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 supply of Balance of System (BOS) items, Installation and Commissioning of 75MW (AC) Dhuvaran near Khambhat, District Anand, Gujarat

RFQ NO and date	TGPBOS0048 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

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ELECTRONICS DIVISION
P.O. Box No. 2606, Mysuru Road, Bengaluru - 560 026
An ISO 9001, ISO 14001, OHSAS 18001 & ISO/IEC 27001:2005 Company

Name and address of the Independent External Monitor for this tender	1. Shri Arun Chandra Verma, IPS (Retd.) Flat No. C -1204, C Tower, Amrapali,Platinum Complex, Sector 119, Noida (U.P.) acverma1@gmail.com 2. Shri Virendra Bahadur Singh, IPS (Retd.) H. No. B-5/64, Vineet Khand, Gomti Nagar, Lucknow – 226010 vbsinghips@gmail.com .

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

1) Vendor should have executed contracts of indoor/outdoor electrical installations of 33KV minimum in power plants or sub-stations in India with scope including both supply and erection for a cumulative value of minimum Rs. 7.0 Crores with such individual contract values not less than Rs. 1.0 Crores within last 7 years from date of tender opening. As evidence for this, vendor shall submit (a) certification from clients for completion of supply and erection (b) copies of purchase orders from the clients.

2) Vendor should have achieved annual average financial turnover of Rs. 7 Crores in last three financial years (2016-17, 17-18 and 18-19). Vendor shall submit the audited balance sheets for all the 3 years. In case, for FY 2018-19, audited balance sheet is not available, unaudited balance sheet is acceptable.

3) Vendor shall submit an undertaking on his letterhead that "All electrical installation works will be carried out by a licensed electrical contractor qualified to carry out such electrical works as per CEIG norms of Gujrat state

4) 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.

REQUEST FOR QUOTATION

MMI:PU:RF:003

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

RFQ NUMBER:
TGPBOS0048

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	PS0679082930 Supply of MC4 connectors, cable ties etc * HSN/SAC : 8544 Test Certificate Supply of MC4 connectors, cable ties, HDPE conduits, cable lugs, hardware etc .	1	ST	1	18.02.2020
2	PS0679082948 Supply of LT control / instrumentation * HSN/SAC : 8504 Test Certificate Supply of LT control / instrumentation cables with cable installation accessories, hardware, termination kits etc	1	ST	1	18.02.2020
3	PS0679082956 Supply of UPS panels, FCBC, ACDB, UPS DB * HSN/SAC : 8504 Test Certificate Supply of UPS panels, FCBC, ACDB, UPS DB Batteries Aux transformer . etc with all related accessories and hardware	1	ST	1	18.02.2020
4	PS0679082964 Supply of earthing items * HSN/SAC : 8504 Test Certificate Supply of items of earthing system for solar array field, inverter/CMCS room panels, transformer yard equipment etc including earthing electrodes & earthing chemicals , Copper flats, earthing cables, GI wires, earth chamber lids and all related miscellaneous hardware etc	1	ST	1	18.02.2020
5	PS0679082972 Supply of lightning arrestors * HSN/SAC : 8504 Test Certificate Supply of lightning arrestors along with poles/masts, down conductors, all related accessories and hardware for the complete solar	1	ST	1	18.02.2020

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

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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

REQUEST FOR QUOTATION

MMI:PU:RF:003

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

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Fax :
E-mail: pragadeeshtg@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
	power plant				
6	PS0679082980 Supply of items for plant lighting * HSN/SAC : 8504 Test Certificate Supply of items for plant lighting system such as electric poles, bend pipes, luminaires/lamps, ballasts, junction boxes, cable conduits, fittings/clamps, other related accessories and hardware etc	1	ST	1	18.02.2020
7	PS0679082999 Supply of miscellaneous items * HSN/SAC : 8504 Test Certificate Supply of miscellaneous items such as WEATHER MONITORING SYSTEM , ABT meters, metering panel metering panels, weather monitoring system, LED display for SCADA system, cable route markers, cable tags, danger boards, hoarding boards, sign boards, display boards, electrical insulation mat, checkered plates, air conditioners, tool kits, measuring instruments, SCADA office furniture etc	1	ST	1	18.02.2020
8	PS0679083006 Supply of CCTV System * HSN/SAC : 8504 Test Certificate Supply of CCTV System	1	ST	1	18.02.2020
9	PS0679083014 Supply of safety related items * HSN/SAC : 8544 Test Certificate Supply of safety related items including fire alarm systems for inverter station /CMCS rooms, fire extinguishers, safety gadgets etc	1	ST	1	18.02.2020

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For and On behalf of BHEL.

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Semiconductors & Pho

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

RFQ NUMBER:
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RFQ DATE :
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Due Date/Day: 16.12.2019 MON
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Fax :
E-mail: pragadeeshtg@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
10	PS0679083022 Supply of spare items * HSN/SAC : 8544 Test Certificate Supply of spare items	1	ST	1	18.02.2020
11	PS0679083030 Supply of electrical utility items * HSN/SAC : 8544 Test Certificate Supply of electrical utility items such as LED luminaires, fans, exhaust fan etc for Inverter station, PEB rom, security room, pooling yard, transformer yard, watch tower etc	1	ST	1	18.02.2020
12	PS0679083049 I&C: Interconnection of SPV modules, * HSN/SAC : 7308 inter connections of modules .Routing of 6sqmm cables and terminating in SCB & closing the trench.	1	AU	1	24.03.2020
13	PS0679083057 I&C: laying of 1cx400 sqmm cable * HSN/SAC : 7308 I&C: laying of 1cx400 sqmm cable ,closing the trench & terminating at scb & pcu end	1	AU	1	24.03.2020
14	PS0679083065 I&C: Iinstallations of equipment * HSN/SAC : 7308 I&C:installations of pcu ,transformer ,ht panel & other	1	AU	1	24.03.2020

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

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Electronics Division
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INDIA

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Fax :
E-mail: pragadeeshtg@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
	electrical equipment such as dry type transformer,ACDB,UPS etc.				
15	PS0679083073 I&C: cablaying from pcu to transformer * HSN/SAC : 7308 I&C:laying of 1cx400 sqmm cable from pcu to transformer ,& installation of 4nos of tray for each transformer .	1	AU	1	24.03.2020
16	PS0679083081 I&C:laying and termination & dressing of * HSN/SAC : 7308 I&C: laying and termination & dressing of HT CABLE ,Auxilary ,control & communication cable in IR & CR	1	AU	1	24.03.2020
17	PS0679083090 I&C:scada installation * HSN/SAC : 7308 I&C: Weather monitoring ,CCTV , Fire Alaram , LA & scada i&c	1	AU	1	24.03.2020

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

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Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
18	PS0679083103 I&C: earthing * HSN/SAC : 7308 I&C: Earthing for solar array strucure, Module , SCB ,Invertor platform equipment , & control room equipment	1	AU	1	24.03.2020
19	PS0679083111 I&C: miscellinious installation * HSN/SAC : 7308 I&C: Installation of fire fighting system ,Identification of marking cable,SCB , INVERTOR, Transformer,Earth pit chamber, other equpments at IR & CR Platform,placement of cable root marker, Display board & danger board ,& installation of other miscellinious items such as AC , furniture, lighting items etc	1	AU	1	24.03.2020
20	PS0679083120 I&C:Installation of lighting system * HSN/SAC : 7308 I&C: Installation of lighting system(of total solar powerplant periphery & array etc)	1	AU	1	24.03.2020
21	PS0679083138 I&C: commissioning * HSN/SAC : 7308	1	AU	1	24.03.2020

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E-mail: pragadeeshtg@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
	I&C: precommissioning test & check ,commissioning & synchronization, liasoning with with govt agencies for approvals				

Total Number of Items - 21

1.
2.

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

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For and On behalf of BHEL.

TG Pragadeesh
Semiconductors & Pho

FIRST ANGLE PROJECTION

DRAWING NO. BHEL-SECI-50-SCCL50-DWG-ELE-003

ALL DIMENSIONS ARE IN mm

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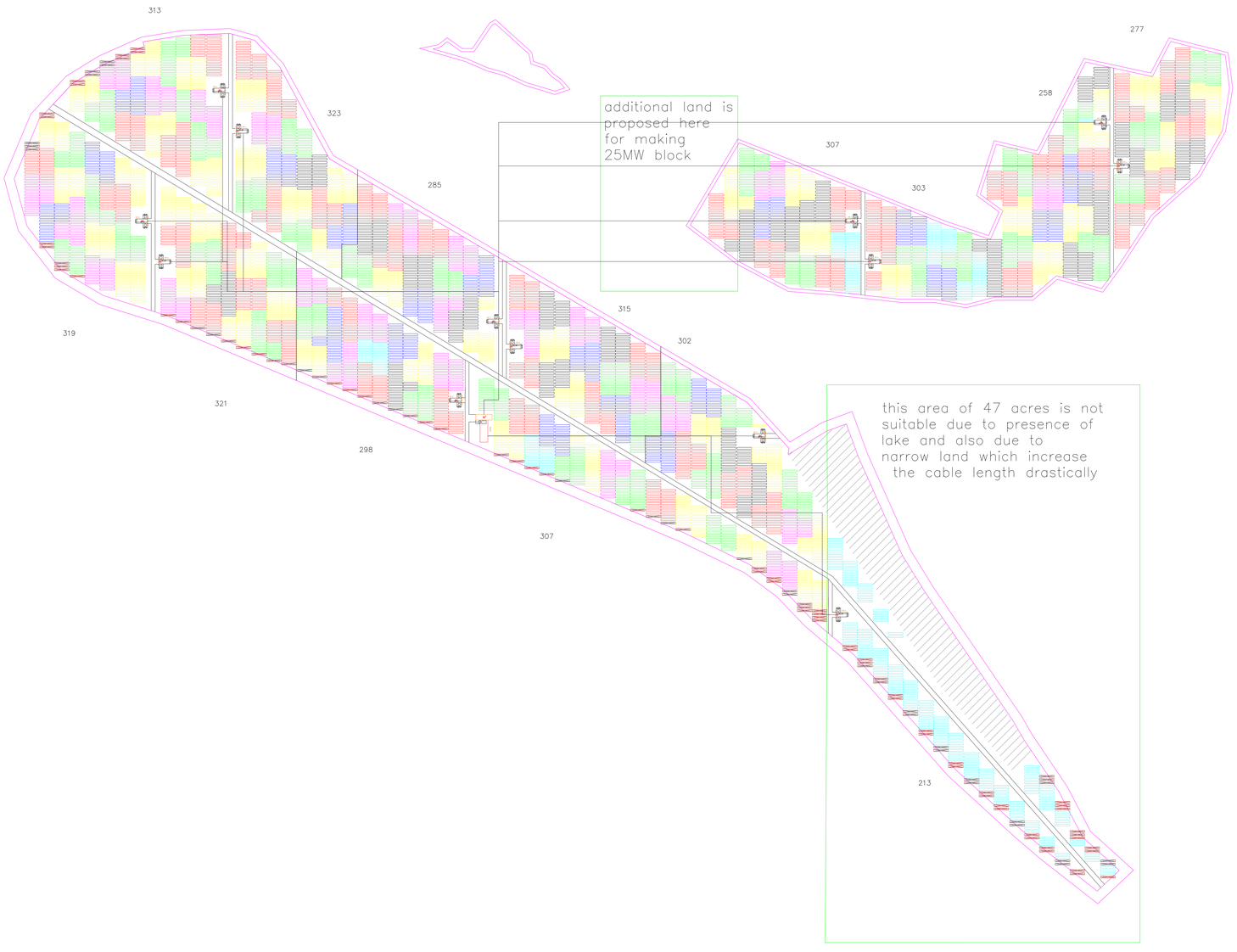
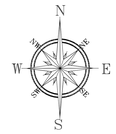
It must not be used directly or indirectly in a prejudicial way to the interest of the Company





POINT M ON BOUNDARY HAS BEEN CONSIDERED AS REFERENCE POINT
POINT M: EASTING 267874.92
NORTHING 2461180.94

POINT	EASTING	NORTHING
1	266525.3682	2462141.7648
2	266368.2430	2461875.1297
3	266739.2936	2461921.3605
4	266601.9767	2461740.3617
5	267044.0422	2461726.3552
6	266885.3866	2461585.7140
7	267331.2610	2461597.6193
8	267300.6761	2461411.6000
9	267513.7809	2461423.7730
10	267652.9619	2461365.2841
11	267821.5778	2461191.8726
12	268039.0572	2461110.0281
13	268212.2623	2460834.2862

LEGEND	
1) LAKE AREA	
2) TOTAL NUMBER OF TABLES WITH OFFSET AREA CONSIDERING RIVER SUBMERSION IS 110	
3) TOTAL NUMBER OF TABLES OUTSIDE THE SQUARE BOX IS 3991	
4) TOTAL NUMBER OF TABLES INSIDE THE SQUARE BOX IS 213	
5) TOTAL NUMBER OF STRUCTURES IS 4606	
6) TOTAL NUMBER OF SMB IS 308	
7) TOTAL NUMBER OF INVERTER ROOMS IS 15	

REV.	DATE	ALTERED / CHECKED / APPROVED
00		FIRST ISSUE

	NAME	SIGN	DATE
DRAWN	SEEMA		
CHECKED	NY		
APPROVED	GLN		

DISTRIBUTION OF PRINTS

DEPT.	CODE
SC&PV	439

PROJECT : 75MW DHUVARAN (PHASE-2)
CUSTOMER : GSECL

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: TENTATIVE ARRAY LAYOUT

No. OF SHEETS	01
SHEET No.	01
REV	00

BHEL DRG. No.

SIGN & DATE

REF. DRG.NO.

INVENTORY NO.

A0 SIZE

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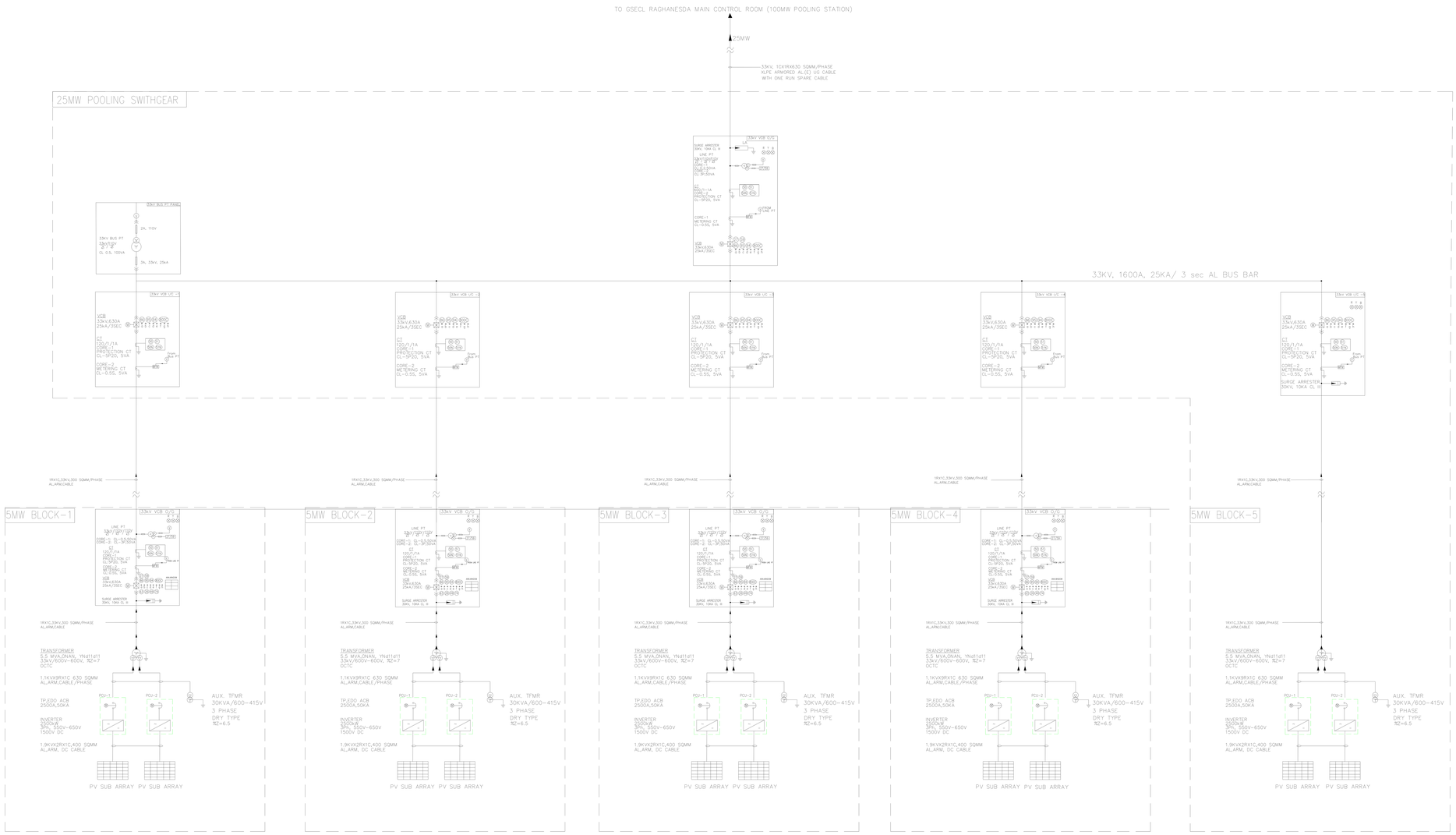
* THERE WILL BE FOUR BLOCKS OF 25MW FOR THE 100MW SPV PLANT



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
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	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	DC DC	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
45		ANNUNCIATOR WINDOW
46		RYB INDICATION

NAME OF PROJECT: 100MW SOLAR POWER PLANT RAGHANESDA
NAME OF CUSTOMER: GSECL

BHARAT HEAVY ELECTRICALS LIMITED
ELECTRONICS DIVISION, BANGALORE

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

REV.	DATE	ALTERED / CHECKED / APPROVED
01	8-8-19	AS PER DISCUSSIONS AT VADODARA ON DATED 31-7-19, THE NECESSARY MODIFICATIONS ADDED.
02	21-8-19	1) BUS PT IS OF DRAW OUT TYPE. 2) LA ADDED AT INCOMER. 3) RYB INDICATION ADDED AT OUTGOER. AS PER CUSTOMER COMMENT. 4)BUSHING CT PROVIDED FOR 64RHV PROTECTION.

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

TITLE
AC SINGLE LINE DIAGRAM- 100MW

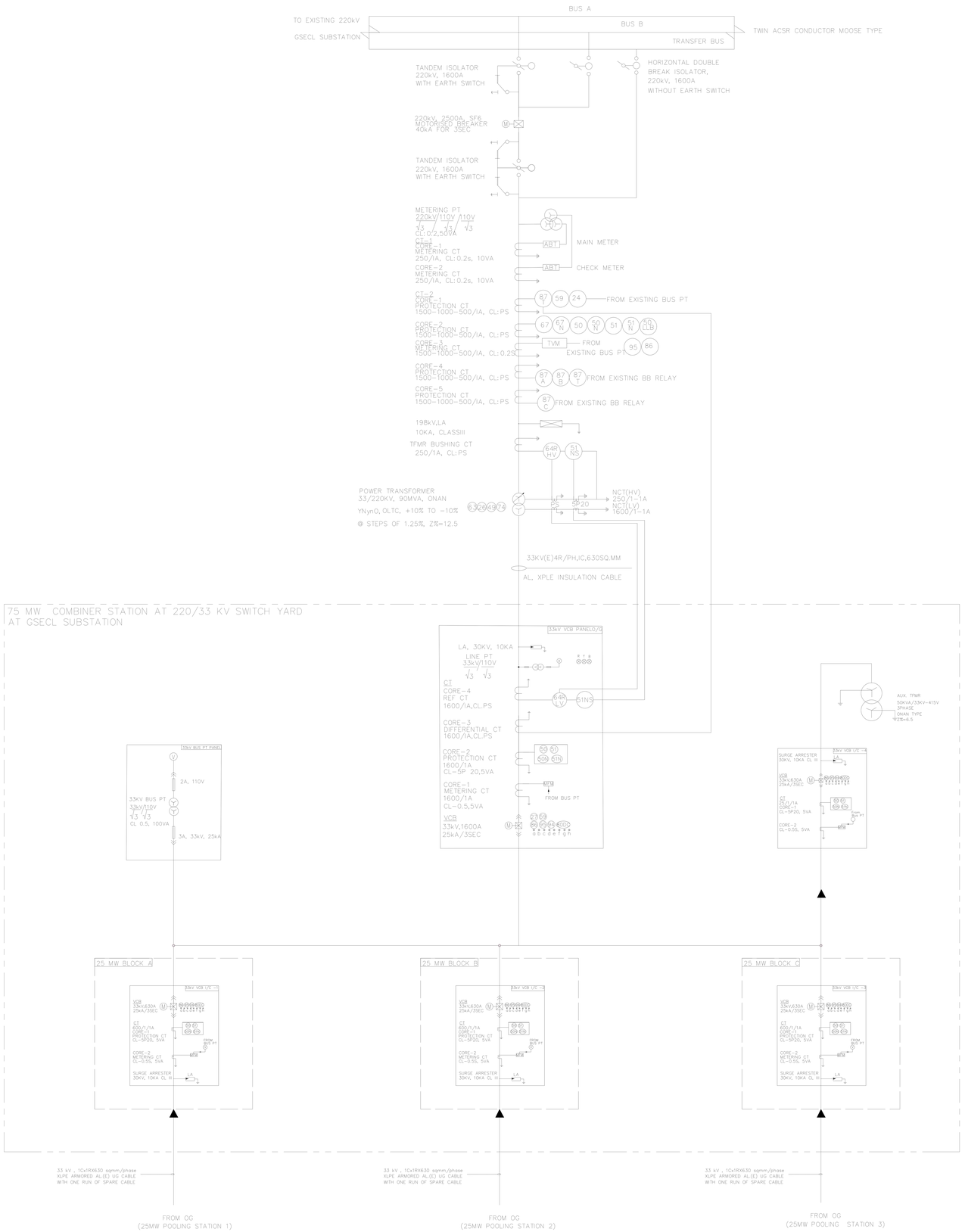
DRAWING NO. 3-SK-GSECL-75-SLD
REV. 02.
SHEET NO. 01
NO. OF SHEETS : 02
A2 SIZE

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

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

DRAWING NO.



NOTE:
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LEGEND DETAILS

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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
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33		ISOLATOR WITH SINGLE EARTH SWITCH
34		ISOLATOR WITHOUT EARTH SWITCH
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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	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. 02
SHEET NO. 01
NO. OF SHEETS.02

REV.	DATE	ALTERED / CHECKED / APPROVED
01	8-8-19	AS PER DISCUSSIONS AT VADODARA ON DATED 31-7-19, THE NECESSARY MODIFICATIONS ADDED.
02	21-8-19	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.

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REF. DRG.NO. REF

SIGN. & DATE

INVENTORY NO.

A1 SIZE

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Technical specification for Supply of Balance of System items, Installation and Commissioning of

75MW(AC) DHUVARAN NEAR KHAMBHAT,DISTRICT ANAND, Gujarat

Revision details: R00 dtd 25-11-2019	Prepared Phalguni Sahoo	Approved GLN MUTHY	Date: 25.11.2019

1.0	Introduction
1.1	Overall project outline of 100MW (AC) solar photovoltaic power plant
1.2	Scope of this tender specification
1.3	Enclosures to this tender specification (Tender purpose only)
2.0	Location/ address of power plant:
3.0	Vendor scope of supply, Installation and Commissioning
4.0	BHEL scope of supplies and works
5.0	Technical specification for supply, installation and commissioning
5.1	Temporary site office for vendor use
5.2	Electrical power / water for construction
5.3	Construction of temporary yards for safe storage of vendor supplied items
5.4	Unloading, safe storage and movement of supply items received at site:
5.5	Construction of bore wells including hydro survey, water analysis, electrical cabling and plumbing works.
5.6	Series interconnection of SPV modules to form strings
5.7	Routing of 1Cx 6 cable below the SPV modules
5.8	Interconnection of SPV module strings to 1Cx6 cable and Supply MC4 connectors
5.9	Installation of SCB and Diode boxes including erection of SCB and diode box mounting structures
5.10	Routing of 1Cx6 cable in DWC HDPE pipes underground between the rows of solar array
5.11	Termination of 1Cx6 cables on input side of SCBs
5.12	Ferruling for 1Cx6 cable
5.13	Underground cable trenches and laying of 1Cx400 sqmm cables in solar array field
5.14	Laying of 1Cx400 sqmm cables and terminations at PCU
5.15	Termination of 1Cx400 DC power cables at SCBs
5.16	Laying and Termination of 1Cx630 LT AC power cables at PCU and Inverter Transformer
5.17	Identification marking of cables using cable tags
5.18	Installation of electrical panels at Inverter station, Transformer yard pooling yard, main control room PEB etc
5.19	Laying, termination of LT/HT/aux supply cables at inverter platform / main control room platform and in associated with pooling station .
5.20	Laying of HT CABLE 1cx630 sqmm from 25MW pooling station to Dhuvaran substation (10 RUN including 1 spare)
5.20	Laying and installation of Control / data / instrumentation / OFC cables
5.21	Supply, erection and commissioning of auxiliary transformer 30kVA/600-415V, Dry Type
5.22	Auxiliary AC/DC power supply system
5.23	Supply and Installation of Weather monitoring system
5.24	Installation and commissioning of SCADA integration systems
5.25	Supply and installation of lightning protection system (ESE type lightning arrestors) to protect the electrical equipment of SPV power plant and Buildings from lightning.
5.26	Earthing for solar array structures and SCBs
5.27	Earthing system for inverter station, main control room, 33kV transformer yards, and interconnection point
5.28	Design, supply and installation of CCTV System

5.29	Design, supply and installation of Plant lighting system
5.30	Fire alarm and firefighting systems
5.31	Identification marking using painting
5.32	Cable markers and cables tags
5.33	Display boards and sign boards
5.34	Electrical insulation mat
5.35	Supply and Installation Miscellaneous Items
5.36	Tool kits and instruments
5.37	Cable installation Methodology
5.38	Pre-commissioning inspections/ checks/tests, MRT tests, coordination/liaison with state /central departments/CEIG etc. for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning
5.39	Spares required to be supplied along with main consignment:
6.0	General conditions applicable during supply, installation, commissioning
7.0	Documents to be submitted for BHEL/GSECL approval during detailed engineering

1.0 Introduction

1.1 Overall project outline of 75MW (AC) Dhuvaran Mega Solar Park, Gujarat

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

Solar PV modules employed at the plant generates DC electricity that in turn shall be inverted to AC at 600V-700V range Output of each solar block (5MW) with independent Inverter station (IR) / transformer yards shall be stepped up to 33kV. Solar plant comprises of 12 no.s of Inverter stations with associated 5 MW PV array and 3 no.s of 25MW pooling station. MMS structures are fixed type.

Output of Inverter station is combined at 33KV of three separate 25MW pooling yard.There will be three HT panels of 25mw block of outdoor type which are mounted in three different location . From which 1runs of 630sqmm cable per phase will be run to Dhuvaran substation .**Laying of this cable is not included in BOS VENDOR SCOPE . MMS structures are fixed type.**

.
The plant is envisaged to have several other infrastructural support systems such as module cleaning system for SPV modules, plant illumination system, fire alarm system, boundary fencing, approach roads, pathways, drainage system etc.

It is to be noted that all the Electrical equipment in this Project are outdoor type .

1.2 Scope of this tender specification

Vendor scope includes supply, installation, testing and commissioning of certain identified activities of the solar photovoltaic power plant as detailed in this specification.

This scope includes activities but not limited to obtaining approval from BHEL/ GSECL for the datasheets/ drawings/ MQP, manufacture/ testing/ inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery to site, unloading, storage, installation and commissioning of certain AC and DC side activities of power plant identified under this specification.

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

1.3 Enclosures to this tender specification (Tender purpose only)

1	Tentative AC single line diagram of overall Solar PV power plant
2	Tentative SPV plant layout with solar array, control/ inverter rooms

2.0 Location/ address of power plant:

75MW(AC) Dhuvaran Solar Project Near Khambhat,District Anand , Gujarat

3.0 Vendor scope of supply, Installation and Commissioning

The table below indicates the scope of work for the vendor, as briefly outlined. Vendor shall submit the offer as per this list and quantity.

#	Scope of work (as briefly outlined)	Qty
1	Supply of MC4 connectors, cable ties, HDPE conduits, cable lugs, hardware etc	1 set
2	Supply of LT control / instrumentation cables with cable installation accessories, hardware, termination kits etc as per clauses	1 set
3	Supply of Aux Transformer,UPS panels, FCBC, ACDB, UPS DB Batteries etc with all related accessories and hardware	1 set
4	Supply of electrical utility items such as LED luminaires, fans, exhaust fan etc for Inverter station, PEB rom, security room, pooling yard, transformer yard, watch tower etc	1 set
5	Supply of items of earthing system for solar array field, inverter/CMCS room panels, transformer yard / metering yard equipment etc including earthing electrodes, Copper flats, earthing cables, GI wires, MS rods (earth mat), earth chamber lids and all related miscellaneous hardware etc	1 set
6	Supply of lightning arrestors along with poles/masts, down conductors, all related accessories and hardware for the complete solar power plant	1 set
7	Supply of items for plant lighting system such as electric poles, bend pipes, luminaires/lamps, ballasts, junction boxes, cable conduits, fittings/clamps, other related accessories and hardware etc	1 set
8	Supply of miscellaneous items such as weather monitoring system, LED display for SCADA system, cable route markers, cable tags, danger boards, hoarding boards, sign boards, display boards, electrical insulation mat, checkered plates, air conditioners, tool kits, measuring instruments, SCADA office furniture etc	1 set
9	Supply of safety related items including fire alarm systems for inverter station /25MW Pooling station, fire extinguishers, safety gadgets etc	1 set
10	Supply of CCTV system	1set
11	Supply of spare items as per clause wise mentioned in spec	1 set
12	I&C: Inter connections of modules .Routing of 6sqmm cables and terminating in SCB.and closing the trench as per drawing .	1 AU
13	I&C: laying of 1cx400 sqmm cable ,closing the trench & terminating at scb & pcu end	1 AU
14	I&C: Installations of pcu ,transformer ,ht panel & other electrical equipment such as dry type trax,ADB,UPS etc required for solar plant commissioning .	1 AU

15	I&C: laying of 1cx400/630 sqmm cable from pcu to transformer ,& installation of 4nos of tray for each transformer .	1 AU
16	I&C: laying and termination & dressing of HT CABLE ,Auxilary ,control & communication cable in IR & CR. HT CABLE: 1cx185 SQMM from 5MW pooling station to 25MW pooling station	1 AU
17	I&C: Weather monitoring ,CCTV , Fire Alaram , LA & scada	1 AU
18	I&C: Earthing for solar array structure, Module,SCB ,Invertor Platform Equipment & control room equipment .	1 AU
19	I&C: I&c of miscellaneous items such as Installation of fire fighting system ,Identification of marking cable,SCB , INVERTOR, Transformer,Earth pit chamber, other equpments at IR & CR Platform,placement of cable root marker, Display board & danger board ,& installation of other miscellinious items such as AC , furniture, lighting items etc	1 AU
20	I&C: Installation of lighting system of total solar power plant (Peripheral ,array, IR Switch yard)	1 AU
21	I&C: precommissioning test & check ,commissioning & synchronization, Co-ordination with switch-yard vendor for obtaining permission from govt agencies for solar plant charging. Liasioning with govt agencies is under the scope of switch yard vendor .	1 AU

4.0 BHEL scope of supplies and works

For clarity to the vendor, other items and activities within BHEL scope of solar PV plant end of the project are listed below:

1	Supply of 1C x 6 sqmm Solar Cable	~280 KM
2	Supply of DC cable, 1C x 400 sqmm, Cu, XLPE, armoured as per IS: 7098 (from SMB to PCU)	~90 KM
3	Supply of LT cable, 1C x 630/400 sqmm, Al, XLPE, armoured as per IS: 7098 (from PCUs to Inverter transformers)	~8 KM
4	Supply of 33kV cable, 1C x 185, Al, XLPE, armoured as per IS: 7098 (for all 33kV connections within Aux solar plant including transformer HV side)	~25KM
5	Supply of 33kV cable, 1C x 630, Al, XLPE, armoured as per IS: 7098 (From pooling station to switch yard)	~48KM
6	Supply of SCADA ,OFC cables along with termination kits. Also, termination of the cables at both ends .	As required
7	Supply of outdoor power conditioning units (PCUs) of 2.5 MW	30 Sets
8	Supply of String Combined Box	235 Sets
9	Supply of inverter transformer 5.5MVA, 33kV/xxx-xxx V, ONAN	15 Nos
10	Supply of 33kV breaker panels	15Sets
11	Supply of SCADA system including PLC panels, computers, software systems and related peripherals & accessories	1 set

12	Supply of GI earthing strips for PV array, Inverter station, 33Kv pooling yard, control room, interconnection yard etc	1 Set
13	Supply and Installation of Module cleaning system	1 Set
14	Supply and Installation of Module mounting structure including module mounting	~4612 Sets
15	Construction of Inverter and aux transformer foundations including chain link fencing at IR.	1 Set
16	Construction of foundation for Inverter station, 33KV pooling yard	1 Set
17	Unloading/ storage/ security for BHEL supplied items.	-
18	Construction of Inverter station Platform & PEB ROOM Platform .	15 +1 Set
19	Construction of civil works such as approach roads, pathways, drains, overall plant boundary fencing, soak pit, septic tank.	-

5.0 Technical specification for supply, installation and commissioning

#	Vendor scope of supply & i&c in detail .
5.1	**Temporary site office for vendor use** Vendor shall make necessary office arrangements such as porta cabin, furniture, electrical points/ fittings etc. on their own for their use/ occupation at site during the period of project execution. **Note:** Site offices for BHEL and GSECL shall be arranged by BHEL.
5.2	**Electrical power / water for construction** Vendor shall organize, on their own, necessary electrical power supply such as DG sets and water supply etc. required for construction activities and supply of DG SET during commissioning .
5.3	**Construction of temporary yards for safe storage of vendor supplied items** Vendor shall, at a suitable location at the site, as decided based on discussions with BHEL site engineer, construct temporary yards for safe storage of vendor supplied items.
5.4	**Unloading, safe storage and movement of supply items received at site:** **A. Items supplied by vendor** (1) Vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc.) for unloading the items (supplied by the vendor) received at site and subsequent movement to storage yards. (2) Similar arrangements shall also be made by vendor for movement of the stored items from storage yards to the exact construction locations within the project site. (3) Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, LRs, delivery challans, material receipt certificates etc.) and shall take approval from BHEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to BHEL. (4) Registers shall be maintained for the yard to keep track of incoming/outgoing items. (5) Safety of items shall be in vendor scope. Accordingly, suitable watch and ward shall be deployed on round-the-clock basis. **B. All other items (supplies from BHEL and other vendors)** (1) Receipt, unloading, storage, security guards shall be in scope of BHEL/ other vendors. (2) However, movement of these items from their respective storage locations to the points of construction is in scope of vendor (excluding modules and MMS). Accordingly, vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc.) for this purpose.

	(3) Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, LRs, delivery challans, material receipt certificates etc.) and shall take approval from BHEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to BHEL
5.5	**Series interconnection of SPV modules to form strings** Supply of SPV modules is in BHEL scope. Type of module: L24270 (~330Wp). Total quantity = ~277200 Nos Vendor shall interconnect the SPV modules as follows: (a) Each module is fitted integrally with a junction box having positive and negative polarity cables (4 sq-mm). (b) Positive cable of one module shall be connected to the negative cable of adjacent module. The cables have MC4 type of connectors. One polarity cable has male type connector, while the other has female type connector. (c) This way, **30 modules** shall be connected in series. Each set of connections is called as a series string. (d) Each Module mounting structure (MMS) contains **60 nos of SPV modules**. Thus from each MMS, two sets of series strings (top row forms one string and bottom row forms other string) will be formed via **leap-frog method**. These two strings will be paralleled at MMS itself using **Y-connectors** to form a combined output and will be terminated at the input side of SMB as a single input. After placing the purchase order on vendor, BHEL will provide layout drawings that will describe the exact way in which the series strings are formed. Vendor shall implement the interconnection as per these drawings
5.6	**Routing of 1Cx 6 cable below the SPV modules** (1) 1Cx6 sq-mm cables connecting the SPV module strings to SCBs suitably routed below the SPV modules and along the horizontal C-lip purlin member of MMS structure. These cables shall be dressed properly and fastened to the purlin using UV resistant cable ties of suitable length. (2) Cable ties shall be in vendor scope of supply. (3) Cable ties, nylon polyamide 6.6 UV stabilized black, UL94 flammability rating V2, operating temperature up to 85 deg C, shall be used to arrest any possibility of movement or sagging. Cable ties shall be of make: 3M, Phoenix contact, Weidmuller, Hellermanntyton, Panduit or other reputed equivalent subject to approval of BHEL/ GSECL. Width and Length shall be so appropriate as to ensure that the bunched cables are held firmly to the mounting structure. Spacing between two adjacent cable ties shall be so appropriate as to ensure that there is no loose hanging of cables. During detailed engineering, BHEL/ GSECL approval shall be obtained for the selected brand and sizes of cable tie. (4) Spacing between two adjacent cable ties shall be so appropriate as to ensure that there is no loose hanging of cables. (5) Solar cables, wherever exposed to direct sunlight (including gaps between tables) and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.
5.7	**Interconnection of SPV module strings to 1Cx6sqmm cable and Supply MC4 connectors** (1) Vendor shall connect two series strings of 60 SPV modules to 1Cx6 cable (copper, XLPO insulation cable) using **Y-connector and MC4 connectors**. (2) Vendor shall supply **308 sets** (1 set = 2 nos) each of Y-connectors and MC4 connectors for array associated with each Inverter station ,similarly for **15 invertor station** (3) Extra quantity shall be procured for any damages / pilferage during the installation by vendor at site. Such additional quantities will not be paid for. Vendor shall ensure that there shall not be any shortage during execution time.

	(4) Required sets of tool kits shall be supplied. This shall include crimping plier MC4, open end spanner set MC4, stripping plier MC4, socket wrench insert to tighten, socket wrench insert to secure, inserts for 6 sq-mm. (5) MC4 connectors shall have rating of 1500VDC (IEC), rated current of 30A (min), type approved by TUV Rheinland for product safety. (6) Approved make: Multicontact, Bizlink, Sunlont, Elmex or other reputed equivalent subject to BHEL/ GSECL approval during detailed engineering. (7) In addition, any other required tools and tackles for crimping of cable etc. shall be arranged by vendor.
5.8	**Installation of string monitoring boxes including supply/erection of mounting structures** (1) Supply of string Combined boxes (SCB), **235 sets**, is in BHEL scope. These are **22-in/ 1- out type. This way, on input side of SCB.Out of these 22 input only 20inputs will be used and two will be kept as spare .** (2) SCB shall be mounted on the Module Mounting structures. Provision will be provided in the Module mounting structure to mount the SCB. However, necessary hardwares like nuts, bolts, washers etc and canopy of SCB shall be in the vendor scope of supply. (3) Vendor shall install the SCBs on the module mounting structures. (4) All necessary labour, tools, machinery etc for erection work shall be in vendor scope.
5.9	**Routing of 1Cx6cable in DWC HDPE pipes underground between the rows of solar array.** (1) One SCB is connected to **20 strings**. SCBs are located in center of a string block. Where 1Cx6 cables run vertically along MMS leg or between two rows of structure (or) where the cables cross over the pathway separation between two adjacent solar array blocks, HDPE double walled corrugated (DWC) pipe shall be provided to route the cables underground from one row/ block to the other. HDPE DWC pipe together with necessary HDPE couplers/ joints (T-joints, elbows, bends etc.) shall be within scope of vendor supply. Where cables run vertically along MMS leg, HDPE pipes shall be routed properly and tied/ clamped to leg. For this, necessary UV protective cable ties of suitable length or clamps shall be in vendor's scope of supply. (2) Specification of HDPE DWC pipe: As per relevant IS; ID shall be selected to accommodate the number of 1Cx6 cables to be guided. A maximum of 7 circuits can be run through single HDPE pipe. Fill ratio will be considered max 50%. However, exact ID shall be selected to ensure that only a maximum of 50% of the ID space is occupied by the cables. Make, part number, sizes/ dimensions shall be submitted for BHEL/ GSECL approval during detailed engineering. (3) Cables with HDPE pipe (and couplers/joints etc.) shall be directly buried underground as per IS: 1255. Continuous trenches shall be excavated on either side of the SCB. In addition, for each SCB, there shall be minimum one pathway crossing, for which trench shall be excavated. a. Trench depth = 400 mm minimum b. Trench width = As per conduit size and number of conduits c. Trench shall, then, be filled with refill soil and compacted. Excavation, laying of pipes, routing of 6 sqmm cables through HDPE pipe, fixing of couplers, sealing end of the HDPE pipes, trench backfilling shall be vendor's scope. Trenches shall be backfilled, compacted and the area shall be neatly levelled. (4) Total length of HDPE DWC pipe and quantity of couplers/joints shall be as required. (5) Bending radii for cables shall be as per IS: 1255.

	(6) At road crossings, cables shall be routed through Hume pipe of class NP3 of appropriate size that shall be in vendor scope of supply and technical details/ brand etc. shall be submitted for BHEL/ GSECL approval during detailed engineering. (7) All cable entry openings of conduit pipes, after laying/ termination of the cables, shall be sealed using appropriate sealant (single component thermoplastic insulating compound) to ensure water proof tightness. The sealant supply will be vendor's scope of supply. (8) Solar cables, wherever exposed to direct sunlight and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits. NOTE: **Trench will be excavated by MMS Vendor but other works like backfilling dressing will be done by BOS vendor . To expedite the progress of module mounting this has been included in MMS vendor scope .BUT Supervision is required from BOS VENDOR along with the BHEL site in charge.**
5.10	**Termination of 1Cx6cables on input side of SCBs** 1Cx6 sqmm cables of positive and negative polarities originating from **Y CONNECOR** of module strings shall be terminated at the input side of SMBs. (2) Vendor scope includes removal of sleeve at the cable end, crimping with suitable cable lug of appropriate type/size and connecting the lugged end to the terminal block (connector) within the SMB. Cables shall enter the SCB through the cable glands that are provided as part of the SCBs supplied by BHEL. (3) Cable lug shall be in vendor scope of supply. Type of lug (pin type etc) shall be in accordance with the termination arrangement within the SCB. Quantity required shall be appropriately selected by the vendor (cable lug + any other hardware if required). (4) Any other hardware, if necessary for fulfilling the connection, such as bolts, nuts, screws, washers etc shall be in vendor scope of supply. All hardware shall be of SS304. (5) All necessary tools such as pliers, strippers, crimping tool etc shall be within vendor scope
5.11	**Ferruling for 1Cx6sqmm cable** 1) For 1Cx6 sqmm DC solar array cable, vendor shall supply and provide UV resistant ferrules printed with source/destination identification of cable. Printing details shall be given by BHEL after placement of order. Printing shall be of appropriate size to ensure readability. 2) Supply of ferrule shall be in vendor scope. 3) Ferrules shall be provided on all termination ends: module end and SMB ends for all **6 sqmm cables.**
5.12	**Underground cable trenches and laying of 1Cx400 sqmm in solar array field** (1) DC power cable 1Cx400 sqmm, Aluminium conductor, XLPE, armoured (from SCB to PCU) shall be laid underground by way of direct burying as per IS:1255. Supply of above the cables shall be in BHEL scope. Cable laying shall be carried out as per **"Cable installation methodology"** defined in this specification. (2) Typical trench details/dimensions are below only for tender purpose. (a) Total trench depth = 850 mm minimum (b) Trench width = As per number of cables laid. (c) Trench shall have layers one over the other as below (from bottom to top): 1. Bottom layer shall be sand of IS: 383 with 75mm minimum thickness 2. 1Cx185 sqmm cable shall be laid over the sand layer 3. Another layer of sand of 75 mm minimum thickness. 4. Single layer of brick as protective cover covering all cables 5. Trench shall, then, be filled with refill soil and compacted (3) Communication from SCB to SCADA is not required. (4) Bending radii for cables shall be as per IS:1255. At road crossings, cables shall be routed through Hume pipe (Class NP3, 300 dia) of appropriate size that shall be in vendor scope of supply. At Nallah crossings, cables shall be routed through Covered cable trays/

	structures. Hume pipe and cable trays/ structures of appropriate size shall be in vendor scope of supply, fabrication, grouting and erection. (5) Vendor shall take utmost care in laying the cables in order to prevent wastages and damages on outer sheath and inner insulation. Cable shall be drawn with rollers only to ensure no damage to cable during laying. In case cables found to be damaged/ cut after the laying in trenches, vendor shall implement suitable corrective action such as cable jointing, or re-lay a new cable in consultation with BHEL. (6) NOTE: **Trench will be excavated by MMS Vendor but other works like backfilling dressing will be done by BOS vendor . To expedite the progress of module mounting this has been included in MMS vendor scope .BUT Supervision is required from BOS VENDOR along with the BHEL site in charge. Near invertor station where all the cables are coming to invertor ,those area trench excavation will be under bos VENDOR SCOPE .**
5.14	**Laying of 1Cx400sqmm in inverters rooms and terminations at PCU** (1) 1Cx400 cables (ALUMINIUM conductor, XLPE insulation, armoured: BHEL scope of supply) running from SCBs (through outdoor cable trenches) shall be routed under the platform at Inverter stations. (2) Vendor shall carry out drilling of holes in cable gland plates of the PCUs for the 9 positive and 9 negative DC inputs of 1Cx400 cable. Gas cutting method is strictly not allowed. Vendor shall organize hole-saw cutters of appropriate size for this purpose. All necessary drilling machines / tools etc. shall be made available at site. (3) Prior to termination, each cable shall be checked for continuity and megger. In case any cable found defective, vendor shall implement suitable corrective action such as cable jointing, replacement/re-laying of cable etc. as applicable. (4) Vendor shall carry out glanding of the cables following which the glands shall be fitted to the respective holes of gland plates. (5) Vendor shall carry out the 1Cx400 cable terminations for the 8 positive and 8 negative inputs that include tasks such as unsleeving, crimping, connecting to the tinned copper bus bars, tightening using torque wrench etc for all PCUs (7) Vendor shall arrange torque wrench of appropriate range. Torque setting shall be as per the bolt size and property class. For the setting, approval shall be obtained from BHEL site engineer. (8) All tools/accessories such as crimping tools etc. required to carry out the termination shall be within scope of vendor.
5.15	**Termination of 1Cx400 DC power cables at SCBs** (1) Cables of 1Cx400 (Aluminium conductor, XLPE insulation, armoured) shall be terminated at the output side of SMBs (positive, negative terminals). Supply of this cable is in BHEL scope. (2) Vendor scope includes removal of sleeve at the cable end, crimping with suitable cable lug of appropriate type/size and connecting the lugged end to the tinned copper bus bar within the SMB. Cables shall enter the SCB through the metallic cable glands that are also supplied by BHEL along with SCBs. (3) **Cable lug shall be in BHEL/OEM scope of supply**. (4) For contingency requirements arising out of shortage due to various reasons (damage, theft etc) during installation vendor should arrange lugs and glands . (5) All necessary tools such as pliers, strippers, crimping tool etc shall be within vendor scope.

5.16	**Laying and Termination of 1Cx630 LT AC power cables at PCU and Inverter Transformer** (1) LT Cables 6 runs of 1C x 630 sqmm Al conductor, XLPE, armoured per phase shall be laid between AC side of the PCU and the LT side of the Inverter transformer over the cable trays. Supply of these cable treys along with the cable support structure shall be in vendor's scopes. Cables shall be laid in trefoil arrangement. Trefoil clamps supply and fixing in in vendor's scope. (2) Vendor scope includes removal of sleeve at the cable end, crimping with suitable Bimetallic Lug or Aluminium Lug with Bimetallic washer/ strip. Cables shall enter the PCU and Transformer through the metallic cable glands. Supply of Lugs and Glands required for Inverter Transformer side termination shall be in vendor's scope. (3) **Cable lug shall be in BHEL/OEM scope of supply**. (4) **Cable GLANDS shall be in BHEL/OEM scope of supply**. (5)) For contingency requirements arising out of shortage due to various reasons (damage, theft etc) during installation vendor should arrange lugs and glands. (6) All necessary tools such as pliers, strippers, crimping tool etc. shall be within vendor scope. (7) Tray supply shall be in bos VENDOR SCOPE , Each trsformer will be connected with four nos of tray .Each LV box is connected to two nos of tray & Each tray there will be maximum three nos of ckt will be there . Width of the tray will be approximately 1 meter .& distance between invertor station to transformer is maximum 15 meter .
5.17	**Identification marking of cables using cable tags** 1) Cable tags shall be provided on all power cables at both ends just before entering the equipment enclosure and every 20 m on cable tray or trench run. 2) Cable tags shall be of rectangular shape. 3) Cable tag shall be of 2mm thick aluminum with number punched (embossed) on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. 4) ID numbering scheme shall be provided to vendor after Purchase order placement. Vendor shall submit the technical details of cable tags for BHEL/ GSECL approval during detailed engineering.
5.18	**Installation of electrical panels at 5mw Inverter Station and 33KV 25MW Pooling station** **I. Out door Panel installation at Inverter Station 12 NO & 3nos of 25mw pooling station** Vendor shall organize necessary resources such as labour, cranes, hydra, forklifts, transportation trucks / trolleys and other accessories for movements and positioning of the panels as below **(Quantities mentioned are per 5mw inverter station):** (a) 2 nos of 2.5 MW outdoor PCU (supply in BHEL SCOPE) 1no of outdoor type HT panel of 33kv VCB (SUPPLY IN BHEL SCOPE) 1 Aux transformer dry type outdoor (1no in each alternate station total 10 no in invertor station) 1 AC distribution Panel outdoor type (1no in each alternate station total 10 no in invertor station) 1 SCADA panel outdoor type (This shall be installed on the RCC foundation. Construction of foundation is in BHEL scope)

	(Quantities mentioned are per 25mw pooling station):(3 set) (b) 2 nos of 2.5 MW outdoor PCU (supply in BHEL SCOPE) 1no of outdoor type HT panel of 33kv VCB (SUPPLY IN BHEL SCOPE) 1 Aux transformer dry type outdoor (1no in each platform) 1 AC distribution Panel outdoor type (1no in each platform) 1 SCADA panel outdoor type (1no in each platform) 33kV outdoor VCB panels: 3 No. (5 incomer and one out goer in each panel)This shall be installed on the RCC foundation. Construction of foundation is in BHEL scope) (1) Panels shall be moved to the respective positions and placed over the cable trenches in control room, in the exact sequence and locations as per drawings. Drawing shall be provided after placement of purchase order. (3) Panels / Container shall be suitably grouted using welding/ bolting methods as per relevant standards and recommendation of OEMs. BHEL approval shall be obtained for the grouting arrangement. All necessary hardware for the same shall be within vendor scope of supply.
5.19	**UPS:(16 ups of 3kva outdoor type wih protection class ip65 & one ups indoor type)** Vendor shall supply, install and commission outdoor UPS, UPS battery and UPS DB panels – one for each Inverter station and one for main CMCS room. Thus, there shall be a total of 16 UPS panels. Indicative capacity of UPS shall be 3kVA for Inverter station and 5kVA for main CMCS room. The UPS shall have back up of 4 hours . Vendor shall, however, submit exact sizing calculations considering (but not limited to) the loads as below: • Data logger / SCADA • Fire Detection/ Alarm Panel • HMI of SCADA • Emergency Lighting Battery for UPS shall be VRLA type.
5.20.	**Float cum boost charger and Battery Bank** **(1 set has to be supplied & commissioned at main control room)** **Battery bank** shall be VRLA/MF stationery, sealed type, **110V DC,** at 8 hours rate of discharge, IS 1651-1979, performance as per IS:8702, nominal cell voltage 2V/12 V cells, plastic resin/ ABS/ PP container, epoxy coated exhaust fans to remove the gas emissions, suitable battery rack/stand with painted steel sections. Details of Battery shall be as follows: **Minimum rating of the battery shall be** 2. For 33KV Polling yard : 150 AH, 110 V . **2. Float-cum-boost-charger with boost current (45A) and boost voltage (135V): Minimum Rating of Float-cum-boost-charger shall be**

	(i) boost current (50A) and boost voltage (135V) for 33KV pooling yard. **Each FCBC shall have in build DCDB with following output feeders:** **1. For 33KV pooling yard: 5 nos of 16 A feeder** Battery charger as well as their automatic regulators shall be of static type. Battery chargers shall be capable of continuous operation at the respective rated load in Trickle mode i.e. Trickle charging the associated DC Batteries while supplying the DC loads. The chargers shall be designed to operate, as mentioned above, at an ambient air temperature of 50°C. Battery chargers shall have a selector switch for selecting the battery charging mode i.e. whether Trickle or Boost charging. During automatic boost charging, the Battery chargers shall operate on constant current mode. Charger shall have load limiters which shall cause, when the voltage control is in automatic mode, a gradual lowering of the output voltage when the DC load current exceeds the load limiter setting of the Charger. LED indications with alarm annunciation on the panel for Mains ON, Float charger AC ON, Float charger DC ON, Boost charger AC ON, Boost charger DC ON, AC Mains Fail, Float charger DC fail, Boost charger DC fail, DC earth fault, SCR fuse fail, Filter fuse fail, Blocking diode fail, Battery under-voltage, Battery over-voltage, Charger DC overload. LED indications for various parameters: 3-ph AC input voltage, boost/float/trickle currents, charge/discharge currents, DC output voltage/current, Battery leakage current etc. Selector switches for Float Auto/Manual, Boost Auto/Manual, Float/Boost/ Autoboost selector switches. Also, Voltmeter / Ammeter selector switches as applicable
5.21	**Laying, termination of LT/HT/aux supply cables/ inverter station/ 25MW Pooling station associated 33KV yards** (1) For all electrical panels viz. PCUs/ VCB panels/ ACDB panel/ UPS/ FCBC battery charger/ battery bank /DB boards/ aux transformer and inverter transformers of the inverter rooms, laying and termination of LT/HT/Aux power cables shall be in vendor scope. (2) For all electrical panels viz. PCUs/ VCB panels/ ACDB panel/ UPS/ FCBC battery charger/ Battery bank / DB boards / aux transformers/ inverter transformers/ GOS/ Metering panel/ Metering CT/ Metering PT of the control room, laying and termination of LT/HT/Aux power cables/, switchyard structure & equipment erection shall be in vendor scope. (3) 630sqmm AC cables in transformer yards in inverter room and control room yard shall be routed on ladder type cable trey 600mm above the ground. Support structure required for cable tray shall be in vendor scope. (4) Cable glands, cable lugs, 33kV HT cable termination kits (indoor/ outdoor types as applicable), Cable jointing kits, lugs, clamp & connectors, cable support structure for termination of 33KV cable at the evacuation point , bolts, nuts, washers etc. shall be in vendor scope of supply. (5) It is the responsibility of the vendor to assess the actual length requirements duly considering all applicable clearances as per relevant standards, Indian electricity rules, CEA/CEIG requirements etc. For this purpose, tentative (indicative) locations of inverter/Control rooms, internal layouts of inverter/Control rooms are enclosed along with tender. (6) For marshalling box of transformer/ UPS/ SCADA/ DB boards, single compression nickel plated brass glands shall be provided by vendor. Make shall be COMET or reputed equivalent subject to approval of BHEL/ GSECL. (7) HT termination kits (indoor/ outdoor as applicable) shall be of Raychem make as shall be approved by BHEL/ GSECL. HT termination shall be carried out by certified jointers.

Credentials / certification of experience from Raychem for the proposed jointers shall be submitted for BHEL/ GSECL approval during detailed engineering.

(8) Quantity of 33KV End termination and straight through jointing kits shall be supplied by vendor as follow :

a. Outdoor 33KV End termination kit for 1Cx185 sqmm (E) cable = 180 **Nos**
b. Outdoor 33kv End termination kit for 1CX630 SQMM €CABLE =20 NOS
c. Straight through jointing kit for for 1Cx185 sqmm (E) cable **= as per site requirement**
d. Straight through jointing kit for for 1Cx630 sqmm (E) cable **= as per site requirement**

These quantities are excluding spares requirement.

(9) The scope of HT cable laying and termination at Inverter station incomer panels for the cables coming from Inverter room shall be in the scope of the vendor.

(10) All trench excavations, cable laying, sand and brick layer, backfilling etc as per IS 1255 shall be in vendor's scope.

(11) Vendor shall make appropriate holes in the gland plates of PCUs, HT VCB panels, ACDBs, SCADA panels, Inverter transformers, Marshaling boxes, Auxiliary transformer, Battery chargers, Distribution boards etc. for fixing the cable glands. Gas cutting is strictly prohibited. Hole-saw cutters of appropriate sizes with suitable drilling machines shall be made available at site for this purpose.

(12) Bimetallic lugs or aluminium lugs with bimetallic strip/washer shall be used for connecting Cu bus bar and Al cables or vice-versa wherever applicable.

(13) Terminations with M10 and above shall be tightened using torque wrench. Torque setting shall be as per size, property class of bolt. BHEL approval shall be obtained for the settings prior to tightening.

(14) Approximate (indicative) specifications of certain power cables are as follows. Exact specification shall be based on design calculations that shall be submitted for BHEL/ GSECL approval during detailed engineering. Quantity shall be appropriately selected.

(a) PCU to 5MVA transformers: **Cable supply in BHEL scope**

3-phase 3-wire system, 6Rx1Cx630 sqmm per phase, 1.1kV grade, aluminium conductor, XLPE insulation, unarmoured, PVC sheathed as per IS: 7098. (Note: cables from inverter tp stransformer shall be laid on ladder type cable trey in trefoil arrangement).

(b) HV (33kV) side connections in VCB panels, 5.5MVA transformer, 33KV pooling yard , **Cable supply in BHEL scope**

3-phase 3-wire system, 3Rx1Cx185 sqmm, 33kV, aluminium conductor, XLPE insulation, armoured, PVC sheathed as per IS: 7098.

(d) ONAN Auxiliary transformers to ACDB panel in 33KV pooling yard near CMCS room: **Cable supply in vendor scope**

(e) Metering CTs, PTs, GOS, LA connections in control room: **ACSR Conductor & termination accessories supply in vendor scope**

(f) LT AC aux power supply cables from ACDB panels in Inverter/control room to the related utility loads such as battery charger, UPS, 33KV Motorised isolator, metering yard kiosks, MCB DB boxes for room appliances, PCU, ABT meters, transformers aux supply, SCADA, VCB panels aux supply, fire alarm system, panel illumination lamps, space heaters of VCB panels etc. **Cable supply in vendor scope**

(g) LT DC aux power supply cables from DCDB panels in inverter /CMCS rooms to the utility loads such as DCDB panels, VCB panel tripping/closing circuits, SCADA, VCB panel spring charge motors in 33kV metering yard etc. **Cable supply in vendor scope**

	(15) Supply of all cable accessories (for the above requirements) such as cable trays, cable glands, cable lugs, ferrules, nuts/bolts/washers, cable dressing ties etc shall be in vendor scope. (16) Laying of above cables, fixing of cable glands, cable termination at the respective terminal bus bars shall be in the scope of vendor (17) All resources such as labour, machinery, tools and accessories to carry out the above electrical works shall be in vendor scope. (18) All applicable/relevant clauses under "**General specification of LT cables**" and "**Cable installation methodology**" sections of this specification shall be adopted for all aspects of these cables.
5.22	**Laying and installation of Control / data / instrumentation / OFC cables** (1) Vendor shall supply all the control/ data/ instrumentation / communication cables except OFC and Ethernet LAN cables for SCADA. (2) All the cable installation accessories such as cable trays, cable conduits, cable glands, cable lugs, ferrules, cable ties, bolts, nuts, washers etc. shall be in vendor scope of supply. Cable laying and cable terminations shall be in vendor scope. All necessary resources such as labour, tools and accessories required to carry out laying and termination works etc. shall be in vendor scope. (3) **OFC cable** termination kits shall be in BHEL scope of supply. Vendor scope includes laying of the OFC cable underground in the conduit from inverter station SCADA panels to main control room SCADA panel. Termination of the OFC cables at both the ends shall be in BHEL scope. (4) Vendor shall lay and terminate the **RS485 cables** to SCADA from all plant equipment e.g. HT panels, ACDBs, transformers, FCBC, UPS etc. These cables shall be laid between the panels of respective inverter station/ main control stations. (5) Vendor shall lay and terminate the Ethernet cables to SCADA from (a) PCUs, (b) numerical relays of VCB panels. These cables shall be laid between the panels of respective inverter station/ main control rooms. (6) Vendor shall lay and terminate control and instrumentation cables from inverter transformers to SCADA and from HT breakers to SCADA. (7) Laying and termination of cables in 33KV pooling yard e.g. from 33 KV motorized isolator, metering CTs, Metering PTs to SCADA/ ABT meters/ HT breakers etc. Distance of Metering yard from control room is 100 m approximately. (8) Electrical Interconnections of HT breaker panels e.g. outgoer, incomers, Bus PT panels for 3Kv pooling yard HT breakers. (9) Suitable size ferrules with details shall be provided on either side on either side of each control/ data/ instrumentation cable. (10) Vendor shall submit cable schedules for approval of BHEL/GSECL. (11)All applicable/relevant clauses under "**Cable installation methodology**" sections of this specification shall be adopted for all aspects of these cables. **NOTE: From SCB no communication cable is required to lay to the SCADA panel** .
5.23	**Erection of 33kV outddor Equipments/panels** (1) Near each Inverter station there shall be one transformer yard having one 5.5 MVA inverter transformer. (2) Near Inverter station there shall be 1 nos of 30 KVA/600-415 aux transformer at33KV pooling yard. (3) Construction of transformer RCC foundations, fencing and gates for these transformers yard and pooling yard near control room and inverter station is in BHEL scope.

	Levelling, stone jelly, cable support structures fabrication & cable tray support foundation works, all earthing related works-excavation etc shall be in vendor's scope. **TRANSFORMER ERECTION-** (1) Vendor shall erect the inverter and auxiliary transformers on RCC foundation as per transformer GA details. Vendor scope of I&C of transformers shall include: a) Movement of transformers and its accessory parts such as radiators, cable boxes, hardware etc from storage yard and placement on foundation pedestal. b) Assembly of transformer parts. c) Cable laying and terminations at LV/HV/Marshalling boxes of transformers. d) All activities applicable to oil filling and filtration including measurement of oil BDV and PPM. Particularly for inverter transformers, filtration of oil shall be carried out to such an extent as to obtain the desired BDV (>60 kV) and PPM (< 15ppm) values. e) Testing of transformers as per "**pre-commissioning checks**" section of this section. (2) After installation of transformers at the transformer yards of each inverter station/ pooling yard near control room, vendor shall level/ compact the ground with an appropriate magnitude and direction of slope to facilitate draining of rain water away from transformer yard. Accordingly, to prevent stagnation of water within transformer yard, vendor shall implement suitable civil works in and around the transformer yard. This shall include filling up the land (wherever necessary) with suitable soil and compact the filled-up portions either manually or with rollers, as applicable, as per site conditions, to achieve required compaction/slope. **General Notes-** Vendor shall provide the 100 mm layer of stone gravels in transformer yards as per relevant IS standards / CBIP/ CEIG requirements etc. Vendor shall provide applicable earthing connections to transformers, fencing / gates etc. in the yard as per relevant clauses under the "**Earthing system**" section of this specification. All other items (if any, other than the above) that are required to meet the technical requirements of transformer yard as per applicable standards / electricity rules shall be incorporated by the vendor.
5.24	**Inter connection Point** From the three 25MW POOLING STATION 1CX630 SQMM cable will run per phase to the Dhuvaran Switchyard which is 3.5km away from the solar power plant . All the cable laying from three 25MW pooling station to SWITCH-YARD is not in BOS vendor scope . In 75mw Pooling station which is located in the switch-yard there will be one 75mw 33kv HT panel (outdoor type) Whose installation is in bos vendor scope . Termination is also in the scope of BOS vendor . There one dry type transformer 50kva as mentioned below has to be installed.
5.25	**Supply, erection and commissioning of auxiliary transformer 50kVA, 33kV/415V, 3 Phase Dry Type, Outdoor** **QTY REQUIRED- 1 NOs** Type test reports from NABL accredited lab will be submitted for Auxiliary transformer for approval of manufacturer. Vendor will be approved based on type test report and credential.

1.0 Technical parameters and specifications:

#	Technical parameter	Specification
1	Transformer type	Outdoor, Dry type
2	IP class	Transformer, including cable box and marshalling box shall be of IP55
3	Type of cooling	Not Applicable
4	Governing Standard	IS: 1180
5	Rating in KVA	50 kVA
6	No. of phases	3
7	Frequency	50 Hz, +/- 3%
8	HV winding	33kV, 3-Ph, with **Delta** connection
9	LV windings	415V, 3-Ph, with **Star** connection
10	Winding material	Electrolytic grade copper for both HV and LV windings
11	Winding Insulation	Class A
12	Neutral on LV side	Neutral terminal shall be brought out separately to facilitate earthing connections.
13	Vector Group	Dyn11
14	Short circuit withstand time (thermal)	2 sec.
15	% Impedance	As per IS: 2026
16	Termination HV/LV/Orientation	Air insulated cable box with disconnecting chamber, for both HV and LV sides. Cable box / Cable box / 180^0.
17	Cable entry on HV side	Bottom entry of cables.
18	Cable entry on LV side	Bottom entry of cables.
19	Cables and accessories	HV & LV Cables, termination kits (for HV), cable lugs (Dowell make), (Comet make) and connecting hardware shall be in vendor scope of supply. Vendor shall provide hole on the bottom-side gland-plate of HV & LV side cable box for cable entry as per the final outer diameter of cable provided by BHEL during detailed Engg.
20	Tapping on HV winding	Off circuit tap changer (OCTC) switch with five tap positions: +5%, +2.5%, 0, -2.5%, -5%.
21	Loading Capability	Continuous operation at rated KVA on any tap with voltage variation of +/-10%. Transformer shall be capable of being loaded in accordance with IS: 6600 / IEC 60076-7.
22	Ambient temperature	Max 50 deg C
23	Temperature rise	For top oil: Max. 50 deg C by thermometer method For winding: Max. 55 deg C by resistance method Both rises shall be over an ambient temperature of 50 deg C irrespective of tap position.

24	Flux density	Not to exceed 1.9 Wb/sq.m at any tap position with +/- 10% voltage variation from voltage corresponding to the tap. Transformer shall also withstand following over-fluxing conditions due to combined voltage and frequency fluctuations: a) 110% for continuous rating b) 125% for at least one minute c) 140% for at least five seconds Vendor shall furnish over-fluxing characteristics up to 150%
25	Air Clearance	As per CBIP
26	Load loss principal tap at 75^0C, with IS tolerance	This shall be provided by vendor.
27	No Load loss at rated voltage on principal tapping and at rated frequency, with IS tolerance	This shall be provided by vendor.
28	No load current at rated voltage and rated frequency	This shall be provided by vendor. To be indicated as percentage.
29	Efficiency at 75^0C, UPF	As per IS 1180 and CBIP
30	Regulation at full load, 75 ^{o}C	< 2 % for UPF For 0.8 PF lagging, to be indicated by vendor.
31	Harmonics	Shall be designed to suppress harmonics especially 3rd& 5th.
32	Vibration & noise	Noise level shall be according to NEMA TR-1 standard
33	Highest system voltage	LV side: 1.1kV HV side: 36 kV
34	Insulation levels as per IS:2026 Rated Lightning Impulse withstand voltage / Short duration power frequency withstand voltage	LV side: -- kVp / 3 kV rms HV side: 170kVp / 70kV rms
35	Overall dimensions in mm Length x Breadth x Height	This shall be provided by vendor.
36	Oil capacity (in Litres)	This shall be provided by vendor.
37	Weight of transformer in Kg	This shall be provided by vendor.
38	Constructional features	As per relevant clause of this specification

39	Fittings and accessories	As per relevant clause of this specification
40	Painting	RAL 7032

2.0 Tests on auxiliary transformer will be witnessed by BHEL/ GSECL prior to dispatch clearance.

5.26 **Supply, erection and commissioning of auxiliary transformer 30kVA, XXXV/415V, 3 Phase Dry Type TRANSFORMER , Outdoor TYPE**

QTY REQUIRED- (12+3) NOs

Type test reports from NABL accredited lab will be submitted for Auxiliary transformer for approval of manufacturer. Vendor will be approved based on type test report and credential.

I. Technical Specification:

1. Type : VPI or cast resin dry type transformer
2. Construction : Ventilated metal enclosure, removal type, IP23 or better
3. Governing stds. : IS 11171/IS2026
4. Application : Distribution of electrical power.
5. Power : 30 kVA
6. HV voltage : 415 V
7. LV voltage : 500 to 700 V (Will be specified during detailed Engineering)
8. No. Of phases : Three
9. System frequency : 50 Hz ± 3 Hz
10. Class of insulation : F class or better
11. Insulation level : As per IS 11171/ IS2026
12. Conductor : Electrolytic grade copper (free from scales and burr)
13. Tapping on HV : +5% to - 5 % in steps of 2.5 % (OCTC)

14. Type of terminals : As per IS 11171/ IS2026

15. Cooling : Air natural

16. Mounting : Indoor (inside the control room)

17. Ambient temperature : -5°c to 50°c

18. Vector group : YNd11 (HV side star and LV side delta)

19. Percentage Impedance : 4%

20. Termination-LV side : Cable box with 63A MCCB

21. Termination-HV side : Cable box

22. Protection : Winding Temperature Indication (WTI)

2.0 Tests on auxiliary transformer will be witnessed by BHEL/ GSECL prior to dispatch clearance.

Note: 12 no 30kva transformer is required for each invertor station but in case of 3 no 25MW STATION 2nos of 50 kva may be required will be decided at the time of detailed engineering

5.27 **Auxiliary AC/DC power supply system**

1. Per two PCU container shall have 1 no aux transformer for aux supply requirement. Vendor shall provide a small Ac distribution board to cater the aux supply requirement like lighting, UPS, FCBC, transformer aux supply, module washing pump etc.
2. For Control room vendor shall supply the ACDB which shall be fed from 1 nos of 33, KVA Aux transformer. There shall be a changeover switch of suitable rating for selection of the transformer. Installation, testing and commissioning is in vendor's scope.

Following DB boards for application in main control room shall be in vendor scope of supply, installation and commissioning:

UPS DB for 230V AC UPS supply to SCADA, weather monitoring system, fire alarm system, emergency loads, CCTV system - 1Nos

i. Following DB boards for inverter rooms shall be in vendor scope of supply, installation and commissioning:

UPSDB 230V UPS supply for PCUs (control circuits), fire alarm system panel, emergency loads, CCTV system etc – 1 No

ii. SLD will be shared after PO placement.

iii. Above DBs shall be **outdoor type**, of reputed make such as Legrand, Siemens, Schneider or any other reputed make as approved by BHEL/ GSECL.

iv. Installation of all the above items including all necessary cable terminations/ installation shall be in vendor scope.

5.28 Supply and Installation of Weather monitoring system

As part of weather monitoring system (WMS), vendor shall supply, install and commission Pyranometers, Anemometer, Temperature sensors and data logger with all necessary software and hardware such as power supply/ control/ data/ communication cables, support structures etc. required to integrate with SCADA.

Scope of vendor shall also include supply and erection of all the mounting arrangements including all necessary civil works/ foundations, clamps arrangement etc. as recommended by manufacturer and required at site. Communication cables shall be laid and terminated at both SCADA station at main control room and data logger at weather monitoring station end. Similarly, power supply cables shall be laid between WMS and DB boards in main control room.

Exact location of the weather monitoring station shall be decided during detailed engineering.
Detailed specification of WMS items is as below-

Pyranometer (2 Nos)
Vendor shall supply and erect 2 Nos pyranometers secondary standard pyranometers (ISO 9060 classification) for measuring the incidental solar radiation at horizontal and inclined plane of array. One shall be mounted horizontally and one shall be mounted in tilt position. Specification of the pyranometer shall be as follows-

Parameter	Specification
Spectral Response	0.31 to 2.8 micron
Time response (95%)	Maximum 15s
Nonlinearity	±0.5%
Temperature Response	±2%
Tilt error	<±0.5%
Zero offset thermal radiation	±7 W/m2
Zero offset temperature change	±2 W/m2
Operating temperature range	0°C to +80°C
Non-stability	Maximum ±0.8%
Resolution	Minimum +/- 1W/m2
Output	Analog output: 4 – 20 mA, Serial output: RS485

Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. The signal cable length shall not exceed 20m. The Contractor shall provide instrument manual in hard and soft form.

Temperature Sensors
Vendor shall supply and install two thermometers (one for ambient temperature measurement with shielding case and other for module temperature measurement). The

thermometers shall be RTD/ semiconductor type measuring instrument with measurement range of 0°C to 80°C. The instrument shall have valid calibration certificate.

Ultrasonic Anemometer and wind vane (wind speed and direction)
Vendor shall supply and install one no. ultrasonic wind sensor (no moving parts) for wind speed and direction monitoring.
Specification of the Anemometer shall be as follows-

Parameter	Specification
Velocity range with accuracy limit	0-60m/s with +/-2% accuracy @12 m/s; Resolution: 0.01m/s
Wind direction range with accuracy limit	0 to 360° (No dead band) with +/-2° accuracy @12 m/s; Resolution: 1°
Mounting Bracket	Anodized Aluminium bracket to reduce corrosion, all mounting bolts of SS
Protection Class	IP66
Output	RS232 and RS485

Data logger and Data Acquisition System

Vendor shall supply and install data logger for weather monitoring system. Data logger for the weather monitoring station should have the following features:
Provision for analog, digital and counter type inputs for interfacing with various type of sensors
(i) Analog Input
- Adequate nos. for all analog sensors with redundancy
- Provision for operation in different current and voltage ranges as per connected sensors
- Accuracy of +/-0.1% of FS

(ii) Digital Inputs
- Adequate no. of Digital inputs and outputs for the application

(iii) Provision for RS232 and RS485 serial outputs
(iv) Built-in battery backup
(v) Connectivity and Data transmission:
- Built-in GSM/ GPRS modem for wireless data transmission to SCADA/ cloud server (procurement of GPRS enabled SIM Card and connection subscription to be the responsibility of Contractor). It should be possible to remotely communicate with the device for configuration settings.
- RS485 MODBUS interface for data collection and storage on SCADA
- Web interface with provision for user login to enable viewing and downloading of weather data in XLS/ CSV format
- Communication protocol should support fast data transmission rates, enable operation in different Frequency bands and have an encryption-based data security layer for secure data transmission

(vi) Display Settings: Graphic LCD screen which should be easily accessible and should display relevant details like all sensor values, battery strength, network strength etc.
(vii) Provision of Time synchronization from telecom time or server time
(viii) Data Storage: Provision for at least 2 MB internal Flash Memory and at least 8 GB Micro SD card (expandable)
(ix) Protection level: IP65 or better

5.29 Installation and commissioning of SCADA integration systems

(1) SCADA system, supply of which shall be in BHEL scope, comprises of data station panels and PC based control desks with software to collect, store, process and report the data parameters of power plant and also to control the operations of the power plant by integrating the various equipment at the segments as follows:

(a) String monitoring boxes (360 Nos) in solar array field

(b) Weather monitoring equipment: Pyranometers for solar irradiation (2 Nos), thermometer for ambient temperature (1 No), thermometer for module surface temperature (1 No), anemometer for wind speed and direction with datalogger.

(c) Power conditioning units (20Nos): DC input / AC output parameters of inverters, grid data, fault status and events logged, etc.

(d) Inverter transformers (10 Nos): Alarm/Trip signals, WTI/OTI temperature values.

(e) 33kV VCB breaker panels (as per SLD): status of VCB breakers, status of protection relays of transformers, oil / winding temperatures, AC parameters at every 5MW level of the plant.

(f) ACDB multifunction meters (2 Nos): AC auxiliary utility consumption parameters

(g) Fire alarm system (all inverter station/ main control rooms): status signals

(h) CCTV system

(2) BHEL scope of SCADA:

(a) Supply of Data station panels with necessary data loggers / PLCs and other accessories such as power supply etc to integrate the data signals as listed below. This includes main panel at main control room and intermediate (linking) panels at inverter room.

(b) Supply of Desktop PCs (HMI control desks) provided with necessary software packages and remote monitoring features.

(c) Supply of OFC and LAN cables for SCADA.

(d) Termination of OFC cable at SCADA panels.

(3) Vendor scope of supply and installation of SCADA system:

(a) Vendor shall install the BHEL supplied SCADA system in the SCADA room in main control room. Vendor shall also install SCADA panels in the inverter rooms.

(b) Cable laying/ terminations of all SCADA cables at respective rooms/ panels / equipments including cable trenche works shall be in vendor scope. BHEL will provide the necessary cabling schedule during detailed engineering.

(c) Supply of all SCADA related control / communication cables except OFC and LAN cables shall be in vendor scope.

(d) INTERNET CONNECTION: (Internet/Intranet at Plant with Static IP: Public or private network access shall be provided at the plant through any broadband/VSAT connectivity of 2Mbps or higher bandwidth. SCADA system shall be capable of sending all plant data in real time to the Remote Server.) All required hardware items such as Modem / Router / Wifi facility etc. shall be in vendor scope.

(e) Data Communication to SLDC: Vendor shall provide required interface to integrate plant SCADA with GSECL-SLDC, in compliance with grid code, to send any parameters specified by SLDC.

Note: The methodology and specification of SLDC interface will be provided separately by SLDC/GSECL and it shall be the responsibility of the vendor to obtain and implement the same as per SLDC/ GSECL requirements.

5.30	**Supply and installation of lightning protection system (ESE type lightning arrestors) to protect the electrical equipment of SPV power plant and Buildings from lightning.** 1. The Complete Solar PV Power plant shall be provided with Lightning and over voltage protection. The "Lightning Protection System" must be completed prior to start-up of commissioning activities of the project. The main aim of over voltage protection is to reduce the over voltage to a tolerable level before it reaches the PV or other sub-system components. The source of over voltage can be lightning or other atmospheric disturbance. 2 The Lightning Conductors shall be made to protect the entire Array Yard from Lightning stroke. Necessary concrete foundation for holding the lightning conductor in position to be made after giving due consideration to maximum wind speed and maintenance requirement at site in future. 3 The lightning conductor shall be earthed through flats and connected to the Earth mats as per applicable Indian Standards with earth pits. Each Lightning Conductor shall be fitted with individual earth pit as per required Standards including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, watering pipe using charcoal or coke and salt as required as per provisions of IS. 1.8.4 Direct Stroke lightning protection shall be used. The system shall have following features: a. Active Lightning Rod OLP-214 shall based on Early Streamer Emission principle, complying NFC 17-102 and UNE 21186 Standards. The Device shall create an upward propagating streamer into the air 60 microseconds earlier than conventional air terminals or other objects on the earth, The device selected shall gives 107 meter radius of protection in level Ill when mounted on 5 meter effective height mast. Along with Mast (G.I. pipe of suitable height) for mounting The device & adaptor along with supporting stray wires, etc. The device shall be in compliance to CE. The device shall be tested & cer1ified by CPRI (Central Power Research Institute- Bangalore) Govt. of India. The device shall be tested from International lab I University in compliance with NFC17-102 standard for Lightning catching head (ESE) impulse voltage streamer time Lag. Gain measurement. The ESE device shall have Warranty of 30 years. b. High voltage insulated (HVI) cable shall be used as a down conductor to overcome the separation distance which is essential to avoid creep age flashovers. The HVI shall have high voltage resistant of the inner Cu conductor. Safe injection of lightning voltage at the entry thus preventing creeping flashovers (voltage flashovers) along the surface between the first Earthing point and the entry. The diameter of cable shall be 27mm, inner conductor size 25sqmm. And Separation distance :S 90 cm in air or :Sl.8 meter in solid c. Tripod C- Bar Maintenance Free Chemical Earthing for Lightning Protection consists of 3 Nos. of Copper bonded rod of 5/8"dia 10' length (The electrode shall be a solid steel rod made of high tensile low carbon steel and coated with molecularly bonded copper on the outside as per UL 467. The thickness of the copper coating shall be at least 250 microns. The electrode shall carry UL marking.) With two clamps (Clamp shall be suitable to terminate the earth rod and strip. The clamp shall be of Brass/Gunmetal), supported with 3 bags of 22.6 Kg Ground Enhancement Material (GEM) {The GEM shall have a low resistivity for faster transient/fault current dissipation. The GEM shall be Performed in all

	soil conditions even during dry periods. The GEM shall maintain constant resistance for the life of the system, temperature variation effects less than 1.0%. The GEM shall be non-toxic, environment friendly and does not adversely affect soil or ground water. The GEM shall lowers the contact resistance to earth by up to 63%.The GEM shall have a resistivity of less than 0.2 ohmmeter. The GEM shall be CE & ROHS certified.} Joined by using 25x3mm copper flexible strip of 3 mtr length each (total 9 mtr.) and one number of poly plastic pit cover no meson work needed. d. The Contractor shall ensure adequate lightning protection to provide an acceptable degree of protection as per IS for the array yard. If necessary more numbers of Lightning conductors may be provided. Theoretical design calculations and detailed explanations along with drawings shall be provided and approved by BHEL/GSECL.
5.31	**Earthing for solar array structures and SMBs** Vendor shall supply and install the earthing system for solar array, MMS structures, SMBs and various other electrical equipments in line with IS 3043 latest amendment. **Vendor shall supply required nos of Earth electrode of 17mm dia, 3 m length along with back fill chemical compound for array earthing.** Electrode connection shall be brought out upto ground level.. Earthing cables all necessary hardwares like nut, bolts, bimetallic lugs etc. shall be in vendor's scope of supply. Supply of 25x3 and 25x6 GI earth strip shall be in BHEL scope. Vendor has to supply and fix the earth chamber precast/prefab type for each earth electrode with following details. (a) Minimum Inner diameter shall be 300mm. Exact size shall be chosen to ensure ease of maintenance operation using spanners etc. (b) Projection of chamber above FGL = 150mm minimum (c) Cover plate with suitable lifting hooks and padlocking arrangement. Supply and installation of all materials related to Earth chambers shall be in vendor scope. **Array Earth mat grid shall have following dimensions:** (1) Earth mat grid (25X6 mm GI flat) shall be buried 600mm minimum below ground level. Where it crosses trenches, pipes, ducts, channels etc, it shall be at least 300mm below them. Back filling soil to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm. Backfilled surface shall be well compacted. (2) Inner branches (along the solar array rows) shall be with GI flat 25x6mm (Supply of GI strip by BHEL). Inner branches shall be connected to outer grid. All excavations related to earthing in each row shall be in scope of vendor. **Earthing of MMS structures shall be as follows:** (1) Solar array MMS structure shall be connected to earth mat using GI flat 25x6 mm minimum; Bolting on structure (M10 minimum), Welding on earth mat end. (2) Adjacent structures shall be connected to one another using GI flat 25x3 mm minimum. Both ends shall be bolted (M10 minimum).

	(3) Wherever the clear distance between the adjacent structure is 2m, 25x6 GI strip shall be laid below the ground at a depth of 600mm from GL. (4) Earth strips shall be bend properly and taken along the support structure. **Earthing of SCBs shall be as follows:** (1) SPD earth point shall be earthed using 1Cx16 flexible copper (unarmoured) green cable from SPD to SMB structure. Both ends of cable shall be suitably lugged and connected using matching hardware. (2) Above earthing cables along with Lugs shall be in vendor's scope of supply. (3) SCB structure shall be connected from structure legs (2 independent connections) to MMS leg using 25X6 GI strip for earth continuity. Earth strips shall be bend properly and taken along the support structure. **General points:** (a) **Stainless steel**, nuts, plain washers shall be used. Spring washers shall be zinc/epoxy coated. (b) All connections to equipments and earth electrodes shall be bolted connections. (c) Weldings ahall be allowed only in case of inner earth grid to outer earth grid connections. Welding for GI flats shall be using electric arc welding. Both the flats shall be overlapped for the full width where they are in perpendicular direction in same plane. Where the connection is along same line, both flats shall be overlapped for a minimum of 50mm. L-bend with weld length of 50mm minimum shall be adopted wherever overlap length to be ensured. (d) Resistance of welded joint shall not be more than that of GI flat. (e) All Welds shall be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection. (f) Bimettalic lugs/ washers shall be used wherever copper to GI earthing is made. Supply of bimetallic lug/ washer is in vendor's scope. (g) While laying earthing electrodes, adding/mixing of chemical compound and water around the electrode in the dug hole shall be as per instructions of OEM. (h) In compliance to Rule 11 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.
5.32	**Earthing system for inverter station, main control station, 33kV transformer yards and metering Yards** **Vendor shall supply and install minimum following no of earth electrode:** **Inverter station transformer yard: 20 nos for each Inverter station** **Control room: 5 nos** **33KV pooling yard: 15 nos** **Interconnection point : 12 nos** (1) Vendor shall install and commission earthing system for protection against faults as guided by IEC 60364 for the inverter station main control room, 33kV transformer yards, 33Kv pooling yard and interconnection point. (2) Vendor shall prepare and submit the earthing system Layout for Inverter station, Control Room, 33Kv pooling yard, interconnection point and Transformer yards and submit for BHEL/ GSECL approval during detailed Engg. (3) Earthing electrodes of 3m minimum long, 17.2 mm minimum diameter, copper bonded MS, chemical compound filled shall be in vendor scope of supply (4) Bore holes of appropriate diameter shall be made by vendor on the earth for insertion of such chemical earthing electrodes with filling of mix of chemical compound and water

around. Inverter rooms and main control room shall be provided with separate earth grids.

(5) Earthing connections to electrical panels within the inverter room/ main control room: Flats GI 65x8 (BHEL scope of supply) shall be provided for double earthing of 33kV VCB panels, UPS/ FCBC/ Battery banks, ABT metering panels, cable trays. The earthing for PCU shall be done through 1Cx 70 flexible copper cable and for SCADA through 1Cx 16 sqmm copper cable. Supply of 1CX70 sqmm cable, 1CX16 sqmm cable, cable lugs and hardware is in scope of vendor.

(6) Earthing of inverter transformers in the transformer yards of inverter/control room, Aux transformer, :

(a) Flats GI 65x8 minimum shall be provided for interconnecting various parts of the inverter transformer (for body earthing) viz tank, conservator, disconnecting chambers, cable boxes, marshaling box, radiators etc.

(b) Such interconnected local grid shall be double earthed to the main earth mat grid running underground through GI flats 65x8 outside 2 m from yard fence.

(c) Flats shall be bolted on transformer side and overlap welded to earth mat grid. Two earth pits shall be located close to each transformer for body earthing.

(d) Shield earthing of inverter transformers shall be separate and connected to two earth pits (connected together, isolated from earth grid) using copper flat 50x6mm

(e) Neutral of Inverter transformer shall be connected to two earth pits (connected together, isolated from earth grid) using copper flat 50X6 mm.

(f) Neutral of aux transformer shall be connected to two earth pits (connected together, isolated from earth grid) using copper flat 50X6 mm.

(7) Transformer yard fencing shall be earthed at every alternate post using GI flats 25x6 mm minimum to the earth grid. Gate shall be looped to the fencing mesh by way of GI wire of suitable size.

(8) Switchyard/ metering yard structure and equipments shall be earthed using GI flats 65x8 minimum.

(9) The metallic frame work of all switchyard equipment, cable trays and support structures shall be connected to the earth grid by means of two separate and distinct connections

(10) Earth grid shall be buried underground up to a depth of 600mm minimum from NGL. Back filling soil to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm. Backfilled surface shall be well compacted.

(11) Vendor has to provide the brick earth chamber each earth electrode with following details

a) Minimum Inner diameter shall be 300mm. Exact size shall be chosen to ensure ease of maintenance operation using spanners etc.

b) Projection of chamber above FGL = 150mm minimum

c) Cover plate cast iron cover plate with suitable lifting hooks and padlocking arrangement.

(12) Supply and installation of all materials related to Earth chambers shall be in vendor scope.

(13) Earth electrode shall be bolted to a horizontal GI flat 65x8 minimum that in turn bolted (M10 minimum) to two GI flat 65x8 minimum raisers on either side of horizontal flat. Raisers shall be connected to earth mat grid by way of overlap welding.

General points:

(a) All earthing electrodes, GI flats is in BHEL scope of supply

(b) All earthing cables, 50X6 mm copper strip, lugs, hardware etc shall be in vendor scope of supply.

(c) **Stainless steel** bolts, nuts, plain washers shall be used. Spring washers shall be zinc/epoxy coated.
(d) Welding for GI flats shall be using electric arc welding. Both the flats shall be overlapped for the full width where they are in perpendicular direction in same plane. Where the connection is along same line, both flats shall be overlapped for a minimum of 50mm. L-bend with weld length of 50mm minimum shall be adopted wherever overlap length to be ensured.
(e) Resistance of welded joint shall not be more than that of GI flat.
(f) Welds shall be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection.
(g) While laying earthing electrodes, adding/mixing of chemical compound and water around the electrode in the dug hole shall be as per instructions of OEM.

5.33 Design, supply and installation of CCTV System

Surveillance CCTV system is required to ensure effective surveillance of solar power plant area (array yard, 5MW Inverter station, transformer yards etc.) as well as create a tamperproof record for post event analysis. The System shall provide an online display of video images on Large LCD/LED monitors located in Main Control Room as well as at main security cabin in the site. System shall facilitate viewing of live and recorded images and controlling of all cameras by the authorized users present in the LAN. System shall provide interoperability of hardware, OS, software, networking, printing, database connectivity, reporting, and communication protocols. System expansion shall be possible through off-the-shelf available hardware.
There shall be cameras installed inside and outside the Inverter room/Inverter station control rooms, main gate, security cabin, switch yard, all weather stations and all watch tower, providing round the clock surveillance. The
location and type of cameras are mentioned as here
Location of Surveillance Cameras:
1. Following table states location wise types of cameras to be used in CCTV system.

Sr. No	Location	Type of Cameras
1	Inside each Inverter room	Dome Type
2	Outside each Inverter Station	Bullet Type
3	Transformer Yard	Bullet Type
4	Inside Control room	Dome Type
5	Outside Main control room	Bullet Type
6	Main Gate	Bullet Type
7	Inside Security Cabin	Dome Type
8	Outside Security Cabin	Bullet Type
9	Each Weather station	Bullet Type
10	Each Watch tower	PTZ

Cameras shall cover the entire inside & outside area of all inverter & main control rooms, main gates, security cabin, switch yards, all weather stations and all watch towers, providing round the clock surveillance considering the safety point of view. No. of cameras will depend on the design of Surveillance & vigilance CCTV system.
Design & drawing for the Surveillance & vigilance CCTV system shall be submitted for approval to BHEL/ GSECL
2. Equipment with better specifications shall be accepted.

a. CCTV Cameras shall have low lux so that the same can operate in minimum illumination also. Cameras shall have both auto/manual focus mode and control shall also be both manual/auto.
b. The system shall be based on Stand Alone Integrated DVR (Digital Video Recording). Specifications of Stand Alone Integrated DVR:
(i) Ability to connect Cameras as per requirement,
(ii) Facility to store 90 days of Video,
(iii) Capability to set the frame rate, contrast, brightness of each individual camera,
(iv) Shall have facility to view live video (with audio) images in a monitor, in a PC and web browser.
(v) Remote Administration: Shall be fully administrable/ programmable remotely through client software and web browser.
(vi) Recording rate per channel - NTSC/30 fps per channel, PAL/25 per channel.
(vii) Configurable/adjustable recording rate.
(viii) Full recording and playback facilities on remote machine.
(ix) Smart monitoring (Motion Detection).
(x) Adjustable motion detection (motion detection sensitivity shall be adjustable).
(xi) Ability to convert H.264 video into AVI files.
(xii) Date and time stamping of video files.
(xiii) Viewing for all cameras.
(xiv) Shall support backup devices like USB drive, DVD writer DVR Software must be able to take backup in DVD writer, USB drive etc.
(xv) Shall have live display, playback, record facilities.
(xvi) Shall have minimum 1 USB port.
c. System shall have the capability of increasing the storage capacity as and when required.
d. It shall have low maintenance cost and shall be upgradeable to inputs for more cameras, as and when required, with minimum cost.
e. It shall be compatible with alarm system.
f. Cameras shall be C-mount type.
g. The firm installing the system shall have adequate infrastructure for providing after sales/installation service.

3. **PTZ Cameras**

- 36x optical zoom and 12x digital zoom, up to 432x total zoom
- High resolution of 540TVL (color) and 570TVL (B/W)
- Wide Dynamic Range (WDR)
- True Day/Night (IR-cut filter)
- IP66 rate and surge protector
- Pan speed up to 300°/sec and tilt speed up to 120°/sec
- High-performance memory with 128 preset positions, 24 privacy mask zones and 3 selflearning auto tracks

Image Sensor : 1/4” Sony ExView HAD CCD or equivalent
Effective Pixels: 752(H) x 582(V)
Horizontal Resolution: 540TVL (Color), 570TVL (B/W)
1.0lx (30IRE): IR Cut Filter On
0.1lx (30IRE): IR Cut Filter Off
0.001lx: DSSx256-ON
Minimum Illumination: 0.0001lx (30IRE): Night ON+DSS
Focal Length: f=3.4mm - 122.4mm
Aperture Range : F1.6 (wide) - F4.5 (tele)
Angular Field of View: 57.8° (wide) - 1.7° (tele)

Electronic Shutter: 1/50 - 1/10,000 Sec
Synchronization: Internal/External (V-Lock)
S/N Ratio : > 50dB
White Balance: Manual / Auto / Indoor / Outdoor / ATW
Day/Night: True Day/Night (IR-cut filter)
WDR: ON/OFF
BLC: ON/OFF
Dome Size: 6"
Power-off Real-time Memory: Yes
Long-focus Speed-limited: ON/OFF
Camera ID Range: 0 – 255
Video Output: (1.0Vp-p), 75ohm, BNC
Pan Angle: 360° rotation capability
Tilt Angle: 0° - 90°
Pan Speed: 0.1° - 300°/Sec
Tilt Speed: 0.1° - 120°/Sec
Zoom: 36x Optical Zoom, 12x Digital Zoom
Auto Scan: ON/OFF
PTZ Tours (Pattern): 3 Programmable, 120 Seconds
Preset Speed: 360°/Sec
Accuracy: 0.1°
Turn Over: Digital Turn Over
Preset Position: 128 Maximum
Vector Scan Group: 6
PTZ Protocol: Pelco D/P, KD6, VCL, Maxpro Mode
Power Supply: 24VAC 2A 60Hz/50Hz, Surge Protector
Power Consumption: 35W
Connector: RS-485
Protection Class: IP66
Operating Temperature: -20°C to 55°C
Certification: CE, FCC,UL

4. Integrated IR Analog Bullet camera 700 TVL

- Ultra high resolution: 700TVL
- Min. illumination: 0 Lux (IR ON)
- 2 IR LED array lights; 30 – 40m IR range
- 5 - 50mm lens
- True Day/Night (with IR-cut filter)
- AES, BLC, White Balance, digital spot compensation, lens shaded control, horizontal mirror
- Motion detection, privacy masking
- Lens shaded control, horizontal mirror, OSD
- Defog function
- IP66, alluminium casing – vandal-proof, lightening-proof
- UTC (Up-the-Coax) function optional
- Operating Temperature -20°C to 50°C
- Storage Temperature -30°C to 70°C
- Operating Humidity 90%RH (non-condensing)
- Casing Material Aluminium Alloy
- Rating IP66, vandalproof, lightening proof

5. Analog Dome camera 700 TVL

Ultra high resolution: 700TVL

- 5 - 50mm lens
- True Day/Night (with IR-cut filter)
- White Balance, electronic Shutter adjustable, BLC
- Lens shaded control, horizontal mirror
- Defog function
- Motion detection, privacy masking, OSD
- Up-the-Coax (UTC) function (optional) for controlling OSD remotely
- 24V AC / 12V DC
- Video Cable: RG59U video cable (with heavy gauge PVC conduit)
- Power Cable with heavy Gauge
- Other technical requirements:
- The DVR system shall have CE certification with certificates
- All Cameras must be provided with suitable mounts/housings Wall, Dome etc.
- All cameras must be connected with DVR system with RG59 (with heavy gauge PVC conduits) cables and vendor must perform the necessary cabling to connect DVR with cameras.
- The DVR system offered must be an integrated DVR system and shall not be a DVR system assembled using third party Personal Computers and DVR cards.
- 16 channel DVR shall be able to support D1 resolution for all camera's with 16 TB HDD facility & they shall have a central management software & joystick keyboard shall be there for PTZ controlling.
- Training Aspect
- At the time of installation of equipment, the vendor shall offer free training specific to CCTV system.
- CCTV vendor shall be reputed and have relevant experience of similar solutions in any of Private/ PSU/ State Govt . Supporting documents in form of customer completion letter shall be submitted at vendor approval stage to BHEL/ GSECL
- The CCTV system shall be warranted for 5 years from the date of commissioning. Circuit
- diagram for the Surveillance & vigilance CCTV system shall be submitted for approval to GSECL

All related supplies, installation including trench work, civil works etc for CCTV system shall be in scope of vendor. All necessary labour, machinery, tools, instruments shall be in vendor scope

5.34 **Design, supply and installation of Plant lighting System**

Illumination system within main control room (CMCS) shall be BHEL scope of supply and installation.

Illumination system (lighting) at 20 Inverter Stations. PEB rooms, 33KV pooling yard, security cabin, watch tower and Transformer yards at inverter stations shall be in vendor scope of supply and installation. All fixtures shall be Led type. Minimum following LED lights shall be provided as per the details below

Sl. No	Location	No of Lights	Type of Light
1	Inverter station (20)	4	70 W LED
2	Inverter Transformer yard (20)	2	70 W LED
3	33KV switchgear panel (20)	2	70 W LED
4	PEB room (1)	4	35 W LED
6	Interconnection point (1)	4	70 W LED
7	Security Room (2)	2	35 W LED
8	Watch man cabin (8)	2	1 No search Light an 1 No Flood Light

In addition 1 No of Exhaust fan shall be supplied and installed in each PEB room and 1 no wall mounted fan in each security room.
All necessary cable, switches, boards etc shall be in vendor scope of supply.
Layout shall be submitted for BHEL/ GSECL approval during detailed Engg.

Array / Peripheral Lighting
Vendor shall design supply and install array/ peripheral lighting system to provide average lux10. Lights used shall be LED type. Lights shall be mounted on the GI poles. Vendor shall submit the detailed calculation for type of light/ height of pole, pole foundation, cable details to meet the lux calculation for BHEL/ GSECL approval during detailed Engg.
All material like Light, Pole, cable JB, earhing for lighting pole etc shall be vendor scope of supply.

5.35 Fire Alarm and Firefighting systems

Fire alarm system :

Vendor shall supply and install intelligent microprocessor based main fire alarm panel of modular construction complete with central processing unit, input and output modules, power supply module , supervision control and isolator modules with 10% spare provisions. Fire detection alarm system shall include alarm initiating devices e.g. multisensor type smoke detectors and alarm notification Appliances (Audio device). Multisensor type smoke detectors shall be provided for areas of Inverter Room and Main Control Room. One(01) sensor shall be provided for each 25 sqm of area in Inverter & Main Control Room.

Fire Alarm Control Panel:
Alarm conditions shall be immediately displayed on the control panel of Main Control Room. Alarm LED shall flash on the control panel until the alarm has been acknowledged. Once acknowledged the LED shall remain lit. A subsequent alarm received from another zone after acknowledgement shall illuminate the alarm LED and the panel display shall show the new alarm information.
During an alarm condition, an alarm tone shall sound within the control panel until the alarm is acknowledged.
If the audible alarm signals are silenced for any reason, they shall automatically resound if another zone is activated.

All alarm signals shall be automatically "locked in" at the control panel until the operated device is returned to its normal condition and the control panel is manually reset

Firefighting systems: Fire extinguishers and sand buckets

Vendor shall provide fire extinguishers/ sand buckets as follows for fighting fire of oils, solvents, gases, paints, varnishes, electrical wiring, live machinery fires and flammable liquid/ gas as per recommendation by relevant fire safety authority and as per relevant standards IS: 2171 and IS: 10658 marked.

All buildings shall be installed with required no. of fire extinguishers as per relevant BIS standard and NBC. LiquefiedCO_2/ foam/ ABC type fire extinguisher shall be upright type of capacity 10kg conforming to IS: 2171, IS: 10658.

- DCP type (ABC) 10 Kg designed/tested IS 15683/ IS 2171 with safety release valve, NRV and CE approved valve. Dry powder IS 14609 with standard accessories.
- CO2 type 10 Kg with wheel. Designed/tested IS 2878/ IS 15683/ IS 8149 complete with hose, screw valve, CO2 gas IS 1522, cylinder IS 7285, valve IS 3224. Tested at 250 Kgf/cm2.
- Sand bucket should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546 at strategic locations.

Minimum Quantity requirements:

Type of extinguisher	DCP type (ABC) 10 Kg	CO2 type Hand 10 Kg	Foam type Hand held 9 Kg	Sand bucket stand (4 sand bucket on one stand)
Main control station	3	3	3	2
Inverter station	2	2	2	2
Inverter room transformer yard	2	2	2	2
Metering Yard	1	1	1	2
Security rooms	-	1	-	1

5.36 Identification marking using painting

Following items shall be identified by way of artistic painting in black letters with yellow background. For danger symbol/text, white letters in red background. Identification number/ text to be painted shall be submitted for BHEL/ GSECL approval during detailed engineering for the following.

(1) Solar array structures: ~324000 Nos
(2) String monitoring boxes: 360Nos
(3) Size/ source/ destination of DC cable 1Cx185 with arrow mark (power flow direction) to be painted on SMBs and PCUs
(4) PCUs front side: PCU ID number (1 to 20) with rating 2500kW, AC chamber/ DC chamber, Danger text/symbol.
(5) PCUs DC chamber back side: SMB ID numbers, cable size (1Cx185 +,-) with upward arrow mark, danger text/symbol
(6) PCUs AC chamber back side: Inv Trnfmr ID, cable size (6Rx1Cx630 / ph) with downward arrow mark, danger text/symbol
(7) Same way as above, the corresponding panel ID with rating, cable destination with arrow mark in power flow direction, danger text/symbol shall be painted for all VCB panels, Inverter transformers (HV and LV sides), Aux transformer (HV and LV sides),

ACDB panel.

(8) For UPS/ FCBC/ SCADA/ ABT metering panels, C&R panel, all DB boards/ fire alarm panels ID number shall be painted. Cable size/ destination/ arrow marks not required to be painted as cable tags shall be adequate.

(9) For earth chambers of inverter rooms, main control room, switchyard, array, ID number with resistance value and due date shall be painted.

(10) All switchboards shall be painted with ID number.

5.37 Cable markers and cables tags

(1) Cable markers and joint markers for underground cables shall be provided along the route of the cables as per section "**Cable installation methodology**" of this specification.

(2) Cable tags shall be provided at either of the cable (at the entry point to the panel / equipment to which it is connected / terminated) shall be provided as per section "**Cable installation methodology**" of this specification.

(3) Cable tags details shall be provided by BHEL during detailed engineering.

5.38 Display boards and sign boards

Sl. No	Description	Qty for Inverter Station	Qty for Control room
1	Board displaying instruction chart for restoration from Electric Shock	1 No	1 No
2	Board displaying instruction chart for artificial respiration	1 No	1 No
3	Board displaying dos and don'ts.	1 No	1 No
4	Board displaying fire extinguishers details and operations	1 No	1 No
5	"No smoking" board	2 Nos	5 Nos
6	Danger boards: 33000V with danger symbol in Hindi, GUJRATI, English	As required	As required
7	Identification boards, of suitable sizes, within and outside control room such as Inverter room, Main control room, Executive lounge, Store room, Gents toilet, Ladies toilet, SCADA room, Battery room, Pantry room etc. BHEL will provide list.	1 set	5 set

(a) 5mm thick sun board with LG make vinyl sticker (computerized cutting and pasting) shall be used for Sl Nos 5, 6 and 7.

(b) For others, flex banner with design & printing shall be used.

5.39 Electrical insulation mat

(1) Vendor shall supply electrical insulating mats as follows:

(a) Reputed make as shall be approved by BHEL/ GSECL
(b) As per IS: 15652:2006
(c) Class C
(d) Thickness 3 mm minimum
(e) Size = 2m x 1m minimum, exact size shall be as approved by BHEL/ GSECL during detailed engineering.
(f) Colour: to be approved by BHEL/ GSECL
(g) Max use voltage = 33 kV
(h) Marking of IS standard on the mat

(2) Test certificate shall be provided by vendor
(3) Vendor shall lay the mats in front of all the indoor electrical panels viz. PCUs, VCB panels, ACDB panels, SCADA panels, UPS panels, FCBC battery charger, battery banks etc.

5.40 Supply and Installation Miscellaneous Items

(1) Split Air conditioner of 1.5 tonne 5 star rating (2 Nos) of split type for SCADA room, conference room and office room of Voltas/ Hitachi/ Samsung/LG make.

(2) Furnitures for SCADA room as below

- Table with drawer for desktop PC – 5 Nos
- Chair, industry standard, revolving type, with wheels, arm rest, provisions for adjustment of height (hydraulic/ gas lift):5 Nos
- Storage almirah: 4 No
- Filing cabinet: 4 No
- Printer table: 1 No

(3) Furniture for Conference Room

- 1 number of LED TV of 48 inch of Sony/ Phillips / Samsung make,
- 1 no of conference table of 10 person equipped power sockets and 10 chairs revolving type with wheels.

(4) Furniture for security room and security cabins

- Table with drawers – 2Nos
- Chairs revolving type with arm rest – 10 Nos

Note : Make of the above mentioned furniture shall be Godrej/DURIAN/ZUARI or equivalent.

The above list is tentative only actual will be given at the time of procurement

5.41 Tool kits and instruments

A. Measuring instruments

1	Earth Resistance Tester	Reputed make	2 No
2	Array tester	Reputed Make	1 No
3	Insulation tester	Reputed make	2 No
4	Digital multimeter	Reputed make	2 No
5	Clamp meter	Reputed make	2 No
6	Infra-red thermal imaging camera	Reputed Make	1 No
7	Digital lux meter	Reputed Make	1 No

Note: Make / model number etc shall be approved by BHEL/GSECL prior to procurement. All testing equipment shall possess valid calibration certificate issued from approved NABL labs.

B. Tool kits

1	Double ended spanner Set of sizes 10-11, 12-13, 14-15, 16-17, 17-18	1 No each
2	Screwdriver Set	1 Set
3	Crimping tool with Dye range 50-630sq-mm cable, mechanical gear power, hand operated	1 Set
4	Crimping tool up to 10 sq-mm cable	1 set
5	Drilling machine AC, hand operated, with bit size up to 20 mm	1 set
6	Measuring Tape, 5m	1 No
7	Measuring Tape, 50 m	1 No
8	Allen Key set	1 Set

9	Adjustable spanner 2-inch size	1 No
10	Hammer	1 No
11	Rough file kit	1 Set
12	Platform balance, 50Kg range	1 No
13	Cutting Pliers	1 No
14	Nose Pliers	1 No
15	Vacuum cleaner, of industrial type, for control room sweeping / cleaning.	1 No
16	Blowers for cleaning the panels	1 No

Note: Prior to procurement, vendor shall obtain approval from BHEL for the make and specification of the items.

Detailed specification of the instruments are as below-

Earth resistance tester

Parameter	Specification
Display	Backlit LCD or LED display
Range	Earth Resistance: up to 2000 Ω Earth Voltage: 200 V
Accuracy	± (2% + 5)
Safety Ratings	IP 56
Programmable Limits setting	Enabled

Accessories-
Earth Ground Stakes (4 Nos)
Three cable reels with cable length up to 20 m
Carry Case-1 (capable of handling tester along with accessories)
1 set of spare battery

Array tester

Parameter	Specification
Display	Backlit LCD or LED display
Functionality	All electrical tests required by IEC 62446-1:2016
Memory	Up to 200 records & USB downloadable to Computer

Accessories
A set of two, 4mm fused leads for extra protection during installation tests.
Leads which enable the array tester to connect directly to PV arrays
1 set of spare battery

Insulation tester

Parameter	Specification
Display	Backlit LCD or LED display
Insulation Test Range	0.1 MΩ to 10 GΩ
Test Voltage	250V, 500V, 1000V, 5000V
Test Voltage accuracy	+20% on positive side only no negative variation is allowed

Insulation Test Current	1 mA nominal
Auto Discharge	Discharge time< 0.5 Second for C = 1
Open Circuit test Voltage	>4 V, <8 V

Accessories

Heavy duty Test Lead Set – 4 Nos.

Carry Case with sufficient space for accommodating accessories.

Digital Multimeter

Parameter	Specification
Display	Backlit LCD or LED display; Minimum resolution: 5 ¾ places for DC, 4 ¾ places for AC
Measuring Category	1000V CAT III as per IEC Standard 61010-1; wave shape independent RMS measurement (True RMS) suitable for operation in the site conditions.
Additional Functions	Resistance (Ω), Temperature ($_o$C), Continuity, Diode, Capacitance, Frequency, Duty cycle measurement

Accessories

Temperature Probe

Silicon Test Lead

Alligator Clip

Carry Case with sufficient space for accommodating accessories.

Clamp meter

Parameter	Specification
Display	Backlit LCD or LED display
Measuring Category	1000V CAT III as per IEC Standard 61010-1; wave shape independent RMS measurement (True RMS) suitable for operation in the site conditions.
Current Range	AC&DC Current up to 1000A/400 A
Voltage range	AC&DC Voltage upto 1000V
Additional Functions	Resistance, continuity, diode and non contact voltage detection, Active, Reactive and Apparent Power, THD, PF

Accessories

Test leads

Electrical test leads

Probe light & extender

Carry Case with sufficient space for accommodating accessories.

Infra-red thermal imaging camera

Parameter	Specification
Spectral response	8 µm to 14 µm (LW)
Temperature-sensitivity and calibration range	–20 °C to +120 °C
Atmospheric air temperature	-10 °C to +40 °C
Thermal sensitivity	NETD ≤ 0.1 K at 30 °C
Geometric resolution	640 x 480 pixels
Photo camera resolution	Approx. 30 times of IR camera resolution
Absolute error of measurement	< ± 2 K
Adjustable parameters	Emissivity, ambient temperature
Adjustable functions	Focus, temperature level and span
Measurement functions	Measuring spot, measuring area with average and maximum temperature
Calibration	The measuring system (Camera, lens, aperture and filter): The camera has to be traceably calibrated at least every two years. The calibration has to be documented. If the camera is not compliant, it has to be readjusted by the manufacturer.
Documentation	Storing of the infrared picture with the radiometric data

Digital lux meter

Parameter	Specification
Range	0 – 1000 lux
Accuracy	± (2% + 5)
Resolution	1 lux
Display	3½ digits, Backlit LCD/LED

All the tools and instruments are required for post-commissioning of the plant. Items shall be handed over to BHEL in new condition. Used tools and instruments will not be accepted. Any tools and instruments required by Vendor during I&C activities will be arranged separately by vendor.

5.42 Cable installation Methodology

1. CODES AND STANDARDS

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.

IS:513	Cold rolled low carbon steel sheets and strips.
IS:802	Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.

IS:1079	Hot Rolled carbon steel sheet & strips
IS:1239	Mild steel tubes, tubulars and other wrought steel fittings
IS:1255	Code of practice for installation and maintenance of power cables upto and including 33 KV rating
IS:1367 Part-13	Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).
IS:2147	Degree of protection provided by enclosures for low voltage switchgear and control gear
IS:2309	Code of Practice for the protection of building and allied structures against lightning.
IS:2629	Recommended practice for hot dip galvanizing of iron & steel
IS:2633	Method for testing uniformity of coating on zinc coated articles.
IS:3043	Code of practice for Earthing
IS:3063	Fasteners single coil rectangular section spring washers.
IS:6745	Methods for determination of mass of zinc coating on zinc coated iron & steel articles.
IS:8308	Compression type tubular in- line connectors for aluminium conductors of insulated cables
IS:8309	Compression type tubular terminal ends for aluminium conductors of insulated cables.
IS:9537	Conduits for electrical installation.
IS:9595	Metal - arc welding of carbon and carbon manganese steels - recommendations.
IS:13573	Joints and terminations for polymeric cables for working voltages from 6.6kv up to and including 33kv performance requirements and type tests.
BS:476	Fire tests on building materials and structures
IEEE:80	IEEE guide for safety in AC substation grounding
IEEE:142	Grounding of Industrial & commercial power systems
DIN 46267 (Part-II)	Non tension proof compression joints for Aluminium conductors.
DIN 46329	Cable lugs for compression connections, ring for Aluminium conductors
VDE 0278	Tests on cable terminations and straight through joints
BS:6121	Specification for mechanical Cable glands elastomers and plastic insulated cables.
	Indian Electricity Act
	Indian Electricity Rules.

Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

2. DESIGN AND CONSTRUCTIONAL FEATURE

Inter Plant Cabling

Interplant cabling for main routes shall be laid in Cable trenches/duct banks. Cables from main plant to control room shall be laid in Cable trenches/duct banks. In case of Duct banks, pull-pits shall be filled with sand and provided with a PCC covering. Directly burried cables, if essential ,shall not have concentration of more than 4 cables in one route. All buried

cables shall be armoured.

Trenches

PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.

No subzero level cable vault/trenches shall be provided below control building/switchgear rooms in plant.

General

The cable slits to be used for motor/equipment power/control supply shall be sand filled & covered with PCC after cabling.

Sizing criteria, derating factors for the cables shall be met as per respective chapters. However for the power cables, the minimum conductor size shall be 6 sq.mm. foraluminium conductor and 2.5 sq.mm. for copper conductor cable.

Conscious exceptions to the above guidelines may be accepted under special conditions but suitable measures should be taken at such location to:

- Meet all safety requirements
- Safeguard against fire hazards, mechanical damage, flooding of water, oil accumulation, electrical faults/interferences, etc

3. Cable accessories

3.1 Cable trays, Fittings & Accessories

a) Cable trays shall be ladder/perforated type as specified complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable tray shall be ladder type for power & control cables and perforated for instrumentation cables.

b) Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. These (including hardware) shall be hot dip galvanized as per relevant IS.

c) Cable trays shall have standard width of 150 mm, 300 mm & 600 mm and standard lengths of 2.5 metre. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2 mm. The thickness of side coupler plates shall be 3 mm.

d) Cable troughs shall be required for branching out few cables from main cable route. These shall be U-shaped, fabricated of mild steel sheets of thickness 2 mm and shall be hot dip galvanised as per relevant IS. Troughs shall be standard width of 50 mm & 75 mm with depth of 25 mm.

3.2 Support System for Cable Trays

(a) Cable tray support system shall be pre-fabricated similar or equivalent to "Unistrut make".

(b) Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types: (i) C1:- having provision of supporting cable trays on one side and (ii) C2:-having provision of supporting cable trays on both sides. The support system shall be the type described hereunder:

1. Cable supporting steel work for cable racks/cables shall comprise of various

channel sections, cantilever arms, various brackets, clamps, floor plates, all hardwares such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc.

2. The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hardwares, fitings and accessories shall be prefabricated factory galvanised.
3. The main support and cantilever arms shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hardware etc. to form various arrangements required to support the cable trays. Welding of the components shall not be allowed. However, welding of the bracket (to which the main support channel is bolted) to the overhead beams, structural steel, insert plates or reinforcement bars will be permitted. Any cutting or welding of the galvansied surface shall be brushed and red lead primer, oil primer &aluminium paint shall be applied.
4. All steel components, accessories, fittings and hardware shall be hot dip galvanised after completing welding, cutting, drill ing and other machining operation.
5. Support system shall be able to withstand
   - weight of the cable trays
   - weight of the cables (75 Kg/ Metre run of each cable tray)
   - Concentrated load of 75 Kg between every support span.
   - Factor of safety of minimum 1.5 shall be considered.

3.3 Pipes, Fittings & Accessories

a) Pipes offered shall be complete with fittings and accessories (like tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples etc.) The size of the pipe shall be selected on the basis of maximum 40% fill criteria

b) GI Pipes shall be of medium duty as per IS:1239

c) Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.

d) Hume pipes shall be NP3 type as per IS 458.

3.4 Junction Boxes

a) Junction Boxes with IP:55 degree of protection, shall comprise of a case with hinged door constructed from cold rolled sheet steel of thickness 2mm. Top of the boxes shall be arranged to slope towards rear of the box. Gland plate shall be 3mm thick sheet steel with neoprene/synthetic rubber gaskets. All junction boxes shall be of adequate strength and rigidity, hot dip galvanised as per relevant IS, and suitable for mounting on wall, columns, structures etc. The boxes shall include brackets, bolts, nuts, screws M8 earthing stud etc. required for installation.

b) Terminal blocks shall be 1100V grade, 10Amps rated, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side two (2) nos. stranded copper conductors of size upto 2.5 sq mm each. All internal wiring shall be of minimum 1.5 sq. mm cu. Conductor PVC wire.

3.5 Terminations & Straight Through Joints

a) Termination and jointing kits for 33kV,11kV, 6.6 kV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be pre-moulded type, taped type or heat shrinkable type. 33kV, 11kV and 6.6 kV grade joints and terminations shall be type tested as per IS: 13573. 3.3kV grade joints and terminations shall be type tested as per VDE0278. Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the aluminium solderless crimping type cable lugs & ferrule as per DIN standard.

b) Straight through joint and termination shall be capable of withstanding the fault level for the system.

c) 1.1 KV grade Straight Through Joint shall be of proven design and make shall be approved by BHEL.

3.6 Cable glands

Cable shall be terminated using double compression type cable glands. Cable glands shall conform to BS: 6121 and be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.

3.7 Cable lugs/ferrules

Cable lugs/ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments. Cable lugs and ferrule shall conform to relevant standard.

3.8 Trefoil clamps

Trefoil clamps for single core cables shall be pressure die cast aluminum or fibre glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength to withstand the forces generated by the peak value of maximum system short circuit current.

3.9 Cable Clamps & Straps

The cable clamps required to clamp multicore cables on vertical run shall be made up of Aluminium strip of 25x3 mm size. For clamping the multicore cables, self-locking, de-interlocking type nylon clamps/straps shall be used. The clamps/straps shall have sufficient strength and shall not get affected by direct exposure to sun rays and outdoor environment.

3.10 Receptacles

Receptacles boxes shall be fabricated out of MS shet of 2mm thickness and hot dipped galvanized or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC

supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polymide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with inbuilt ELCB rated for suitable mA sensitivity.

3.11 Galvanising

- Galvanising of steel components and accessories shall conform to IS: 2629, IS: 4759 & IS: 2633. Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots.
- The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS: 1367 . The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified.

3.12 Welding

The welding shall be carried out in accordance with IS: 9595. All welding procedures and welders qualification shall also be followed strictly in line with IS: 9595.

4. CABLE INSTALLATION

4.1 Cable tray and Support System Installation

a) Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.

b) Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/clamps on both top and bottom side rails at an interval of 2000 mm in general. For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted. Cable tray installation shall generally be carried out as per the approved guidelines/ drawings. Vendor shall design the support system along with tray, spacing etc in line with relevant standard.

c) The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated.

d) The contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M 8 X 50 and material shall be stainless steel grade 316 or better. Anchor fastener shall be fixed as recommended by manufacturer and as approved by site engineer. For brick wall suitable anchor fasteners shall be used as per the recommendations of manufacturer. Make of anchor fasteners subject to QA approval.

e) All cable way sections shall have identification, designations as per cable way layout drawings and painted/stenciled at each end of cable way and where there is a branch connection to another cable way. Minimum height of letter shall be not less than 75 mm. For long lengths of trays, the identification shall be painted at every 10 meter. Risers shall additionally be painted/ stenciled with identification numbers at

every floor.

f) In certain cases it may be necessary to site fabricate portions of trays, supports and other non- standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint.

4.2 Conduits/ Pipes/ Ducts Installation

a) The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/roof/wall / cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.

b) GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc.

c) Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material.

d) Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average spacing between the supports as given below, unless specified otherwise

Conduit /pipe size (dia).	**Spacing**
Upto 40 mm	1 M
50 mm	2.0 M
65-85 mm	2.5 M
100 mm and above	3.0 M

e) For bending of conduits, bending machine shall be arranged at site by the contractor to facilitate cold bending. The bends formed shall be smooth.

4.3 Junction Boxes Installation

Junction boxes shall be mounted at a height of 1200mm above floor level or as specified in the drawings and shall be adequately supported/mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.

4.4 Cable Installation

a) Cable installation shall be carried out as per IS: 1255 and other applicable standards.

b) For Cable unloading , pulling etc following guidelines shall be followed in general :

- Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e. with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken

during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.

- While laying cable, ground rollers shall be used at every 2 meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Project Manager.

c) Cables shall be laid on cable trays strictly in line with cable schedule

d) Power and control cables shall be laid on separate tiers in line with approved guidelines/drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, HT cables shall be laid on topmost tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every two meter. All multi core cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with self locking type nylon cable straps with de-interlocking facilities. For horizontal trays arrangements, multi core power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multi core power cables and control cables shall be secured at every one meter by nylon cable strap. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by aluminium strips at every five meter interval and at every bend.

e) Bending radii for cables shall be as per manufacturer's recommendations and IS: 1255.

f) Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.

g) No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Vendor shall identify and accordingly procure the cable drum length.

h) In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.

i) Wherever few cables are branching out from main trunk route troughs shall be used.

j) Wind loading shall be considered for designing support as well Cable trays wherever required.

k) Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.

l) The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each

area every day. Contractor shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.

4.5 Separation

At least 300mm clearance shall be provided between :

- HT power & LT power cables,
- LT power & LT control/instrumentation cables,

4.6 Segregation

a. Segregation means physical isolation to prevent fire jumping.
b. All cables associated with the unit shall be segregated from cables of other units.
c. Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set.
d. In switchyard, control cables of each bay shall be laid on separate racks/trays.

4.7 Minimum number of spare cores required to be left for interconnection in control cables shall be as follows:

No. of cores in cable	No. of spare cores
2C,3C	NIL
5C	1
7C-10C	2
14C and above	3

4.8 Directly Buried Cables

a) Cable trenches shall be constructed for directly buried cables. Construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of route markers and joint markers. Laying of cables and providing protective covering shall be as per IS: 1255. Reference drawing for buried cables is included as a tender drawing and enclosd with this specification.
b) RCC cable route and RCC joint markers shall be provided wherever required. The voltage grade of the higher voltage cables in route shall be engraved on the marker. Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable Joint". The marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road crossings and drain crossings. Top of cable marker/joint marker shall be sloped to avoid accumulation of water/dust on marker.

4.9 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat

stamped on the cable tags.

4.10 While crossing the floors, unarmoured cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray.

5. Cable Terminations & Connections

a) The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Project Manager. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Contractor shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site.

b) Work shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Project Manager.

c) The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets.

d) Control cable cores entering control panel/switchgear/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with self-locking type nylon cable ties with de interlocking facility to keep them in position.

e) All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, -etc along with cable numbers and coiled up after end sealing. Supply of ferrules is in Vendor's scope.

f) All cable terminations shall be appropriately tightened to ensure secure and reliable connections.

Cable Sealing:

Vendor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All opening in floor/roof/wall/cable tunnel/cable tranches made for conduit installation shall be sealed and made water proof by the vendor with modular multi dimensional cable system consisting of frames, blocks, compression wedge and its accessories. The cable sealing system shall have been tested for fire insulation for minimum 2 hrs as per BS 476/UL 1479/EN 1364 and shall provide water sealing for continuous pressure of 0.3 bars the system shall be rodent proof and shall have valid enclosure protection as per IEC 60529.

5.43 **Pre-commissioning inspections/ checks/tests, MRT tests, coordination/liaison with state /central departments/CEIG etc. for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning**

#	Scope description
	Vendor shall be responsible for carrying out following minimum tests/ checks for the respective IR, CR, metering yard, transmission line and substation bay and any other tests as per requirements of GSECL / concerned state / central departments / CEIG/ CEA etc.

		1	Pre-commissioning inspections / checks / tests, MRT tests and coordination / liaison activities with state / central departments / Transco/ DISCOM/ CEIG/ CEA etc for necessary approvals / clearances for commissioning, synchronization with grid and post-commissioning operation of the plant. (Clearances shall include obtaining prior approvals for all applicable drawings/ documents etc from concerned state / central departments / Transco/ DISCOM/ CEIG/ CEA etc.)				
			A	Basic checks			
				A1	Tightness checks:		
					1) Terminations of AC/DC power cables at SMBs, PCUs, Inverter transformers, Aux transformer, ACDB panel, UPS/ FCBC/ Battery banks, Aux AC/DC DB boards, ABT metering panel, 33kV VCB panels, metering CT/PT, GOS, LA, LV side of Inverter transformer, SCADA panels etc. 2) Terminations of Control/ Instrumentation/ Data/ Communication cables wherever applicable. 3) Terminations of earthing at all electrical equipment/ panels of inverter rooms/ control room/metering yard/Transmission line/ Substation bay 4) Terminations of earthing of inverter transformers, aux transformer 5) Terminations of earth chambers of vendor scope. **Note:** For M10 and above, torque wrench settings shall be followed for reference.		
				A2	Electrical continuity checks		
				A3	Megger (5kV) checks for all HT (33kV) cables and Line		
				A4	Hi-pot testing for all HT (33kV) cables prior to connection to the panels/ transformers.		
				A5	Megger (1kV) checks for all 1.1kV grade cables		
				A6	AC/DC supply checks at TBs of all electrical panels/ DBs/ Transformers.		
				A7	Transmission line testing		
			B	Pre-commissioning electrical tests:			
				B1	Power conditioning units (with the support of PCU service engineer at site)		
					1) DC side open circuit voltage and verification with SMB side measurements 2) Vendor to provide technician support to PCU service engineer for all other pre-commissioning tests as per OEM checklist 3) Functioning of duct fans (operation, direction of rotation)		
				B2	Inverter transformers and Aux 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 the 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. DG if required for oil filtration shall be arranged by vendor. 2) IR tests LV-HV, HV-E, LV-E		

						3) Vector group 4) Voltage ratio 5) Magnetizing current 6) Magnetic balance 7) Winding resistance at all taps 8) Fault simulation checks (at VCB breaker panels): Buchholz, OTI, WTI, PRV, LOLA etc 9) Alarm, trip settings (S1, S2) for WTI, OTI 10) Oil level at conservator (to be topped up, if required)		
					B3	CTs 33kV at plant and substation		
						1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Ratio tests / primary injection		
					B4	PTs 33kV at plant and substation		
						1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Voltage ratio test 3) Polarity test		
					B5	33KV breakers at plant and substation		
						IR tests Contact resistance measurement (CRM) Timing test: close/ open/ close-open Functional checks: breaker open/close, spring-charged motor Remote operation from SCADA panels: open/close, command/ status, lamp indications		
					B6	Numerical relays at 33KV breaker/C&R panels at plant & substation		
						1) Relay calibration using applicable kit/ software 2) IDMT, DT curves with timing/pickup settings in all relays based on gradation across from downstream to upstream taking into account settings at substation 3) Overcurrent/ earth fault pickup/ tripping time tests		
					B7	CT ratio / PT ratio to be set in meters/relays		
						i. All MFM meters ii. ABT meters iii. Protection relays		
					B8	ACB breaker settings (with the help of PCU service engineer)		
						1) Over load, Short time fault, ground fault		
					B9	Earth resistance measurements for all chambers of vendor scope		
						1) With electrode connected to grid 2) Without connecting electrode to grid		
					B10	UPS/ FCBC charger/ Battery banks		
						1) All functional checks: battery charging/ discharging, FCBC/ battery output parameters etc. as per OEM checklists		
					B11			
					B12	Tests on 30KV LA		
				C	Testing agency			
						Credentials of testing agency shall 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 lead in the process of obtaining approval from Transco/ DISCOM/ CEIG/ CEA etc as applicable for line charging/ grid synchronization/ plant commissioning. 2) Liaison responsibility for getting the approvals rests with the vendor. Wherever technical clarifications are required by the approving agencies with regard to SPV portions (including solar array) up to metering yard, transmission line and substation bay, vendor shall suitably coordinate/liaison with the concerned state/central approving agencies to make the approval process successful. Accordingly, vendor shall participate in direct discussions with the approving agency whenever necessary. Also, all the necessary payments/expenditures to be incurred with ref to such coordination/ liaison in this regard shall be borne by the vendor. 3) Following are the areas of approval, as applicable (a) GTP/ datasheets/ GA drawings/ Bill of materials, MQP etc of all (BHEL's/vendor's) supply items. (b) Site test reports of transformers, transformer oil, VCB breakers, CTs, PTs, LAs, resistance of earth mat grids etc (c) Interaction with supervising/ inspection agency such as MRT departments, Transco, CEIG, CEA etc, as applicable, for applying to them/ inviting them for supervision/ inspection at site. (d) Interaction/ coordination with customer in the above process as and when required. (e) All necessary testing kits/ instruments shall be arranged as per the requirements of inspection agency. Basic instruments such as digital multimeter, 5kV digital megger with PI feature, earth resistance meter, VCB open/close timing test kit, clamp meters etc shall be organized at site at the time of inspection. Competent electrical technician shall also be made available at the site. (f) Subsequent to site inspection by the concerned agency, vendor shall obtain the clearance for grid synchronization after implementation of all the observations of CEIG. (g) Vendor shall also coordinate with DISCOM for obtaining approvals such as grid connectivity approval etc.		
				E	Commissioning of Substation bay equipment, Transmission line and Solar Power Plant		
					1) Vendor shall organize all necessary tools/ measuring instruments required to operate the various electrical equipment at the time of commissioning: Digital megger 5KV with PI feature, Earth resistance tester, Phase sequence meter, Clamp meters etc., discharge rods, PPE safety gadgets (helmets, shoes etc.). 2) It is the responsibility of the vendor to successful charge 33kV transmission line followed by charging of 33kV yard at SPV plant end and grid synchronization of inverters/ plant commissioning for full DC capacity. 3) Vendor shall participate actively in the commissioning until it is established that there is successful export of power from all the strings PCUs and through the 33kV transmission line/ switchyards/ substation bay.		
					After commissioning and completion of all works including clearing of all punch points, trail run of the plant will be commenced for 7 consecutive days		

				based on acceptance by GSECL. Immediately after trial Performance Guarantee test shall start for a period of 30 days. During trial run and PG test vendor shall deploy manpower, operate and maintain the plant and ensure that there are no breakdowns in any equipment, all required tools and spares are available.		

5.44	**Spares required to be supplied along with main consignment:** 1) Fuses of all types: 1 % of total population of respective items 2) MCB of all types: 1% of total population of respective items 3) Indicating lamp set of all types: 1% of total population of respective items 4) Surge protection devices/ MOV: 1% of total population of respective items 5) Lamps for peripheral lighting- 10 Nos 6) MC4 connectors: 250 sets (1 set = 2 nos) 7) 33KV, 1C, 185 sqmm (E) OUTDOOR End termination kits- 5 Nos 8) 33KV, 1C, 630 sqmm (E) Straight through jointing kits- 3 Nos Notes: (a) 1 set refers to total quantity of the item used in one transformer. (b) In case quantity arrived based on percentage is a decimal figure, it shall be rounded off to next higher integer.

6 General conditions applicable during supply, installation, commissioning .

6.1	As already mentioned in previous clauses, vendor shall organize power supply on their own. Accordingly, DG sets of suitable capacity shall be deployed by the vendor for construction works.
6.2	Similarly, water required for construction works shall be organized by vendor (tankers etc).
6.3	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.
6.4	All necessary tools and tackles such as crimping tool (including heavy duty tools for crimping copper/ aluminium cables up to 630 sq-mm), 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/ shuttering materials for RCC works, spade, shovel, hammer etc shall be organized by the vendor.
6.5	All necessary measuring instruments such as digital multimeters, measuring tapes, vernier calipers, electrical testers, digital meggers (1kV, 2.5kV, 5kV), earth resistance meters, clamp meters, transformer oil BDV kit, relay testing kit (secondary injection), primary injection kit, infrared thermal imaging handheld temperature meter etc. All these instruments shall possess valid calibration certificate issued from approved NABL laboratory.
6.6	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.
6.7	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.
6.8	Vendor shall maintain updated labour register, with name, age, qualification, salary, attendance details etc. at the site.
6.9	Vendor shall use danger boards, wherever required, to ensure safety of the persons during the work at site.

6.10	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.
6.11	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.
6.12	Vendor shall carry out the work without causing inconvenience to other contract groups at the site. In case of conflicts with other groups, vendor shall ensure that the matter is resolved at once amicably so that the progress of work is not affected.
6.13	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.
6.14	No child labour shall be employed for execution of the present contract.
6.15	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.
6.16	Special instruction for earthing: In compliance with Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode. Accordingly, all cases such as cable support structures, cable ladders, cable trays (control room) etc. shall be earthed.
6.17	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 quality assurance plan 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.
6.18	Field Quality Plan / Quality control system (if applicable) Vendor shall set up a field quality control laboratory with full set up to facilitate testing of all construction materials in accordance with FQP (Field quality control plan) as approved by BHEL/GSECL. 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 the work. All the third party testing should be conducted in NABL approved laboratories only. Vendor shall submit the FQP for the civil construction works before starting of the works for approval of BHEL/GSECL.
6.19	Any deviations shall be discussed with BHEL/GSECL site engineers and implementation shall be taken up only after approval from BHEL /GSECL.
6.20	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL on the progress of the contract.
6.21	Vendor shall, as and when required by BHEL/GSECL, participate in the review meetings conducted by BHEL/GSECL at project site, BHEL-EDN (Bangalore), BHEL-Corporate office (New Delhi), GSECL office, New Delhi etc
6.22	**General Guidelines** a) Any civil or electrical work which is not mentioned or included in this tender document but necessary for functional requirements of the plant shall be carried out by vendor. b) Vendor shall prepare all designs / drawings based on the specifications given in the tender and in light of relevant BIS/IS/ equivalent standard. c) Vendor shall provide type test reports and datasheet/ GTP for all equipments covered under vendor scope of supply.

	d) BHEL reserves right to modify the design at any stage to meet local site conditions / project requirements. e) All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed thereunder and as amended from time to time.
6.23	For all current carrying parts and earthing, S.S hardware shall be provided and all other places, G.I hardware shall be provided. M.S hardware shall not be used in any place.

7 Documents to be submitted for BHEL/GSECL approval during detailed engineering

7.1	BHEL/GSECL approval shall be obtained for the following technical documents, which shall be submitted to BHEL in phased manner based on priority sequence of activities during detailed engineering (after receipt of purchase order from BHEL).
7.2	Name of vendor/ make, model number/ part number, specification/ sizes/ dimensions/ drawings/ datasheets shall be submitted for all the vendor supplied items.
7.3	Design calculations/ general arrangement drawings/ single line diagrams/ GTP particulars/ datasheets/ schemes/ layouts/ bill of materials etc., as applicable.
7.4	Manufacturing Quality Plans for all the vendor supplied items
7.5	Field quality plan for the field work: civil works, electrical works
7.6	Detailed activity-time chart for project implementation
7.7	Detailed manpower deployment schedule

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-1

INTEGRITY PACT

Between

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

and

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

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____ _____ _____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

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

Section 1- Commitments of the Principal

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

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

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

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

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

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

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

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

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

Section 4 - Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

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

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

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

6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.

6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

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

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

Section 8 - Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.

8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.12 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.

9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

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

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

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For & On behalf of the Principal	For & On behalf of the Bidder/ Contractor
(Office Seal)	(Office Seal)
Place----------	
Date----------	
Witness:_____	Witness:_____
(Name & Address) _____	(Name & Address) _____
_____	_____

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.**