Contractor shall prepare layout drawings and submit the same for approval of the BHEL. The approval of drg. shall not absolve Contractor from his responsibility regarding designing & engineering of switchyard and Contractor shall be fully responsible for all works covered in the scope of this specification.

4) EQUIPMENT ERECTION NOTES

a) All support insulators, circuit breaker interrupters and other fragile equipment shall be handled with cranes with suitable booms and handling capacity.

b) Where assemblies are supplied in more than one section, Contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the Contractor at his own expense. The contractor shall strictly follow manufacturer's recommendations for handling and erection of equipment.

c) The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc. Handling equipment, sling ropes etc. should be tested before erection and periodically thereafter for strength.

d) Bending of piping should be done by a bending machine and through cold bending only. Bending shall be such that inner diameter of pipe is not reduced. The pipes shall be thoroughly cleaned before installation.

e) Cutting of the pipes wherever required shall be such as to avoid flaring of the ends. Hence only a proper pipe cutting tool shall be used. Hack saw shall not be used.

f) For cleaning the inside and outside of hollow insulators only Muslin or leather cloth shall be used.

g) The rigid busbars for equipment interconnections shall have rigid connections at one end and expansion / flexible at the other end. The tubular aluminum connections shall have not more than one joint per span. Since no wastages are permissible, the bidder shall work out the cut lengths of aluminum tube based on finalized layout and dispatch the same to site without requiring BHEL approval. Corona bells shall be provided at the end of the rigid busbars.

5) CABLING

a) Cabling shall be on cable racks, in trenches, vertical shafts, excavated trenches for direct burial, pulled through pipes and conduits run clamped on steel structures etc. in accordance with the requirements specified elsewhere in the specification.

b) Cables inside the switchyard shall be laid on GI angle supports at 600mm spacing with separate tiers for control and power cables. The GI angles shall be bolted / welded to galvanized insert plates inside cable trenches.

c) Cables shall be generally located adjoining the electrical equipment through the pipe insert embedded in the ground. In the case of equipment located away from cable trench either pipe inserts shall be embedded in the ground connecting the cable trench and the equipment or in case the distance is small, notch/opening shall be provided. In all these cases necessary bending radii as recommended by the cable supplier shall be maintained.

d) Cabling in the control room shall be done on ladder type cable trays with supports at an interval of 2000mm.

e) All inter pole cables (both power & control circuit) for equipment's shall be laid in cable trenches/G.I. Conduit Pipe of NB 50/100mm which shall be buried in the ground at a depth of 300mm.

6) EARTHING FOR SWITCHYARD

Vendor shall prepare and submit the earthing layout and design for SPV side for BHEL/GSECL approval. For Substations side earthing shall be done as per GETCO requirement.

a) EQUIPMENT AND STRUCTURE EARTHING

i. The connection between earthing pads and the earthing grid shall be made by short and direct earthing leads free from kinks and splices. In case earthing pads are not provided on the item to be earthed, same shall be provided in consultation with engineer.

ii. Metallic pipes, conduits and cable tray sections for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval.

Apart from intermediate connections, beginning points shall also be connected to earthing system.

iii. Metallic conduits shall not be used as earth continuity conductor.

iv. A separate earthing conductor shall be provided for earthing lighting fixtures, lighting poles, receptacles, switches, junction boxes, lighting conduits, etc.

v. Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam, conduits, etc. and steel reinforcement in concrete it shall be bonded to the same.

vi. Cable and cable boxes/glands, lockout switches etc. shall be connected to the earthing conductor running along with the supply cable which, in turn, shall be connected to earthing grid conductor at minimum two points, whether specifically shown or not.

vii. Railway tracks within switchyard area shall be bonded across fish plates and connected to earthing grid at several locations.

viii. Earthing conductor shall be buried 2000mm outside the switchyard fence. Every post of the fence and gates shall be connected to earthing loop by one lead.

ix. Flexible earthing connectors shall be provided where flexible conduits are connected to rigid conduits to ensure continuity.

x. Equipment earthing (Riser & welding of two conductors) shall be done as per standard drawing enclosed in this part.

b) JOINTING

i. Earthing connections with equipment earthing pads shall be of bolted type. Contact surfaces shall be free from scales, paint, enamel, grease, rust or dirt. Two bolts shall be provided for making each connection. Equipment bolted connections, after being checked and tested, shall be painted with anti-corrosive paint/compound.

ii. Connection between equipment earthing lead and between main earthing conductors shall be welded/brazed type. For rust protections, the welds should be treated with red lead and afterwards thickly coated with bitumen compound to prevent corrosion.

iii. Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingression.

iv. Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.

v. All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on it. Artificial cooling shall not be allowed.

vi. Bending of large diameter rod/thick conductor shall be done preferably by gas heating.

vii. All arc welding with large diameter conductors shall be done with low hydrogen content electrodes.

c) POWER CABLE EARTHING

Metallic sheaths and armour of all multi core power cables shall be earthed at both equipment and switchgear end. Sheath and armour of single core power cables shall be earthed at switchgear end only.

d) SPECIFIC REQUIREMENT FOR EARTHING SYSTEMS

i. Earthing terminal of each surge arrester, capacitor voltage transformer and lightning down conductors shall be directly connected to rod electrode which in turn, shall be connected to station earthing grid.

ii. Earthing mat comprising of closely spaced (300mm x 300mm) conductors shall be provided below the operating handles of the isolators.

SITE TESTING AND COMMISSIONING

An indicative list of tests is given below. Contractor shall perform any additional test based on specialties of the items as per the field QP/ instructions of the equipment supplier or BHEL without any extra cost to the BHEL. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall get the list of instruments approved from the BHEL/GSECL.

6 Pre-commissioning / commissioning / State, CEIG clearances / Liaison etc.

#	Scope description
1	Pre-commissioning inspections / checks / tests, MRT tests and coordination / liaison activities with state / central departments / GETCO/ DISCOM/ CEIG/GUVNL/GEDA etc. for necessary approvals / clearances for commissioning, synchronization with grid and post-commissioning operation of Plant. (Clearances shall include obtaining prior approvals for all applicable drawings / documents etc. from concerned state / central departments / Transco/ DISCOM/ CEIG/ GUVNL/GEDA etc.). GETCO licensed contractor shall obtain necessary approvals for the 220kV SLD, its protection system, PLCC/VHF system and 220kV switchyard from CEIG/E&P Department/GoG Gandhinagar before actual commissioning of the switchyard. **Note: CEIG application, liasoning and obtaining clearance for 220 KV Switchyard and for 75 MW Solar plant is in vendor scope. All necessary documents related to solar plant side for LT/DC works will be provided by BHEL.** A Basic checks A1 Tightness checks:

			1) Terminations of HT(33kV)/LT/Control cables at 33/220kV transformer, C&R panels, ABT metering panels, marshalling boxes, bay marshalling kiosks, motor/ control boxes etc. 2) ACSR conductor terminations 3) Fasteners of all the switchyard structures: bolts/nuts/washers 4) Fasteners of transmission towers: bolts/nuts/washers 5) Fasteners at earthing chambers: bolts/nuts/washers
		A2	Electrical continuity checks
		A3	Cable megger checks: All LT cables
		A4	AC/DC power supply checks at all electrical equipment/ panels/ DBs
		A5	1. Check for physical damage. 2. Visual examination of zinc coating/ plating 3. Check from name plate that all items are as per older/ specification. 4. Check tightness of all bolts, clamps and connecting terminals using toque wrenches. 5. For oil filled equipment check for oil leakage, if any. Also check oil level and top up. 6. Check ground connections for quality of weld and application of zinc rich paint over weld joint of galvanized surfaces. 7. Check cleanliness of insulator and bushings. 8. All checks and tests specified by the manufactures in their drawings and manuals as well as all tests specified in the relevant code of erection. 9.Pressure test on all pneumatic lines at 1.5 times the rated pressure shall be conducted.
	B	Pre-commissioning electrical tests:	
		B1	33/220kV transformer
			1. Oil filtration: Equipment of adequate evacuation/ heating/ oil circulation capacity shall be deployed at site for this purpose. Filtration shall be carried out adequately in order to achieve BDV, ppm, tan delta values within the limits as per relevant standards and as measured by NABL accredited laboratory. The machine shall have built-in BDV measuring set up for in-situ checking of BDV during filtration process. 2. IR tests on windings LV-HV, HV-E, LV-E 3. BDV test on oil 4. Vector group 5. Voltage ratio 6. Tap changer operation check 7. Magnetizing current 8. Magnetic balance 9. Winding resistance at all taps 10. Capacitance, tan delta of HV/LV bushings 11. Neutral connection to earth effectively. 12. Fault simulation checks from C&R panel: Buchholz, OTI, WTI, PRV, LOLA, REF etc.
		B2	Outdoor CT

				1. Insulation Resistance Test 2. Polarity test. 3. Ratio identification test-checking of all ratios on all cores by primary injection of current. 4. Dielectric test of oil (wherever applicable). 5. Magnetizing characteristics test. 6. Capacitance and tan delta measurement at minimum 10kV.
			B3	Outdoor PT (CVT)
				1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Voltage ratio test 3) Polarity test
			B4	SF6 breaker
				1. Insulation resistance of each pole. 2. Check adjustments, if any, suggested by manufacturer. 3. Breaker closing and tripping time. 4. Slow and power closing operation and opening 5. Trip free and anti-pumping operation. 6. Minimum pick up volts of coils 7. Contact resistance 8. Functional checking of compressed air plant and all accessories 9. Functional checking of control circuits, interlocks, tripping through protective relays 10. Insulation resistance of control circuits, motor etc. 11. Resistance of closing and tripping coils.
			B5	GOS isolator / Earth switch
				1. Insulation resistance of each pole 2. Manual and electrical operation on interlocks 3. Insulation resistance of control circuits and motors. 4. Ground connections 5. Contact resistance 6. Proper alignment to minimize the vibration to the extreme possible during operation. 7. Measurement of operating torque for isolator and Earth switch 8. Resistance of operating and interlocking coils.
			B6	Surge arrestor (LA)
				1. Grading leakage current. 2. Resistance of ground connection. 3. Resistive current drawn at rated voltage after energization.
			B7	Bus post insulator / Bus tension Insulator
				Visual examination for finish damage, IR, creep age distance, etc.
			B8	Neutral CT for 33kV and 220kV sides of transformer
				IR tests
			B9	**PHASING OUT**
				The phasing out of all supplies in the station system shall be carried out.

	B10	Numerical & Electro-mechanical relays at C&R panel
		1. Relay calibration using applicable secondary injection kit/ software 2. Overcurrent/ earth fault pickup/ tripping time tests **3.** Relay Make & Model no. shall be as approved GSECL/GETCO. **4.** All relays shall be of numerical type. **5.** Sufficient numbers of inputs and outputs shall be available in BCPU and Numerical relays for providing input to annunciation and SCADA. **6.** Scope also covers other items like Event logger, time synchronizing equipment, dynamic relay test kit, furniture etc also as mentioned at relevant portions of the specification. The testing of all control & protection functions for the bays shall be the responsibility of the bidder. **7.** It shall be possible to monitor and control all the Switchyard bay equipment from the control panel in Switchyard Control Room. **8.** Interlocking to prevent unsafe operation of Switchyard equipment such as circuit breakers, isolators, earth switches etc. shall be implemented. Proper interfacing with the existing scheme shall be ensured.
	B11	Earth resistance measurements for all chambers
		1. With electrode connected to grid 2. Without connecting electrode to grid
	B12	**STATION EARTHING** 1. Check soil resistivity 2. Check continuity of grid wires 3. Check earth resistance of the entire grid as well as various sections of the same. 4. Check for weld joint and application of zinc rich paint on galvanized surface. 5. Dip test on earth conductor prior to use.
	B13	**CONDUCTOR STRINGING AND POWER CONNECTORS**
		1. Physical check for finish 2. Electrical clearance check 3. Testing of torque by torque by torque wrenches on all bus power connectors and other accessories. 4. Sag and tension check on conductors.
	B14	Transmission line U/G Cable
		Physical checking of laying & termination Checking continuity of connections I.R. Test Hi-pot test All other tests as required by GETCO / GSECL / BHEL during supervision.
	C	Testing agency
		Credentials of testing agency to be submitted to BHEL for approval prior to awarding of work.
	D	Coordination and Liaison activities to be carried out by vendor:

1. Vendor shall prepare and submit the drawings/ schemes/ layouts/ calculations (earth mat etc.) to the concerned state/central agency GETCO/ DISCOM/ CEIG/ CEA etc. for their approval after clearance from BHEL.
2. Submission of site test reports to customer (GSECL/GETCO/CEIG etc.) after obtaining approval from BHEL.
3. Preparation of application (along with supporting documents: drawings, factory test reports, site test reports etc.) to concerned agency (CEIG, GEDA, SLDC, GETCO etc.) for site inspection, obtaining signatures from customer (GSECL/GETCO) and submission to the inspection agency.
4. Coordination with customer (GSECL) and liaison with inspection agency (CEIG/GETCO/GEDA etc.) for inviting the inspectors for site inspection prior to plant commissioning.
5. Vendor shall organize inspection at site by above agency with all suitable technical and commercial arrangements. All necessary testing kits/ instruments shall be arranged as per the requirements of inspection agency. Basic instruments such as digital Multimeter, 5kV digital Meggar, earth resistance meter etc. shall be organized at site at the time of inspection. Competent electrical technician shall also be made available at the site.
6. Subsequent to site inspection, vendor shall follow-up with the inspection agency, coordinate with the customer to obtain early clearance for plant commissioning.
7. Vendor shall implement all the observations of CEIG so as to secure their final approval that is mandatory to continue with regular operation of the plant.

Notes:

1. Vendor shall take frontline lead in obtaining the clearance of inspection agency.
2. Vendor shall suitably interact with the contractors of BHEL executing the other portions of solar plant (from solar array up to 33kV sides of 33/33kV transformer) and mobilize all necessary inputs/ documents required from them in the process of getting approval of the inspecting agency for commissioning.
3. Scope of co-ordinating with concerned state/central electricity departments, Transco/ DISCOM/ CEIG/ CEA/GEDA etc. to get their clearances / approvals for licensed/ statutory operation of the power plant on a continuous basis includes all transactions required for successful liaison and clearances. Application fees and renewal fees (say, in the form of DD/ web-based online payment) to be enclosed with application/ renewal documents shall be in the scope of BHEL/GSECL. All other expenses in the above process shall be in the scope of vendor.

FINAL CHECKING before COMMISSIONING:

After completion of the works, final checking of the line shall be done by the Contractor to ensure that all the foundation works, tower erection, and stringing have been done strictly according to the specifications and as approved by the Owner. All

the works shall be thoroughly inspected keeping in view of the following main points:

a) Sufficient backfilled earth is lying over each foundation pit and it is adequately compacted.

b) All bolts are properly tightened and punched/tack welded.

c) The stringing of the conductors and earth wire has been done as per the approved sag and tension charts and desired clearances are clearly available.

d) All conductor and earth wire accessories are properly installed.

e) All other requirements to complete the work like fixing of danger plate, phase plate, number plate, anti-climbing device etc., are properly installed.

f) Wherever required it should be ensured that revetment is provided.

g) The original tracings of profile route alignment and tower, design, structural drawings, bill of material, shop drawings of all towers are submitted to the Owner for reference and record.

h) The insulation of line as a whole is tested by the Contractor by providing his own equipment, labour etc. to the satisfaction of the Owner.

i) All structures are properly grounded.

j) The line is tested satisfactorily for commissioning purpose.

k) Vendor shall organize all necessary tools/ measuring instruments required to operate the various electrical equipment's on 33kV side of power plant at the time of commissioning.

l) It is the responsibility of the vendor to interact technically with the substation for successful charging of 33kV grid lines followed by charging of 33/220kV transformer.

m) Vendor shall suitably interact with the contractors of BHEL executing the other portions of solar plant (from solar array up to 33kV side of 33/220kV transformer) to enable successful grid synchronization of inverters.

n) Vendor shall participate actively in the commissioning until it is established that there is successful flow of power through the 33kV portion of power plant following the synchronization of inverters with grid.

o) Settings:

The bidder shall provide the Employer with a philosophy document clearly setting out the philosophy the bidder will use in determining setting levels. Each setting will have a brief description of the specific function or element. The setting calculation and formula will also be shown on the document. All relevant system parameters, line data, transformer data additionally used for calculating the setting will appear in the setting document. The bidder will conduct system studies in

	determining fault levels on different locations. These study results will also form part of the setting document. Any additional information required to complete this exercise shall be timely requested by the bidder. The setting document will be presented and discussed with the Employer prior to final issue of the document. The final accepted setting document should be made available to the Employer in PDF format. It is the bidder's responsibility to configure each protection relay to provide the protection and control facilities required. A full set of relay configuration and setting files shall be included in the design and documentation submissions. The bidder will issue three sets of setting documents once accepted by the client and consultant

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

SCPV: BOS: ITB - Rev 04

INSTRUCTIONS TO BIDDERS (ITB)

Bidders are requested to read the instructions carefully and submit their quotations covering all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: SCPV: BOS: ITB – Rev 01), General Conditions of Contract (document reference: SCPV: BOS: GCC - Rev 01) and Special Conditions of Contract (document reference: SCPV: BOS: SCC: I - Rev 01/ SCPV: BOS: SCC: F - Rev 01), 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. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be 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. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. 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.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily 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 system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
8. 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 recovered from the supplier's bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**
9. 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: **www.bhel.com.**

10. 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, poor quality, 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.

B. <u>GUIDELINES FOR PREPARATION OF OFFER:</u>

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 super scribed 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 super scribed 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 at the venue/place specified or if any part of the offer is incomplete the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to super scribe 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 shall be duly filled, signed & stamped and must accompany Technical-Commercial offer without fail and should be submitted in original only. Photocopy will not be accepted. All documents submitted along with the offer shall be signed and stamped in each page by authorized representative of the bidder.
4. 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 any deviation.
5. 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.
6. 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.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all applicable taxes and duties, packing & forwarding charges (if applicable), 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.
8. In addition, bidder shall also quote for erection & commissioning charges (I&C charges), documentation charges, service charges, testing charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega

Power Projects, Export Projects, MNRE Concession or other similar projects wherein supplies are eligible for customs duty /Excise 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.

11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totalling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure VI** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. <u>GUIDELINES FOR OFFER SUBMISSION:</u>

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. **(This clause will not be applicable for e-tenders).**

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 IDs within time of submission of tender.
3. 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 to purchase officers.
4. 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. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor 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/courier 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.
   e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.
   Service provider: e-Procurement Technologies Limited (abc Procure)
   Website address: https://bhel.abcprocure.com
   Helpline no.: +91-79-68136819/809/862/867/823/872/842 (9:30 am to 5:30 pm)
   10:00 AM - 07:00 PM (Monday - Friday)
   10:00 AM-04:00 PM (Saturday)
   Purchase Executive / BHEL will not be responsible for any of the activities relating to submission of offer.

D. <u>PROCESSING OFFERS RECEIVED:</u>

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.
3. In case there is no change in the technical scope and / or specifications and / or commercial terms & conditions by BHEL, 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 of Part-1 Bid).

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 vendors, 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. Impact price means only for those items which have been impacted by addition / deletion / changes in the technical specifications or commercial conditions. The impact may be +/- incremental value of the currency in which originally quoted. The impact price bid to be submitted on the cut-off date, time & venue as specified by BHEL. The impact price bid shall be opened along with original price bid.
5. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
6. After receipt of Purchase Order, supplier should submit required documents like 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 EDN and agreed upon in the Purchase Order.
8. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL"). As per RFQ terms.
   "Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and duties, inspection charges, freight charges, test charges, insurance, service tax for services, any other cost indicated by vendor 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 Mega Projects, Physical Imports or such 100% exemptions & MNRE Exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (Wherever applicable and as indicated in SCC document of tender)
9. 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 and on the basis or evaluation of Total Cost to BHEL.

E. <u>INFORMATION ON PAYMENT TERMS:</u>

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. Statutory deductions, if any, will be made and the deduction certificate shall be issued. 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. (Applicable for Indian vendors only).Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
3. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN

Purchase Orders for indigenous procurement

(a) SUPPLY WITH I&C/SUPERVISION:

Supply:

1) 80% of basic Supply value + 100% of taxes, duties and freight charges will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later.
2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any).
3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank.

I&C/Supervision*:* 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis.

O&M: 100% O&M charges are payable as per RFQ terms against report certified by BHEL.

(b) SUPPLY ONLY:

1) 100% of Basic value with taxes, duties and freight will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later)+ submission of PBG valid for Warranty Period+ 3 months Claim Period from BHEL Consortium Bank ,if applicable.

Purchase orders for import procurement:

(c) SUPPLY WITH I&C/SUPERVISION:

Supply:

1) 80% of the basic value (excluding I&C charges) will be paid with 45 days credit, against Sight draft, from the date of AWB/BOL on submission of complete set of documents as in PO.
2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any).
3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank.

I&C: 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis.

(d) SUPPLY ONLY:

1) 100% of PO value will be paid against Sight draft with 45 days Credit from the date of dispatch or 15 days credit from the date of submission of complete set of documents whichever is later)+ submission of PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank ,if applicable.

Note for (a), (b), (c) and (d): In exceptional cases, if vendor fails to submit PBG after supplies, vendors can also accept for the final 10% payment, payable after the warranty period + 3 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable) as PBG is linked to Warranty period.

G. LOADING FACTORS FOR PAYMENT TERMS & DELAYED DELIVERY:

Loading factors as detailed below will be added to the quoted price (basic) to evaluate the lowest quote for non-compliance of BHEL standard commercial term.

Sl No	Deviation on	Nature of Deviation / Offered Terms	Loading %
1.	**Payment Terms**	**For Purchase within India :-**	
		1) Credit period less than 45 days	15
		*** For Foreign Purchase :-**	
		~~1) Payment through At Sight Letter of Credit~~	~~10~~
		~~2)Payment through Letter of Credit with usa~~ of 45 days	
		~~3) Sight Draft with credit period less than 45~~	
2.	**Penalty for Delayed Delivery**	1) Non – Acceptance	10
		2) Partial Acceptance (X%)	(10 – X)

Please see last page (Page No.9) for Loading Factors for foreign Purchase

*** All bank charges shall be to seller's account. If bank charges of BHEL banker are to BHEL's account then additional loading of 2% on the quoted basic value is applicable.**

Offer/s with payment terms other than the standard payment terms indicated at Clause No. F or Deviated Payment Terms with loading indicated at Clause No. G above are liable for rejection.

NOTES:

1. ADVANCE PAYMENT/LC: Quotations with "Advance payment/Inland LC" shall be rejected.

2. Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight and I&C charges (wherever applicable).

3. Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 10% (as applicable) of both purchase order values put together.

4. Non-Compliance of Warranty terms. Offers not complying with Warranty terms as per RFQ Terms is liable for rejection.

5. SALE IN TRANSIT/ LOCAL VAT: Sale in transit under section 6(2) of CST is allowed if movement of goods is interstate. In case intra state movement of goods, benefit of sale in transit is not available.

6. In case of intrastate movement i.e. supply within same state and VAT is applicable, the vendor shall furnish the respective BHEL's nodal agency TIN no. and address in their invoice. (Refer **Annexure IX**)

H. BANK GUARANTEE (BG) / PERFORMANCE BANK GUARANTEE (PBG):

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents. Such PBG shall be valid for a period of Warranty Period + claim period of 3 months for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
    a. PBG shall be from any of the BHEL consortium of bankers **(refer Annexure V)**.
    b. PBGs from nationalized banks are also acceptable.

c. 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. PBG should be in the format indicated. **(Refer Annexure III)**. No deviation to these formats will be allowed.

d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).

e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.

f. In case vendor does not accept for submission of PBG, the vendor is liable for rejection on commercial grounds.

I. DOCUMENTS (TRIPLICATE COPIES) REQUIRED AT THE TIME OF DISPATCH FOR PROCESSING OF BILL:

1. FOR INDIGENOUS SCOPE OF SUPPLY:

For Supply: Invoice in Triplicate, Lorry receipt (LR) copy, Packing List, PSI Call Letter Copy, Proof of delivery such as MRC (Material Receipt Certificate)/ original acknowledged LR, Insurance intimation Letter and Warranty Certificate. Note that document pertaining to Proof of delivery shall clearly mention number of boxes/panels etc which shall be in line with the Packing list.

For I&C: Supplementary Invoice in Triplicate with copy of I&C Certificate (Proof of Completion of I&C).

For PBG: Supplementary Invoice in Triplicate with copy of PBG. However, PBG should reach concerned Purchase Officer directly from the Bank.

2. FOR IMPORTED SCOPE OF SUPPLY:

For Supply: Invoice in Triplicate, Air Way Bill/Bill of Lading, Packing List, PSI Call Letter Copy, and Warranty Certificate.

For I&C: Supplementary Invoice in Triplicate with copy of I&C Certificate (Proof of Completion of I&C).

For PBG: Supplementary Invoice in Triplicate with copy of PBG. Both PBG & supplementary invoice should reach concerned Purchase Officer directly from the Bank.

J. PROVISONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES)

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 any of the following documents along with the tender documents in the Part I / Technical bid cover to avail the applicable benefits.

a. Valid NSIC certificate or

b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).

c. EM II certificate with CA certificate **(in the prescribed format given in Annexure VIII)** applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.

d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

PURCHASE PREFERENCE FOR MSE VENDORS:

e. MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 25% of the requirement against this tender provided. Minimum of 3% reservation for women owned MSEs within the above mentioned 25% reservation.

1. The MSE vendor matches the L1 price.
2. L1 price is from a non MSE vendor.
3. L1 price will be offered to the nearest vendor nearest to L1 in terms of price ranking (L2 - nearest to L1). In case of non-acceptance by the MSE vendor (L2) next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).
4. 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) and (2) are fulfilled.
5. In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 6.25% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.

6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity / items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split will be indicated in the SCC.

K. 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.

L. FRAUD PREVENTION POLICY:

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 their notice.
Fraud Prevention policy and List of Nodal Officers shall be hosted on BHEL website, vendor portals of Units/regions intranet.

PURCHASE EXECUTIVE

Clause G of ITB: Loading Factors for Foreign Purchases

Nature of Deviation / Offered Terms	**Loading %**
100% Sight Draft	1 %
100% Usance LC with 45 days credit	2.5 %
100% LC at Sight	4.5 %

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

SCPV: BOS: GCC - Rev 03

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT (GCC)

These 'General Commercial Conditions for Contract for Purchase' hereinafter 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.
e) "Bidder" shall mean duly established reputed organisation, manufacturer etc. having requisite financial and technical capability and experience of participating in the bid invited by the purchaser for the tender.
f) Bid- The term "bid" or "bidding" can also relate to the documented Offer submitted in response to a request for quotation (RFQ) /Tender.

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 unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.

2. **Validity:** The offer will be valid for a period of 90 days from the date of technical bid opening date. Validity beyond 90 days, if required, will be specified in the SCC (special conditions of contract).

3. **Taxes & Duties:** Taxes as mentioned in the Contract Price or Price Schedule shall be paid to the Contractor subject to the Contractor complying with all the statutory requirements and furnishing the relevant documents including error free invoices containing detailed break-up of the taxes. Any duties, levies or taxes not mentioned in Contract Price or Price Schedule but applicable as per any statute(s) shall be deemed to be included in the Contract price and shall be to the account of the Contractor.
   The Contractor shall bear and pay all the costs, liabilities, levies, interest, penalties in respect of non-compliances of any legal requirements as per various statutory provisions. The contractor shall keep the owner indemnified at all times from any tax liability, interest, penalties or assessments that may be imposed by the statutory authorities for non-compliances or non-observation of any statutory requirements by the Contractor.

4. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head within two weeks from the date 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 two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.

5. **Documentation:** After receipt of Purchase Order, vendor should submit required documents like 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.
   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.

6. **TERMS OF DELIVERY:**
   FOR IMPORTED PURCHASE:
   Price offered shall be for goods packed and delivered CIF Seaport/ International Airport (FCA) including packing, forwarding, Handling, Ancillary charges like processing of Sight Draft, negotiation charges of bank, Export declaration, Certificate of origin etc.
   Packing shall be Air/Sea worthy, best suitable for trans-shipment and to take care of transit damages. If containerized, no. of containers & size of container shall be mentioned. Packing weight (gross & net) Packing dimensions shall be given prior to shipment to ascertain whether the consignment can be carried on standard cargo in contract or as ODC.
   Wooden packing material for all the foreign consignments should be treated as per ISPM-15 & Fumigation / Phytosanitary certificate to be submitted to the freight forwarders/ BHEL along with the invoice, B/L, packing list etc.
   Vendors shall indicate the name of International Airport/Seaport. The consignment shall be handed over to BHEL approved freight forwarder as mentioned in PO.

FOR INDIGENOUS PURCHASE:

Equipment shall be delivered on "FOR SITE" basis, inclusive of freight, packing, insurance & forwarding charges.

Packing shall be Road / Rail / Air / Sea worthy, best suitable for transhipment and to take care of transit damages. Smaller consignments can be dispatched through Courier services/ RPP with the prior approval of the purchasing Executive.

Deviation for the delivery term is liable for rejection.

7. Penalty:

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 document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. 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 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.

8. **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 applied to 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.

9. **Reverse Auction:** BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non- consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

10. **Pre Shipment Inspection:** Prior written notice of at least one week 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.
    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.

11. **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 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.

12. **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 Phytosanitory / 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 (L x B x H) 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.
    Separate packing & identification of items should be as follows.
    1. Main Scope - All items must be tagged with part no. & item description.
    2. Commissioning spares - All items must be tagged with part no. & item description.
    3. Mandatory spares - All items must be tagged with part no. & item description.

13. **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.

14. **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.

15. **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 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.

16. **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.

17. **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.

18. **Shortages:** In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost.
    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.

19. **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.

20. **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.

21. **Product Information, Drawings and Documents:** 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.

22. **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.

23. **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.

24. **Guarantee / Warranty:** Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. The guarantee / warranty period as described shall apply afresh to replaced, repaired or re-executed parts of a delivery. If the vendor fails to take proper corrective action to repair/replace defects satisfactorily within a reasonable period, Purchaser shall be free to take corrective action as may be deemed necessary at vendor's risk and cost after giving notice to the vendor, including arranging supply of goods from elsewhere at the sole risk and cost of the vendor. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable guarantee / warranty period.

25. **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.

26. **Liability during guarantee / warranty:** Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / 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 first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.

27. **Liability after guarantee / warranty period:** At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues notices after the

guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / as specified in RFQ.

28. **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.

29. **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).

30. **Arbitration Clause:** In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract.
    Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
    The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.

31. **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.

32. **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.

33. Vendors shall provide their state wise list of GSTIN number as per Govt of India Statute.

34. If the vendor is below the threshold limit, viz Rs.20. lacs as per existing provisions, then a declaration to be provided to that effect along with copy of accounts, failing which the supplier will be treated as an Unregistered dealer (URD) for which tax is payable on reverse charge (RCM) by BHEL.
35. If the vendor is above the threshold limit & is yet not registered, GST is payable by BHEL on reverse charge basis.
36. All supply items are linked to HSN code (Harmonised System Nomenclature). This goods list is mapped with HSN code which is released by Govt of India & available in public domain. All registered suppliers submitting the quote shall mandatorily mention HSN code relevant for the goods quoted.
37. Under GST, Govt of India has linked every service to a service accounting code called SAC. The list of services and the corresponding service accounting code (SAC) is released by Govt of India & available in public domain. All registered suppliers submitting the quote shall mandatorily mention SAC code relevant for the service quoted.
38. The rate of tax applicable for 35 services is also released by Government and rate for any service not falling in the list of 35 services is 18% .
39. Invoice should contain all particulars as per invoice Rules and should include the GST registration number (GSTIN) , service accounting code (SAC) apart from all other details mentioned.
40. Invoice should contain all particulars as per invoice Rules and should include the GST registration number (GSTIN) , HSN code apart from all other details mentioned.
41. In case GST is payable on reverse charge (RCM) invoice should mention that tax is payable on reverse charge
42. For a registered supplier, the supplier uploaded sales data for the month will be available to recipient on 11th of the subsequent month & details can be verified by BHEL. Credit availment can be confirmed based on this verified data
43. If the Supplier is not registered, then tax is payable on Reverse charge & will be to the account of the supplier
44. All services in the course of business or furtherance of business are eligible to credit subject to other compliances listed herein.
45. If service is eligible for credit, then the credit can be availed only if the invoice is as per the prescribed format, the supplier has uploaded the invoice in the GSTN portal, paid the taxes & uploaded the return, and matches with our inward data, failing which any availment of credit attracts interest.
46. Even in case of services where credit is not eligible,

    (i) either the supplier should have registered (if above threshold limit) & comply with all above statutory provisions relating to invoice, tax remittance, return filing etc. This can be verified by BHEL from the GSTN portal OR
    (ii) if not registered BHEL shall be liable to pay applicable taxes on reverse charge

47. For any deficiency in services, where a recovery is made / adjusted in supplier bills, the supplier has to raise a credit note on BHEL & upload in GSTN portal. All above rules applicable for invoice also apply for credit note.
48. All notifications and rules as per central board of excise and customs will be applicable.

ANNEXURE - I

LIST OF INTERNATIONAL GATEWAY AIRPORTS

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
DO6	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 - II

REQUEST FOR C FORM

NAME OF VENDOR :

VENDOR CODE ALLOTED BY BHEL :

E mail id for c form correspondence :

BHEL PO NO	INVOICE NO	INVOICE DATE	INVOICE AMOUNT	SUPPLY FROM - STATE	SUPPLY TO - STATE	CST TIN NUMBER (SUPPLIER)	INVOICE AMOUNT EXCLUDING FREIGHT	C FORM QTR	YEAR	SUPPLY TO BHEL EDN / SITE

Please note that one 'C' form will be issued for a quarter.

Any modification and cancellation of c form is not possible from our end since it is generated online therefore include all invoices pertaining to quarter in your request
Also check the data are correct in all respect

General Instruction:
1. C form request should be given only in this file.
2. Amount should be 100% of Invoice value but should Not include freight, Insurance etc.
3. PO No. should be numeric, starting with 4 and has 10 digits
4. For every quarter separate file to be provided
5. All Invoices pertaining to the relevant quarter to be included.
6. No corrections will be entertained once c-form is issued.

ANNEXURE D

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 até é é é é é ..(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 Noé é é é é é é dated é é é é é é é é é é é é é .[3] valued at Rsé é é é [4] (Rupees ----------)/FCé é é é é é (in wordsé é é ..) for é é é é é é é é é é [5] (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to é é % (é . Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, é é é é é é é , (hereinafter referred to as the Bank), having registered/Head office at é é é é é . and inter alia a branch at é é é é 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 the é é é é é é é é bank 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.

We é é é é é ..BANK 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 includingé é é é é é é é é é .. [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 the é é é é é é é é é é é .[8]we shall be discharged from all liabilities under this guarantee thereafter.

We, é é é é é é 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 exceedé é é é é é é é é [6]
b) This Guarantee shall be valid up to é é é é é é [7]
c) Unless the Bank is served a written claim or demand on or before _____[8] 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)

Datedé é é é é é .

Place of Issueé é é é é é .

[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

Note:

1. Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.

2. The BG should be 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/Contractor/Supplier /Bank issuing the guarantee.

3. In line with the GCC, SCC or contractual terms, Unit may carry out minor modifications in the Standard BG Formats. If required, such modifications may be carried out after taking up appropriately with the Unit/Regionôs Law Deptt.

4. **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 the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

      b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified 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 Bankôs (BHELôs Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

      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** will 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). The BG Format provided to them should clearly specify the same.

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 swift Code(applicable for EFT only)
8 Bank IFSC code(applicable for RTGS)
9 Bank IFSC code(applicable for NEFT)

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 / transfering 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 resposibility 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 Querry, please call : 080-26998xxx / 2674xxxx or fax no. 080-2674xxxx

List of Consortium Banks

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

ANNEXURE - VI

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 discrepancybetween the unit price and the total price (which is obtained by multiplying the unit price by thequantity), the unit price shall prevail and the total price corrected accordingly, unless in theopinion 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 - VII

BENEFITS FOR MSE SUPPLIERS AS PER MSMED ACT 2006 AND PUBLIC PROCUREMENT POLICY 2012

MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of Acknowledgement in EM II).

Or

Valid NSIC certificate or EM II certificate along with attested copy of CA certificate (Format enclosed: ANNEXURE VIII) where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited).

Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid).

Non-submission of such documents will lead to consideration of their bid at par with other bidders.

No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazette officer.

ANNEXURE - VIII

CERTIFICATE BY CHARTERED ACCOUNTANT ON LETTER HEAD

This is to certify that M/s …….……
…… ……..(Hereinafter referred to as `Company') having its registered office at …….. is registered under MSMED Act 2006, (Entrepreneur Memorandum No ((Part-II) …… dtd …… Category: …… (Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year **…….. as per MSMED Act 2006 is as follows:**
1. For Manufacturing Enterprises: Investment in plant and machinery (i.e., original cost excluding land and building and the items specified by the Ministry of Small Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:
Rs. ……..Lacs.

2. For Service Enterprises: Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
Rs. ……..Lacs.

The above investment of Rs. …… Lacs in within permissible limit of Rs…… Lacs for……..Micro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

(or)

The company has been graduated from its original category (Micro/Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is ……(dd/mm/yy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O.No.3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:
(Signature)
Name -
Membership Number -

Seal of Chartered Accountant

Public Procurement (Preference to Make in India)

"For this procurement, Public Procurement (Preference to Make in India),Order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and /or local content in respect of this procurement, same shall be applicable."

Arbitration Clause in case of Contract with contractors/vendors /consultants 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 contractors/vendors /consultants when they are 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.''

Self-Certification

In line with Government Public Procurement Order No. P-45021/2/2017-BE-II dt. 15.06.2017, P-45021/2/2017-PP (BE-II) dated 28.05.2018 and P-45021/2/2017-PP (BE-II) dated 29.05.2019, we hereby certify that

……

(Supplier name) are local supplier meeting requirement of minimum local content (50%) defined in as above orders for the material against Enquiry No

……

……

……

Details of location at which local value addition will be made is as follows:

……

……

……

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

Seal and Signature of Authorized signatory with date

ANNEXURE C

List of Documents to be submitted by Vendors/Subcontractors for SPV Contracts.		Confirmation on submission	DEVIATION OR REMARKS
IR Documents (Type - A): For all Civil & I&C & O&M			
Sl No.	**Documents**		
1	Wage Sheet (Form 17)	YES	
2	Attendance Register (w.r.t Sl No.1)	YES	
3	Workman Policy & Additional Insurance (Automotive Liability, Group Service Insuarnce Policy etc	YES	
4	PF Challan	YES	
5	ESI (Employee State Insurance)	YES	
6	ECR (Electronic Challan Receipt)	YES	
7	Bank Statement for PF deposit	YES	
8	RCS (Remittance Confirmation Slip)	YES	
Quality Documents (Type - B): For all MMS Civil Works			
Sl No.	**Documents**		
1	FQA (Field Quality Assuarance)	NA	
2	Field Content, Slump Test	NA	
3	Gradiation of Aggregate (10mm, 20mm)	NA	
4	Fine Aggregate Test (for Sand)	NA	
5	Cube Test Registered	NA	
6	Material Test Certificate for Steel & Cement	NA	
7	Consumption Register for Steel & Invoice	NA	
8	Pour Card for Concreting purpose	NA	
9	Royalty Reports (10mm, 20mm, Sand)	NA	
10	Sand Soundess Test Reports	NA	
11	Slump Test Register	NA	
12	Sieve Analysis, Flakiness Index, Elongation Index - Register to be maintained	NA	
13	Moisture Content Coarse and Fine Aggregate - Register to be maintained	NA	
14	Water Test Report for Concrete	NA	
15	Design Mix Report for Concrete	NA	
Quality Documents (Type - B): For all Civil related Works			
Sl No	**Documents**		
1	FQA (Field Quality Assuarance)	NA	
2	Field Content, Slump Test	NA	
3	Gradiation of Aggregate (10mm, 20mm)	NA	
4	Fine Aggregate Test (for Sand)	NA	
5	Cube Test Registered	NA	
6	Material Test Certificate for Steel & Cement	NA	
7	Consumption Register for Steel & Invoice	NA	
8	Pour Card for Concreting purpose	NA	
9	Royalty Reports (10mm, 20mm, Sand)	NA	
10	Sand Soundess Test Reports	NA	
11	Warpage of Bricks Test Reports	NA	
12	Core Cutting (Compaction Test) - Roads & Pathways	NA	
13	Slump Test Register	NA	
14	Sieve Analysis, Flakiness Index, Elongation Index - Register to be maintained	NA	
15	Moisture Content Coarse and Fine Aggregate - Register to be maintained*	NA	
16	Brick Test Reports	NA	
17	Plastering profile and thickness	NA	
18	Compaction test beneath floor of all buildings. - Reports	NA	
19	Test Certificates for Paint, Glan, Glazing, etc.	NA	
20	Test Certificates Aluminium Section for doors and windows (Anodisation Certificates also)	NA	
21	BBS for Buildings	NA	
22	Water Test Report for Concrete	NA	
23	Design Mix Report for Concrete	NA	

Quality Documents: for Electrical & Mechanical Installation Works (BOS)			
Sl No	Documents		
1	FQA (Field Quality Assuarance)	YES	
2	Inspection Reports	YES	
3	Guarantee Certificates	YES	
4	Factory Acceptance Test Reports	YES	
5	Commissioning Reports	YES	

NOTE:

*** This list of documents is indicative and intended towards all Solar Projects.**

*** Apart from the above, any other document required by the Customer and which are mandatory for Billing by BHEL to the Customer, the same respective vendors.**