TECHNICAL DOCUMENT AGAISNT ENQUIRY NO:2851400003

PORTION 2

Contents

ANNEXURE-V TECHNICAL SPECIFICATIONS FOR THE 11kV, 3Cx240 Sqmm XLPE CABLE			
Sl. No	**Description/Specifications**	**Vendor to confirm**	**Deviations**
	Supply of High Voltage,11 KV- XLPE insulated PVC inner / outer sheathed Aluminium armoured Power Cable conforming to the specification given below.		
1	**High Voltage Power Cable :**		
1.1	Normal area of conductor	240sq.mm	
1.2	Number of cores	3core	
1.3	Voltage Rating	11KV, 50Hz. A.C.	
1.4	Type of system	unearthed	
1.5	**Conductor:**		
1.5.1	Material	Strandard circular Aluminium conductor as per IS:8130-1984	
1.5.2	Conductor Screen Material	Non- metallic semiconducting tape or extruded semiconducting material.	
1.5.3	Min number of Strands	30	
1.6	**Insulation:**		
1.6.1	Material & Type	XLPE as per IS:7098-Part-2 of 1985.	
1.6.2	Nominal thickness of Insulation in mm.	5.5	
1.6.3	Core Identification	Coloured strips applied on the core.	
1.6.4	Insulation Screen	Extruded semiconducting material.	
1.6.5	Metallic Copper Tape	Vendor to specify	
1.7	**Innersheath:**		
1.7.1	Material	Extruded PVC type ST-2 as per IS:5381	
1.7.2	Nominal thickness of inner sheath in mm.	0.7mm	
1.8	**Armour :**		
1.8.1	Material	Galavanished steel flat strip as per IS: 3975	
1.8.2	Normal strip size in mm	4X0.8	
1.9	**Outersheath:**		
1.9.1	Material.	PVC compound type -ST2of IS:5831/1984	
1.9.2	Minimum thickness in mm	2.84 mm (Min.)	
1.10	Conformance to Indian Standard Specification	IS:7098(Part-2)-1985	
2	Technical leaflet of the cable indicating the approx diameter, weight, thickness of insulation / sheathing / armour wire, current rating etc. to be enclosed with the offer.	Vendor to furnish	
3	General Features of the H V Cable:		

3.1	Cable shall have the manufacturer name embossed / printed / idented on the outer sheath at regular intervels.	Vendor to confirm	
3.2	Cable shall have voltage grade, cable size embossed on the outer sheath.	Vendor to confirm	
3.3	Routine tests shall be conducted on the cables as per IS and test certificate shall be produced against supply.	Vendor to confirm	
3.4	CPRI/ERDA test certificates for 11KV XLPE cables of IS 7098 Part II 1988: shall be attached along with the offer.	Vendor to confirm	
3.5	Length variation in the quantity of supply if any.	Vendor to specify	
3.6	Cable length shall be of 500Mtrs per Drum	Vendor to confirm	
4	3 copy of make,rating,details,technical details along with the materials required.		
5	Special Note:Point to point confirmation is required from the supplier technical suitability, otherwise the offer will not be considered.	Vendor to confirm	
6	Preferred makes:	APAR industries limited, Cable corporation of india ltd., Diamond power infrastructure ltd, Hindusthan vidyut products ltd., Havells india limited, kei industries ltd., Krishna electrical industries ltd., KEC International limited, Nicco corporation ltd., Paramount communications ltd., Polycab wires pvt. ltd., Ravin cables limited, Sriram cables pvt. ltd., Torrent cables ltd., Universal cables ltd.	

ANNEXURE-VI

TECHNICAL SPECIFICATION FOR MV SWITCH GEAR PANEL

Sl. No	Description/Specifications	Vendor to confirm	Deviations
	Design., manufacture and supply of Medium Voltage, floor mounting, free standing, indoor, cubicle type switchgear panel comprising Air Circuit Breaker feeder and conforming to the specification and features given below.		
1.0	Air Circuit Breaker Make : L & T or GE or SIEMENS or SCHNIEDER or ABB.	Vendor to confirm	
2.0	**Incomer Breaker** : 2000A, 415V, Three Phase and neutral, draw-out type, true, trip free, electrically operated spring closing type, Air Circuit Breakers having 24 V DC shunt trip, emergency hand trip, 4No + 4NC auxiliary contacts, ON / OFF mechanical indication, Integral self powered current release, current transformers of required quantity, burden and accuracy for metering and for protection and confirming to IEC 60947 /2 / IS 13947 (Part 2). **Quantity - 2 Nos**.	Vendor to confirm	
3.0	**Outgoing Breaker** : 1000A, 415V, Three Phase and neutral, draw-out type, true, trip free, electrically operated spring closing type, Air Circuit Breakers having 24V DC shunt trip, emergency hand trip, 4No + 4NC auxiliary contacts, ON / OFF mechanical indication, Integral self powered current release, current transformers of required quantity, burden and accuracy for metering and for Protection and confirming to IEC 60947 /2 / IS 13947 (Part 2). **Quantity - 16 Nos**.	Vendor to confirm	
3.1	**Bus coupler Breaker (ACB):** 2000A, 415V, Three Phase and neutral, draw-out type, true, trip free, electrically operated spring closing type, Air Circuit Breakers having 24V DC shunt trip, emergency hand trip, 4No + 4NC auxiliary contacts, ON / OFF mechanical indication and confirming to IEC 60947 /2 / IS 13947 (Part 2) **Quantity - 1 No.**		

4.0	**Bubars 2000A, TPN aluminium busbars.**(Size -2 runs of 100mmx10mm for phase & 1 run of 100mmx10mm for neutral.)		
5.0	**INCOMER BREAKER PANEL SPECIFICATIONS.**		
5.1	Air Circuit Breaker rated current, Voltage, short circuit breaking capcity.	2000A,415V,75KA	
5.2	Current Transformer Ratio	2000/5A for incomer & main bus bar CT.	
5.3	C T Make(reputed make accepted by BHEL)	Vendor to specify	
5.4	Digital multifunction meter of class 1.0 to show the readings of Voltage, Current, Power,PF, frequency and %THD of voltage & current.Required makes of CONSERV,L&T,AE, SECURE , ELmeasure, RISHAB along with RS 485 communication port.	Vendor to specify	
5.5	Digital multi function meter make:	Vendor to specify	
5.6	Voltmeter detail(reputed make accepted by BHEL).	Analog type, 0-500V, 96mm square, accuracy class 1.0	
5.7	Voltmeter Selector switch make.	Vendor to specify	
5.8	Digital type Three Phase Over Current & Earth fault Relays with High set Communication and breaker control. (L&T, ABB, C&S, SIEMENS, SCHNEIDER or other reputed make accepted by BHEL).	Vendor to specify the make & model no with cataloque.	
5.9	Energy Meter 3 phase, 4 wire, 5A, Class 1.0 Digital meter of reputed make acceptable to BHEL with RS 485 communication port- (L&T, ABB, C&S, SIEMENS, SCHNEIDER or other reputed make accepted by BHEL).	Vendor to specify the make & model no with cataloque.	
5.10	Indication lamp for panel (R,Y,B, ON, OFF & TRIP)	LED type	
5.11	Cable Entry (Detachable type)	Aluminium, PVC armoured cables, bottom entry.	
6	**OUT GOING BREAKER PANEL SPECIFICATIONS**		
6.1	Air Circuit Breaker rated current, Voltage, short circuit breaking capcity.	1000A, 415V, 50KA as specified.	
6.2	Current Transformer Ratio	1000 /5A	
6.3	C T Make(reputed make accepted by BHEL)	Vendor to specify	

6.4	Digital multifunction meter of class 1.0 to show the readings of Voltage, Current, Power,PF, frequency and %THD of voltage & current.Required makes of CONSERV,L&T,AE, SECURE , ELmeasure, RISHAB along with RS 485 communication port.	Vendor to specify	
6.5	Energy Meter 3 phase, 4 wire, 5A, Class 1.0 Digital meter of reputed make acceptable to BHEL with RS 485 communication port-(L&T, ABB, C&S, SIEMENS, SCHNEIDER or other reputed make accepted by BHEL).	Vendor to specify the make & model no with cataloque	
6.6	Digital type Three Phase Over Current & Earth fault Relays with High set Communication and breaker control. (L&T, ABB, C&S, SIEMENS, SCHNEIDER or other reputed make accepted by BHEL).	Vendor to specify	
6.7	Indication lamp for panel (ON, OFF & TRIP)	LED type	
6.8	Cable Entry (Detachable type)	PVCAA - PVC Aluminium armoured cables, bottom entry.	
7.0	**BUS COUPLER BREAKER PANEL SPECIFICATIONS**		
7.1	Air Circuit Breaker rated current, Voltage, short circuit breaking capcity.	2000A, 415V, 50KA as specified.	
7.2	Indication lamp for panel (ON, OFF & TRIP)	LED type	
8.0	**Specification for MV Switchgear Panel.**	Vendor to specify	
8.1	Approx. overall dimensions of the Panel(Max-7000mm length, 1500mm depth & 2200mm height acceptable).	Vendor to specify	
8.2	Make of the accessories in the panel, type, no of ACB, technical leaflet of the ACB and protection release, copy of the type test report of the ACB to be furnished in the offer.	Vendor to confirm	
9.0	3 sets of O & M manual for each panel including spare parts list for the breakers and panel, general arrangement, drawing, power schematic drawing wiring diagram shall be supplied along with the panel.	Vendor to confirm	
10.0	**General Features.**		

10.1	The panel shall be of modular construction, Incomer feeder & bus coupler panels shall house one ACB whereas outgoing feeder panels shall house two Air Circuit Breakers in two-tier formation along with busbars, metering and other accessories. Sufficient space for maintenance shall be provided in the panel.	Vendor to confirm	
10.2	Bus bars shall be made of high conductivity alluminium alloy with adequate cross section to operate at low operating temperatures. Busbars including neutral and earth bars shall be short circuit tested as per IS: 8623 for a fault withstand level of 75 KA for one second and CPRI/ERDA/Govt.approved Test centre test certificate should be enclosed.	Vendor to confirm	
10.3	The neutral busbars shall have a continuous current rating of 50% of the phase busbars. All busbars shall be insulated with heat shrinkable insulating sleeve, colour coded for easy identification of individual phases and neutral.	Vendor to confirm	
10.4	The earth busbar of size 50x6 mm copper shall run through out the length of the switch board and be terminated at the two ends with cable eyes.	Vendor to confirm	
10.5	High tensile bolts and spring washers shall be provided on all busbars and connection joints.	Vendor to confirm	
10.6	All sheet steel work used in the panels shall undergo a rigorous metal treatment process involving alkaline degreasing descaling in dilute sulphuric acid, phaspating and painting.	Vendor to confirm	
10.7	The panel shall have cable chamber housing with cable suitable supports, end connections and power / control cable terminations. Adequate safety shall be provided for working in one vertical section without accidental contact with the live parts in an adjacent section.	Vendor to confirm	
10.8	Adequate number of cable riser supports shall be provided to withstand rated short circuit current.	Vendor to confirm	
10.9	Front and rear doors shall be fitted with dust excluded neoprene gaskets with vermin proof.(protection of IP20)	Vendor to confirm	

10.10	External aperture for ventilation shall be covered with a perforated sheet to prevent entry of vermin.	Vendor to confirm	
10.11	The ACBs shall have three distinct positions i.e. service, test and isolated with position indicators. (Mech/elec)	Vendor to confirm	
10.12	Automatic shutters shall be provided to screen the live parts when the breaker is drawn out of the cubicle.	Vendor to confirm	
10.13	The ACB shall be equipped with an integral self powered microprocessor based current release, which works on true RMS values for ensuring accurate protection, Overload, selective short circuit, instantaneous circuit and earth fault protections shall be provided along with the LED indication/LCD screen. The protection unit should confirm to the EMI / EMC requirement.	Vendor to confirm	
10.14	The min. setting range of protection release should be as follows. **(a)** Over load protection shall have adjustable setting from 50% to 100% of the circuit breaker rated current in steps of 5% preferably. **(b)** Short time delayed short circuit protection shall have adjustable current setting from 200% to 1000% of the overload setting and adjustable time setting for time discrimination from 20ms to 400ms. **(c)** Instantaneous short circuit protection shall be adjustable from 2 to 15 times rated current. **(d)** Earth fault protection shall have current setting from 20% to 60% of rated current and adjustable time setting from 100ms to 400ms.	Vendor to confirm	
10.15	Trip indication shall be provided to display the exact nature of fault(LED/LCD screen) like OL/EF/SC. Test facility to test the healthiness of the release and the trip circuit of the breaker shall be provided.	Vendor to confirm	
10.16	The ACB shall be provided with mechanical anti-pumping feature to prevent auto reclosing of the breaker on fault and necessary safety interlocks for closing the ACB.	Vendor to confirm	

10.17	The control panel of ACB along with its operating device shall project through the cutout in the door which is provided with suitable gasket (without any air gap).	Vendor to confirm	
10.18	The ACB shall be suitable and should be able to carry the rated current for an ambient temperature of not less than 45 degree C without any derating and suitable for working in Indian condition.	Vendor to confirm	
10.19	The Ultimate breaking capacity (Icu) should be equal to service breaking capacity (Ics) and short time withstand capacity (Icw) for 1 sec.	Vendor to confirm	
10.20	Provision should be available for the following. (a) to swtich "ON" and switch "OFF" ACB from a PLC/SCADA using the closing coil and shunt trip. (b) to monitor the ON / OFF status of the breaker through a PLC/SCADA (c) to monitor and acquire the data regarding parameters like current, voltage, power, energy through the communication port of the digital/energy meter.	Vendor to confirm	
10.21	The cassette and the breaker shall be provided with standard interlocks related to the opening / closing of the doors and the positions of the breaker.	Vendor to confirm	
10.22	All control wiring shall be carried out with 1100 V single core PVC cable having standard FRLS copper conductors of min. 1.5 sq.mm. section for potential circuits and 2.5 sq.mm. section for current transformer circuit wires shall be identified with number ferrules at either end.	Vendor to confirm	
10.23	Removable gland plates shall be provided at the bottom of panel for cable termination.	Vendor to confirm	
10.24	The construction of the panel shall generally confirm to the Indian Electricity Rules/CEA regulations.	Vendor to confirm	
10.25	Technical catalogue furnishing the features of the controller (ACBs,Meters etc.,) and panel shall be enclosed with the offer Required.	Vendor to confirm	

11	**Note** : 1) GA drawings and bill of materials to be submitted for approval before manufacturing of the panels. 2) Final inspection to be offered at supplier works before despatch. 3) During commissioning the MV panel in the substation, programming of the ACB,Protection relays and Energy meters to be supported by the supplier / firm and necessary training to our staffs should be given. 4) 3 sets of Operation,Maintenance & programming manual in English . Circuit/ wiring diagram to be supplied along with the each panel Required. Single copy of make,rating,technical details and catalogue of all the bought out items used in each panel. 5) Point by point confirmation is required from the supplier otherwise the offer will not be considered		

ANNEXURE VII

TECHNICAL SPECIFICATION FOR Detuned APFC PANEL OF 300KVAR

Sl. No	Description/Specifications	Vendor to confirm	Deviations
	Supply and commissioning of Automatic Power Factor Improvement Capacitor Panel as per below Specification for Automatic PF Improvement Capacitor Panel		
1.0	Capacitor Bank Rating	300 KVAR.	
1.1	No. and rating of capacitor stages, type (min 10 stages)	50KVAR/ 3Nos., 25 KVAR / 5Nos., 12.5 KVAR / 2 Nos.	
1.2	Model of capacitor	MD Heavy Duty capacitor, MDXL Super Heavy Duty capacitor.	
1.3	Make of the capacitors	L&T/EPCOS/Neptune/ABB/ Electronicon/ Ducati	
1.4	Rated Voltage	415 Volts +/-10%	
1.5	Rated Frequency	50 HZ.+/-5%	
1.6	Current measurement CT ratio	600/5.	
1.7	System	3 Phase, 4 wire system.	
2.0	Type of service	Continuous, indoor operation.	
3.0	Automatic PF control should be Intelligent Microprocessor based power factor controller.-	Make Electronican/ L&T/ABB/ICD /Schnider /Ducati	
4.0	Switching Time	Variable and selectable.	
5.0	Protection.	Over voltage	
6.0	Detection and display.	Over voltage, over current, harmonics (%THD)	
7.0	Manual operation.	Selectable option	
8.0	Contactors for capacitor switching and MCB of suitable capacity as incomer 630 Amps.Capacitor duty contactors-63Amps contactor for 25KVAR,100A contcator for 50KVAR,and 32A contactor for 12.5KVAR.	Capacitor duty contactors of make Schnider/Telemecanique / ABB/ GE/ Seimens/ L&T	
9.0	Digital indicating meters for current ,voltage and power factor , %THD should be to be provided in the panel front	Vendor to confirm	
10.0	No volt release in the event of power failure Required.	Vendor to confirm	
11.0	Necessary switchgear, contactors, HRC fuses Required.	Vendor to confirm	
12.0	Dimension- Appr. H1500 X W1200 X D 500 mm and weight App.600 Kg. .(Panel should be CRCA sheet with thickness of 3mm).	Vendor to confirm	
13.0	Panel ventilation 2 nos. of 510 CFM exhaust fan to be provided.	Vendor to confirm	
14.0	Max. temperature range Ambient .	+/- 50 deg. C	

15.0	Panel shall conform to IE Rules with provision for earthing, fully wired, painted Required.	Vendor to confirm	
16.0	3 sets of Operation,Maintenance and Programming manual in English for Micro Processor, with circuit/ wiring diagram to be supplied along with the panel Required. Single copy of make,rating details,technical details and catalogue of all the bought out items used in the panel.	Vendor to confirm	
17.0	Technical catalogue furnishing the features of the controller and panel shall be enclosed with the offer Required.	Vendor to confirm	
17.1	The capacitor, APFC controller and contactors/switch gears offered should be reputed make acceptable to BHEL.	Vendor to confirm	
18.0	Detuned harmonic suppression filters rated for 5.67% of capacitive reactance for individual capacitor controls has to be provided.--	Vendor to confirm	
	Note : 1)GA drawings and bill of materials to be submitted for approval before manufacturing of the panels. 2)Final inspection to be offered at site before despatch. 3)During commissioning the APFC panel in the substation, programming of the capacitors to suit the reactive compensation to be supported by the firm and necessary training to our staffs should be given. 4)3 sets of Operation,Maintenance manual in English . Circuit/ wiring diagram to be supplied along with the panel Required. Single copy of make,rating details,technical details and catalogue of all the bought out items used in the panel. 5)Point by point confirmation is required from the supplier otherwise the offer will not be considered.	Vendor to confirm	

ANNEXURE-VIII TECHNICAL SPECIFICATIONS FOR THE 1.1kV, 3.5Cx185 Sqmm XLPE ALLUMINIUM CABLE			
Sl. No	**Description/Specifications**	**Vendor to confirm**	**Deviations**
	Supply of High Voltage,1.1 KV- XLPE insulated PVC inner / outer sheathed Aluminium armoured Power Cable conforming to the specification given below.		
1	**High Voltage Power Cable :**		
1.1	Normal area of conductor	185 sq.mm	
1.2	Number of cores	3.5 core	
1.3	Voltage Rating	1.1KV, 50Hz. A.C.	
1.4	Type of system	unearthed	
1.5	**Conductor:**		
1.5.1	Material	Strandard circular Aluminium conductor as per IS:8130-1984	
1.5.2	Conductor Screen Material	Non- metallic semiconducting tape or extruded semiconducting material.	
1.5.3	Min number of Strands	30	
1.6	**Insulation:**		
1.6.1	Material & Type	XLPE as per IS:7098-Part-2 of 1985.	
1.6.2	Nominal thickness of Insulation in mm.	1.1 (min)	
1.6.3	Core Identification	Coloured strips applied on the core.	
1.6.4	Insulation Screen	Extruded semiconducting material.	
1.6.5	Metallic Copper Tape	Vendor to specify	
1.7	**Innersheath:**		
1.7.1	Material	Extruded PVC type ST-2 as per IS:5381	
1.7.2	Nominal thickness of inner sheath in mm.	0.5 mm min.	
1.8	Armour :		
1.8.1	Material	Galavanished steel flat strip as per IS: 3975	
1.8.2	Normal strip size in mm	4X0.8	
1.9	**Outersheath:**		
1.9.1	Material.	PVC compound type -ST2of IS:5831/1984	
1.9.2	Minimum thickness in mm	1.88 mm (Min.)	
1.10	Conformance to Indian Standard Specification	IS:7098(Part-2)-1985	
2	Technical leaflet of the cable indicating the approx diameter, weight, thickness of insulation / sheathing / armour wire, current rating etc. to be enclosed with the offer.	Vendor to furnish	
3	General Features of the H V Cable:		

3.1	Cable shall have the manufacturer name embossed / printed / idented on the outer sheath at regular intervels.	Vendor to confirm	
3.2	Cable shall have voltage grade, cable size embossed on the outer sheath.	Vendor to confirm	
3.3	Routine tests shall be conducted on the cables as per IS and test certificate shall be produced against supply.	Vendor to confirm	
3.4	CPRI test certificates for 1.1KV XLPE cables of IS 7098 Part II 1988: shall be attached along with the offer.	Vendor to confirm	
3.5	Length variation in the quantity of supply if any.	Vendor to specify	
3.6	Cable length shall be of 500Mtrs per Drum	Vendor to confirm	
4	3 copy of make,rating,details,technical details along with the materials required.		
5	Special Note:Point to point confirmation is required from the supplier technical suitability, otherwise the offer will not be considered.	Vendor to confirm	
6	Preferred Makes	RPG,KEI, Gloster, Universal, Mansfield, , APAR industries limited, Cable corporation of india ltd., Diamond power infrastructure ltd, Hindusthan vidyut products ltd., Havells india limited, kei industries ltd., Krishna electrical industries ltd., KEC International limited, Nicco corporation ltd., Paramount communications ltd., Polycab wires pvt. ltd., Ravin cables limited, Sriram cables pvt. ltd., Torrent cables ltd., Universal cables ltd.	

ANNEXURE-IX TECHNICAL SPECIFICATIONS FOR THE 1.1kV, 3.5Cx185 Sqmm XLPE COPPER CABLE			
Sl. No	**Description/Specifications**	**Vendor to confirm**	**Deviations**
	Supply of High Voltage,1.1 KV- XLPE insulated PVC inner / outer sheathed Copper armoured Power Cable conforming to the specification given		
1	**High Voltage Power Cable :**		
1.1	Normal area of conductor	185 sq.mm	
1.2	Number of cores	3.5 core	
1.3	Voltage Rating	1.1KV, 50Hz. A.C.	
1.4	Type of system	unearthed	
1.5	**Conductor:**		
1.5.1	Material	Strandard circular Copper conductor as per IS:8130-1984	
1.5.2	Conductor Screen Material	Non- metallic semiconducting tape or extruded semiconducting material.	
1.5.3	Min number of Strands	30	
1.6	**Insulation:**		
1.6.1	Material & Type	XLPE as per IS:7098-Part-2 of 1985.	
1.6.2	Nominal thickness of Insulation in mm.	1.6mm min.	
1.6.3	Core Identification	Coloured strips applied on the core.	
1.6.4	Insulation Screen	Extruded semiconducting material.	
1.6.5	Metallic Copper Tape	Vendor to specify	
1.7	**Innersheath:**		
1.7.1	Material	Extruded PVC type ST-2 as per IS:5381	
1.7.2	Nominal thickness of inner sheath in mm.	0.5mm min.	
1.8	**Armour :**		
1.8.1	Material	Galavanished steel flat strip as per IS: 3975	
1.8.2	Normal strip size in mm	4X0.8	
1.9	**Outersheath:**		
1.9.1	Material.	PVC compound type -ST2of IS:5831/1984	
1.9.2	Minimum thickness in mm	2.04 mm (Min.)	
1.10	Conformance to Indian Standard Specification	IS:7098(Part-2)-1985	
2	Technical leaflet of the cable indicating the approx diameter, weight, thickness of insulation / sheathing / armour wire, current rating etc. to be enclosed with the offer.	Vendor to furnish	
3	General Features of the H V Cable:		

3.1	Cable shall have the manufacturer name embossed / printed / idented on the outer sheath at regular intervels.	Vendor to confirm	
3.2	Cable shall have voltage grade, cable size embossed on the outer sheath.	Vendor to confirm	
3.3	Routine tests shall be conducted on the cables as per IS and test certificate shall be produced against supply.	Vendor to confirm	
3.4	CPRI test certificates for 1.1KV XLPE cables of IS 7098 Part II 1988: shall be attached along with the offer.	Vendor to confirm	
3.5	Length variation in the quantity of supply if any.	Vendor to specify	
3.6	Cable length shall be of 500Mtrs per Drum	Vendor to confirm	
4	3 copy of make,rating,details,technical details along with the materials required.		
5	Special Note:Point to point confirmation is required from the supplier technical suitability, otherwise the offer will not be considered.	Vendor to confirm	
6	Preferred Makes	RPG,KEI, Gloster, Universal, Mansfield, , APAR industries limited, Cable corporation of india ltd., Diamond power infrastructure ltd, Hindusthan vidyut products ltd., Havells india limited, kei industries ltd., Krishna electrical industries ltd., KEC International limited, Nicco corporation ltd., Paramount communications ltd., Polycab wires pvt. ltd., Ravin cables limited, Sriram cables pvt. ltd., Torrent cables ltd., Universal cables ltd.	

ANNECURE-X

TECHNICAL SPECIFICATIONS FOR THE 1000KVA, 11KV/415V COMPACT SUBSTATION

Specification and Scope of supply:

Design, manufacture and supply of Compact Substation of 11KV/415 Volts, equipped with 1000kVA Cast Resin Transformer, 3 way 11kV Ring Main Unit consisting of 2 nos. 630A at 11kV fault making load breaking switch with one no tee-off as SF6 Circuit Breaker for the primary side controls & with MV 2000A Air Circuit Breaker as secondary side control as detailed below. The detail bill of material for each Compact Substation shall be as under:

S.No	Description	Specification / Confirmation	Deviation
1.0	**HT Switchgear:** Three way 11kV Non-Extensible Ring Main Unit Compact switchgear consisting of two nos. 630A at 11KV fault making/ load breaking switch and one number Fixed manual / auto SF6 breaker in insulated enclosure with self- powered relay having over current and earth fault protection. Interconnection between RMU and transformer shall be using suitable size Aluminum/copper unarmored XLPE Cable. Incomer and outgoing LBS of HT Switchgear should be suitable for termination of 1 run x 3C x 240 sq. mm aluminum armoured XLPE Cable (along with the supply of screened seperable connector).	Vendor to confirm	
1.1	Make and type number of the load break switches, SF6 circuit breaker, protection relay. ABB/ Siemens/ Areva / Alstom make only.	Vendor to specify	
2.0	**Transformer:** 1000 KVA, 11KV / 415V, DYn11, Air Natural cooling Cast Resin Dry Type Transformer with off circuit tap links 5% to -5% @ 2.5% on HT side of transformer with WTI Scanner with Alarm and trip contact Qty: 1 no	Vendor to confirm	
2.1	Make of the transformer. BHEL/ ABB/ Volt Amp/ Ames Impex/ Siemens/ Areva make only.	Vendor to specify	
2.2	Impedance, no-load/ load losses, efficiency, temperature rise above ambient of winding of the transformer	Vendor to specify	

3.0	**MV Switchgear:** 415V indoor MV panel with Aluminum Bus bars, fabricated using 1.5/2 MM CRCA sheet steel, Ingress protection IP4X, complete with internal wiring consisting of following. **Incomer: 2000** A, 415V, 3P, 50Hz, 50KA, Fixed manual / auto type ACB with Microprocessor based release. Qty: 1 set	Vendor to confirm	
3.1	Make and type number of the ACB. Siemens/ ABB/ GE/ L&T/ Areva / Alsthom make only.	Vendor to specify	
4.0	**Enclosure:** Outdoor type enclosure having modular construction of Galvanised Sheet Steel. The degree of protection for HT & LT switchgear compartment & transformer compartment of the enclosure shall be minimum IP23. The enclosure exterior shall be painted with polyurethene paint/ powder coated and tropicalised to Indian weather conditions. Each compartment will be provided with the door and pad locking arrangement. The Compartment illumination lamp with door-operated switch shall be provided for each compartment. Qty: 1 set	Vendor to specify the actual degree of protection.	
5.0	Interconnection between HT switchgear & Transformer using XLPE cable & Interconnection between Transformer & LT switchgear using copper busbars. Internal earthing connections by GI strips. Qty: 1 set	Vendor to confirm	
6.0	Dimension of the compact substation (approx.)	Vendor to specify	
7.0	1.Packge Sub-Station shall be outdoor plinth mounted type. 2. Erection, Commissioning and Civil work for package substation is in the scope of BHEL. However the bidder shall furnish the foundation details clearly. 3.Package sub-station will be complete with the internal interconnections & earthing (GI) and extending of earth bar of Neutral and body terminals to the frame of the CSS for connecting to the earth pits. 4. Vendor shall assemble the Compact substation at site if the same is dispatched in disassembled condition. 5. Vendor shall make necessary supervision at site free of cost during the time of commissioning CSS. 6. Required technical data sheet of the transformer, HV/ MV	Vendor to confirm	

	switchgear, relay etc. should be furnished with the offer. 7. Colour of paint to be mentioned in the offer and to be decided mutually. 8. The equipments should be SCADA compatible. 9. Metering on HV side required and details to be furnished.		
8.0	Routine test to be conducted and original test certificate to be submitted The firm should be a manufacturer of SF6 HV switchgear (OEM)and tested for internal Arc .Pre fabricated SS shall be type tested for internal arc ,temperature rise test , Degree of protection IP54 for HT and LT switch gear and IP 23 for transformer compartment .. as per IEC 61330 - 1995 &/ IEC 62271-202 .	Vendor to confirm	
9.0	**Reference List/ Qualifying Condition**		
9.1	Only those vendors who have supplied and commissioned same or higher capacity compact substation and working satisfactorily for at least five years after commissioning should quote. The Vendor should be a HV switchgear OEM.	Vendor to confirm	
9.2	Information about the companies where same or higher size equipments have been supplied and certificate about satisfactory performance are to be submitted for qualification of the offer.	Vendor to furnish	

Annexure 1

Technical Specifications for the Compact Substation

1.0.0 **CODES & STANDARDS**:

1.1.0 All equipment and material shall be designed manufactured and tested in accordance with the latest applicable IEC standards. The 11KV Package Substation Design must be as per IEC 61330.

1.2.0 The Package Sub-station offered shall in general comply with the latest issues including amendments of the following standards.

Title	Standards
High Voltage Low Voltage Pre-Fabricated Substation	IEC:61330
High Voltage Switches	IEC 60265
Metal Enclosed High Voltage Switchgear	IEC 60298
High Voltage Switchgear	IEC 60694
Low Voltage Switchgear and Control gear	IEC 60439
Power Transformers	IEC 60076

2.0.0 **DESIGN CRITERIA**

2.1.0 Package Sub-station consisting of 3 way 11KV SF6 insulated Switchgear with 630A at 11kV fault making, Load breaking switch with tee-off as 11kV SF6 Circuit Breaker + 11kV/415V, 1000KVA, DYn11 Transformer + LT 415V, 2000A ACB incoming with all connection, accessories, fitting & auxiliary equipment in an enclosure to supply Low-voltage energy from high-voltage system as detailed in this specification. The complete unit shall be installed on a substation plinth (base) as Outdoor substation.

2.2.0 The prefabricated-package substation shall be designed for a) Compactness, b) fast installation, c) maintenance free operation, d) safety for worker/operator & public.

2.3.0 The Switchgear and component thereof shall be capable of withstanding the mechanical and thermal stresses of short circuit listed in ratings and requirements clause without any damage or deterioration of the materials.

2.4.0 For continuous operation at specified ratings temperature rise of the various switchgear components shall be limited to permissible values stipulated in the relevant standard and / or this specification.

2.5.0 Service Conditions:

The Package substation shall be suitable for continuous operation under the basic service conditions indicated below

Ambient Temperature:	40 Deg C
Relative Humidity	upto 95%
Altitude of Installation	upto 1000m

The Enclosure of High Voltage switchgear-control gear, Low Voltage switchgear-control gear & Transformer of the package substation shall be designed for use under normal outdoor service condition as mentioned. The enclosure should take minimum space for the installation including the space required for approaching various doors & equipment inside.

3.0.0 **SPECIFICATION:**

3.1.0 The main components of a prefabricated- package substation are Transformer, High-voltage switchgear-control gear, Low-voltage switchgear-control gear and corresponding interconnections (cable, flexible bus bars) & auxiliary equipment. The components shall be enclosed, by either common enclosure or by an assembly of enclosure. All the components shall comply with their relevant IEC standards.

OUTDOOR ENCLOSURE:

3.2.0 **Outdoor enclosure**:

3.2.1 The enclosure shall be made of Sheet Steel tropicalised to local weather conditions.

3.2.2 The metal base shall ensure rigidity for easy transport & installation.

3.2.3 The protection degree of the Enclosure shall be appropriate one for LT & HT switchgear compartment & IP23 for Transformer compartment. Proper / adequate ventilation aperture shall be provided for natural ventilation by way of Louvers etc.

3.2.4 The doors shall be provided with proper interlocking arrangement for safety of operator.

3.2.5 The H.V. & L.V. outgoing of the transformer are to be connected to SF6 Circuit Breaker of 3 way 11kV RMU & incomer of the Low Voltage Switchgear by means of Copper Cables / Flexible Busbars.

3.2.6 **Internal Fault**: Failure within the package substation due either to a defect, an exceptional service condition or mal-operation may initiate an internal arc. Such an event may lead to the risk of injury, if persons are present. It is desirable that the highest practicable degree of protection to persons shall be provided. The Design shall be tested as per IEC 61330.

3.2.7 **Covers & Doors**: Covers & doors are part of the enclosure. When they are closed, they shall provide the degree of protection specified for the enclosure. Ventilation openings shall be so arranged or shielded that same degree of protection as specified for enclosure is obtained.

Additional wire mesh may be used with proper Danger board for safety of the operator. All covers, doors or roof shall be provided with locking facility or it shall not be possible to open or remove them before doors used for normal operation have been opened. The doors shall open outward at an angle of at least 90^0 & be equipped with a device able to maintain them in an open position.

3.2.8 **Earthing**: All metallic components shall be earthed to a common earthing point. It shall be terminated by an adequate terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured taking into account the thermal & mechanical stresses caused by the current it may have to carry. The components to be connected to the earth system shall include:

a) The enclosure of Package substation,
b) The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose,
c) The metal screen & the high voltage cable earth conductor,
d) The transformer tank or metal frame of transformer,
e) The frame &/or enclosure of low voltage switchgear,

3.2.9 There shall be an arrangement for internal lighting activated by associated switch for HV, Transformer & LV compartments separately.

3.2.10 **Labels**: Labels for warning, manufacturer's operating instructions etc. shall be durable & clearly legible.

3.2.11 Cleaning & Painting:
The paints shall be carefully selected to withstand tropical heat and rain. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.

11KV SF6 Non-extensible RMU Circuit Breaker:

3.3.0 **11KV SF6 RMU Circuit Breaker:** The requirement of 11kV Ring Main Unit is as under.

3.3.1 SF6 Gas filled Non-extensible Ring Main Units with Circuit Breaker comprising of 3 panels as indicated below:

3.3.2 **Panel No.1 & 2**: Isolator panel with one number SF6 insulated load- breaking fault making isolator switch with one cable box.

3.3.3 **Panel No.3:** SF6 Circuit Breaker complete with operating mechanism, protection system and one number of cable box.

3.3.4 The above Isolators, breaker, Busbars should be mounted inside a robotically welded sealed for life, stainless steel tank. The tank should be filled with SF6 gas at adequate pressure.

3.3.5 The Circuit Breaker is required to control 11kV/415 volts distribution Transformer of rating 1000KVA and relay settings shall be selected accordingly.

3.3.6 **General Finish**: Totally enclosed, metal clad, vermin and dust proof suitable for tropical climate use as detailed in the specification.

3.3.7 **Ratings**: The busbars shall have continuous rating of 630 Amps. The isolator shall have a continuous rating of 630 Amps, Circuit Breaker shall have a continuous rating of 630 Amps. in accordance with relevant IEC standard

3.3.8 **Breaking & Making Capacity**: The isolators shall be capable for breaking rated full load current. Circuit Breaker shall be capable of having rupturing capacity of 20kA symmetrical at 11KV.

3.3.9 **Busbars**: Switchgear shall be complete with all connections, busbars etc. The continuous rating of copper busbars shall be 630 Amps and they shall be fully encapsulated by SF6 gas inside the steel tank.

3.4.0 **Isolator**:

The Isolators offered shall conform to IEC60129. The isolator shall be triple pole, spring assisted, hand operated, and non-automatic type with quick break contacts. The operating handle shall have three positions 'ON', 'OFF' and 'EARTH' which shall be clearly marked with suitable arrangement to padlock in any position. A safety arrangement for locking shall be provided by which the isolator operation shall be prevented from 'ON' position to 'EARTH' position or vice versa in a single operation.

3.5.0 **Switchgear:**

The SF6 RMU shall be sealed for life, the enclosure shall meet the "sealed pressure system" criteria in accordance with IEC: 298. There shall be no requirement to 'top up' the SF6 gas. It shall provide full insulation, making the switchgear insensitive to the environment. Thus assembled, the active parts of the switchgear unit shall be maintenance free.

The switchgear & switchboard shall be designed so that the position of different devices is visible to the operator on the front of the switchboard & operations are visible as well. The switchboard shall be designed so as to prevent access to all live parts during operation without the use of tools.

RMU should be tested for internal arc fault test.

3.5.1 **SF6 Circuit Breaker**:

The Unit shall consist 630A Tee-off spring assisted three position, three pole circuit breaker, with integral fault making / dead breaking earth switch. The function shall be naturally interlocked to prevent the main & earth switch from being switched 'ON' at the same time & the CB not allowed to trip in 'Earth On' position. The selection of the main/earth switch lever on the panel, which is allowed to move only if the main or earth switches in the off position. The lever shall be able to pad locked in either the main or earth position.

The manual operation of the circuit breaker shall not have an effect on the trip spring. This should only be discharged under a fault (electrical) trip condition; the following manual reset operation should recharge the trip spring & reset the CB mechanism in 'main off' position.

Protection Relay: The CB shall be fitted with self-powered relay inside the front cover to avoid any tampering. The relay should be 2 Over Current + 1 Earth Fault, fed by protection CTs mounted in the cable box.

3.5.2 **Cable Box**:

Every isolator shall be provided with suitable and identical cable boxes in front for connecting 3 core, 11kV cable from vertically below. The cable boxes shall be so located at convenient height to facilitate easy cable jointing work. The height available for cable termination should be minimum 500 mm. The Cable termination shall be done by Heat shrinkable Termination method so adequate clearances shall be maintained between phases for Termination. It shall be possible to terminate 1 run of 240 sq.mm three core XLPE cable.

3.5.3 **Locking Arrangement**: Suitable padlocking arrangements shall be provided as stated below…

a) CB manual operating handle in the "OFF" position.
b) Each feeder Panel operating handle in 'Closed' 'Open" or 'Earth' position.
c) Each isolator-operating handle in 'Closed', ' Open', or 'Earth' position.

3.6.0 **Ratings**:

Non-Extensible ring main unit with SF6 CB		
3.6.1	**Switchgear Data**	
a)	Service	Outdoor but inside Enclosure
b)	Type	Metal clad
c)	Number of phases	3
d)	Voltage	11000V
e)	Rated Frequency	50 Hz
f)	Rated Current	630 Amp (isolator)
g)	Short Circuit rating	
	i) Breaking	20 kA rms for Breaker
	ii) Short time withstand for 3 Sec.	201 KA rms
	iii) Rated S/c making	52.5 kA peak for Breaker
h)	Short duration pwer freq.	28 kV
i)	Insulation Level	75 KVpeak

j)	System earthing	Solidly earthed at substation
3.6.2	**Breaker**	
a)	Type	SF6 Breaker
b)	Rated voltage	11kV
c)	Breaking current	
	i) Load breaking	21 KArms.
d)	Making current	52.5 KA peak
e)	Rated current	630 Amps.
f)	No. of poles	3
g)	Operating mechanism.	Trip free & free handle type with mechanically operated indication & pad locking.
3.6.3	**Isolators**	
a)	Type	load breaking and fault making in SF6 tank
b)	Rated current	630 Amps.
c)	Rated breaking capacity	630 amps.
d)	Fault making capacity	52.5 KA peak
e)	No. of poles	3
f)	Operating mechanism	Operating handle with ON, OFF, Earth positions with arrangement for padlocking in each position.
3.6.4	**Busbars: (If any)**	
a)	Material	Copper
b)	Type	SF6 insulated
c)	Rated Current	630 Amps
d)	Short time rating for 3 Sec.	

11kV/415V, 1000kVA CAST RESIN DRY TYPE TRANSFORMER:

4.0 **Requirement**: 11000/415 Volt Cast Resin Dry Type 1000KVA, AN cooled transformer Suitable for installation at outdoor in Enclosure for Floor mounting.

4.1 **Voltage Ratio:** No load voltage 11000/415 volt within tolerance as stipulated in IS.

4.2 **Rating:** The transformer shall have a continuous rating as specified at any of the specified tapping position and with the maximum temperature Rise specified.

SPECIFICATION FOR 1000KVA CAST RESIN DRY TYPE TRANSFORMERS

Sr. No.	Descriptions	Unit	Specification
1	Service		Continuous
2	Type		Cast Resin Dry Type
3	Rating	KVA	1000
4	Rated frequency	Hz	50
5	Number of Phase		
	HV Side		3
	LV Side		3
6	Rated Voltage		
	HV Side	kV	11
	LV Side	kV	0.415
7	Vector Group		Dyn 11
8	Type of Cooling		AN (Air Natural)
9	Class of Insulations		Class F
10	Method of earthing-LV		Solidly Earthed
11	Duty		Continuous
12	Taps		
	a) Range	%	+ 5% to -5 %
	b) No. of Steps		Four
	c) In steps of		2.5
	d) Tapping provided on HV Side		Taps Provided on HV side
13	Tap Changer Type		By Off Circuit Tap Links
14	Reference Standards		IS 2026/IS 11171
15	Fittings and Accessories		
	a) Off circuit tap links		Yes
	b) 02 Nos. Earthing Terminal		Yes
	c) Rating and Diagram Plate		Yes
	d) Lifting Lugs for Complete Transformer		Yes
	e) Cover Lifting lugs		Yes
	f) Rollers		Yes

5.0 **L.T. Panel**

5.1.0 **System**:

a) **Nominal voltage**: 3 Phase, 415V, 50 Hz
b) **Neutral**: Solidly earthed at substation.
c) **Busbar**: Aluminum

5.2.0 **Circuit Ways:**

1 No. 2000A or higher, 3 Pole ACB, fixed Type with Over Current, short circuit and Earth Fault Releases (Microprocessor Based)

5.3.0 **Earthing**:

5.3.1 Earthing arrangement shall be provided for earthing each cable, PVC cable gland, neutral busbar, chassis and framework of the cubicle with separate earthing terminals at two ends. The main earthing terminals shall be suitably marked. The earthing terminals shall be of adequate size, protected against corrosion, and readily accessible. These shall be identified by means of sign marked in a legible manner on or adjacent to terminals.

5.3.2 Neutral bus bar strip shall be connected to Earthing terminal with help of GI strip of suitable capacity & nut-bolt arrangement.

ROUTINE TEST ON PACKAGE SUBSTATION:

6.0.0 **ROUTINE TESTS FOR THE PACKAGE SUBSTATION COMPLETELY ASSEMBLED:**

6.1.0 **Routine Tests**: The routine tests shall be made on each complete prefabricated substation.

a) Voltage tests on auxiliary circuit.
b) Functional test.
c) Verification of complete wiring.

6.2.0 **Test Certificates:**

Certified reports of all the tests carried out at the works shall be furnished in three (3) copies for the approval from CEA.

Annexure-XI

Specification for Synthetic High Voltage Insulating Mats as per IS-15652:2006

Sl. No	Description/Specifications	Vendor to confirm	Deviations
	Supply of High Voltage Insulating Synthetic Mats,with High die-electric Strength, Fire Retardant. Insulation Resistance Up to 100,000 Mega Ohm with 5000V Megger. Good Mechanical Properties to With Stand Load and Movement of Breaker Trolleys and Associated Electrical Equipment. No Adverse Effect of Acids, Alkalis and Transformer Oil. to the specification given below		
1.0	**High Voltage Insulating Synthetic Mats**		
1.1	Nominal Thickness of earthmat	2.0 mm, 2.5mm & 3mm	
1.2	Width	1 Mtr.	
1.3	Roll Length	Upto 20 mtrs.	
1.4	Synthetic High Voltage Insulating Mats as per latest IS-15652:2006	Vendor to confirm	
1.5	Di Electric Strength	Vendor to confirm	
1.6	Conformance to Indian Standard specification	IS:15652 / 2006	
1.7	Tensile strength: 15 N/sqm & elongation: 250	Vendor to confirm	
2.0	Technical leaflet of the insulating earth mats indicating the approx. diameter,length, weight, thickness of insulation, current rating etc. to be enclosed with the offer.	Vendor to confirm	
3.0	**General Features of the Insulating Synthetic Mats:**		
3.1	Insulating Synthetic Mats shall have the manufacturer name embossed/ printed/ indented on the mats at regular intervals.	Vendor to confirm	
3.2	ERDA/CPRI test shall be conducted as per IS on the insulating earth mats and test certificate shall be produced.	Vendor to confirm	
4.0	**Reference List/ Qualifying Conditions:**		
4.1	Only those vendors who have supplied similar or higher rating of insulating earth mats should quote.		
4.2	Information about the customers to whom similar insulating earth mats have been supplied is to be submitted for qualification of the offer.		
5	Preferred Makes	A.M. Vinyl Pvt. Ltd., Premier Polyfilm Limited, RMG Polyvinyl INDIA Limited, Vardhman Hoses (P) Ltd., V.R. Enterprises.	

Annexure-XII			
Technical specifications for the 33kv meetering box as per the MSEDCL norms			
Sl. No	**Description/Specifications**	**Vendor to confirm**	**Deviations**
1	Design, fabrication, painting and supply of sheet metal cubicle, supply of coppercomponents, wiring, testing at works, packing and supply on destination basis and performance testing of 33KV self equipped metering cubicle	Vendor to confirm	
2	Construction should of four cabins viz HT, metering and two nos termination compartment	Vendor to confirm	
3	**System parameters:**	Vendor to confirm	
3.1	Rated voltage: 33kV	Vendor to confirm	
3.2	Highest system voltage: 36kV	Vendor to confirm	
3.3	Frequency: 50Hz	Vendor to confirm	
4	**Current Transformer:**	Vendor to confirm	
4.1	Type: Single Phase, Cast resin	Vendor to confirm	
4.2	Rated voltage: 33kV	Vendor to confirm	
4.3	CT ratio: 200/5A	Vendor to confirm	
4.4	Burden: 15VA	Vendor to confirm	
4.5	Accuracy class: 0.2	Vendor to confirm	
4.6	Applicable standard: IS:2705-1992 or latest	Vendor to confirm	
5	**Potential Transformer:**	Vendor to confirm	
5.1	Type: Single Phase, Cast resin	Vendor to confirm	
5.2	Rated primary voltage: 33000V/√3	Vendor to confirm	
5.3	PT secondary voltage: 110V/√3	Vendor to confirm	
5.4	Burden: 50VA	Vendor to confirm	
5.5	Accuracy class: 0.2	Vendor to confirm	
5.6	Applicable standard: IS:3156-1992 or latest	Vendor to confirm	
6	**Metal Cabinet:**	Vendor to confirm	
6.1	Material: Mild steel	Vendor to confirm	
6.2	Plate thickness: 2mm	Vendor to confirm	
6.3	Busbar thickness: 200 Sqmm	Vendor to confirm	
6.4	Ingress Protection class: IP 53	Vendor to confirm	
7	**The metering box should have the following:**	Vendor to confirm	
7.1	3 nos 33kV class CTs	Vendor to confirm	
7.2	3 nos 33kV class PTs	Vendor to confirm	
7.3	Tinned copper busbars/connecting links totally covered by resin casting	Vendor to confirm	
7.4	The secondary wires from the terminals of CTs & PTs in the CT/PT. Compartment shall be covered by resin cast blocks and the secondary wires shall be brought in the metering compartment through rubber bush and shall be left open duly crimped with suitable pin type copper lugs	Vendor to confirm	

7.5	Resin cast bushing board/s with arrangement to receive Reychem or equivalent type of cable terminations (240Sqmm) for incoming and outgoing supply points.	Vendor to confirm	
7.6	Electronic safety lock (optional)	Vendor to confirm	
7.7	All four cabninets should be provided with the removable type doors with neoprene gaskets. HT compartment should be provided with suitable	Vendor to confirm	
7.8	Cable termination from Top	Vendor to confirm	
8	**Special Condition:** Drawing should be submitted to BHEL before starting the manufacturing.	Vendor to confirm	
9	Metetering box should be tested as per the relevent standards and reports should be submitted to BHEL.	Vendor to confirm	

Annexure-XIII

TOOLS & TACKLES AND SAFETY EQUIPMENT

Sl No	Equipment	Unit	Quantity	Preferable Makes	Vendor to confirm	Deviations
1	Digital multimeter (Voltage: AC/DC- 0 to 750V Current: AC/DC- 0 to 200A Resistance: 0 - 20 Mega Ohm)	No	2	Fluke, Motwani, Krycard	Vendor to confirm	
2	Insulation Tester (0-5000V)	No	1	Krycard, Kyoritsu, Fluke, Megger	Vendor to confirm	
3	Insulation Tester (0-500V)	No	1	Krycard, Kyoritsu, Fluke, Megger	Vendor to confirm	
4	Tong Tester (Voltage: AC/DC- 0 to 750V Current: AC/DC- 5mA to 200A)	No	1	Fluke, Motwani, Krycard	Vendor to confirm	
5	3 meter length Earth rods	No	4	Reputed make	Vendor to confirm	
6	Double End Spanner Generally Conforming to IS 2028-2004 (Size: 6x7 to 24x27)	Set	1	Taparia, Gedore	Vendor to confirm	
7	Ring Spanners Generally Conforming to IS 2029-1998 (Size: 6x7 to 24x27)	Set	1	Taparia, Gedore	Vendor to confirm	
8	Allen Keys Generally Conforming to IS 3082-1988 (Size: 1.5mm to 14mm)	Set	1	Taparia, Gedore	Vendor to confirm	
9	Seamless 33kV, 11kV and 415V grade Hand gloves (Each voltage grade 3 Sets)	Set	9	Reputed make	Vendor to confirm	
10	Danger Boards (caution board) written with Marathi, Hindi and English for 33000V, 11000V, 415V (10 nos each)	No	30	Reputed make	Vendor to confirm	
11	Danger Stickers (caution sticker) written with Marathi, Hindi and English for 33000V, 11000V, 415V (20 nos each)	No	60	Reputed make	Vendor to confirm	
12	Combination Plier Generally Conforming to IS 6149-1984 Grade II	No	2	Taparia, Gedore	Vendor to confirm	
13	Screwdriver set	Set	2	Taparia, Gedore	Vendor to confirm	

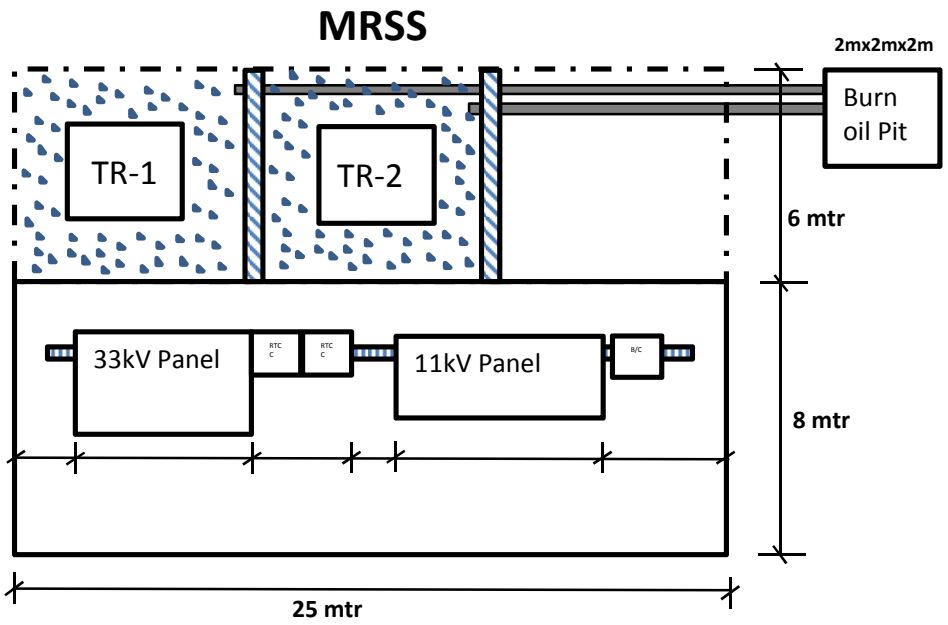
ANNEXURE-XIV

Suggestive Format of Performance Certificate:

The Performance certificate should contain minimum of the below said data and it shall be produced on **Customer's Letter Head** and submitted along with the offer.

1.0	Equipment Supplied to (Customer Details)	
2.0	Substation Capacity	
3.0	Details of Equipment supplied	
3.1	Transformer: Rating/voltage class	
3.2	Medium Voltage Panel (PCC): Busbar rating	
4.0	Purchase Order Number	
5.0	Scheduled date of completion	
6.0	Actual date of completion	
7.0	Reasons for delay (if any)	
8.0	Performance of the contractor during erection & commissioning on turnkey basis	
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

General Layout of Substations



Individual Substations (SS1 - SS5)