

	interrupting current at 90 deg. leading power factor angle (A. rms)	
	(The breaker shall be able to interrupt the rated line/cable charging current with test voltage immediately before opening equal to the product of $U/\sqrt{3}$ & 1.4 as per IEC: 62271-100)	
10.	Temperature rise over the design ambient temperature	As per IEC: 62271-100
11.	i) Total break time as per Cl.3.0 of this specification (ms)	65
	ii) Rated break time as per IEC (ms)	60
12.	Total closing time (ms)	Not more than 120
13.	Operating mechanism	spring/hydraulic or a combination of these
14.	Max. difference in the instants of closing/opening of contacts (ms)	
	i) Between poles (opening)	3.3
	ii) Between poles (closing)	5.0
	The above shall be at rated control voltage and rated operating and quenching media pressures.	
15.	Trip coil and closing coil voltage	110V DC with variation as specified
16.	Noise level at base and upto 50 m (distance from base of breaker)	140 dB (Max.)
17.	Rated terminal load	As per IEC or as per the value calculated by GTR, whichever is higher.
18.	Auxiliary contacts	Besides requirement of specification, the bidder shall wire up 5 NO+5 NC

- | | | |
|-----|--|--|
| | | contacts for future use of Purchaser. |
| 19. | No of Terminals in common Control cabinet | All Contacts & control circuits to be wired out upto common control cabinet plus 24 terminals exclusively for Purchaser's use. |
| 20. | Maximum allowable switching As per IEC overvoltage under any switching condition | (Auxiliary switch shall also comply with requirements stipulated under GTR). |

DISCONNECTORS (ISOLATORS)

Disconnectors shall be of the single-pole, group operated type, installed in the switchgear to provide electrical isolation of the circuit breakers, the transformers, double bus and transmission lines/cables. The disconnectors shall conform to IEC: 62271-102 (or IS: 9921).

SAFETY GROUNDING SWITCHES

Three-pole, group operated, safety grounding switches shall be operated by electric motor for use on 110V DC ungrounded system and shall be equipped with a manual operating mechanism for emergency use. The motor shall be protected against over-current and short circuit.

The safety grounding switches shall conform to the requirements of IEC- 62271- 102

HIGH SPEED MAKE PROOF GROUNDING SWITCHES

Grounding switches located at the beginning of the feeder bay modules shall be of the high speed, make proof type and will be used to discharge the respective charging currents, in addition to their safety grounding function. These grounding switches shall be capable of interrupting the inductive currents and to withstand the associated TRV.

Single phase switches shall be provided with operating mechanism suitable for operation from a 110V DC.

The short circuit making current rating of each ground switch shall be at least equal to its peak withstand current rating. The switches shall have inductive/ capacitive current switching capacity as per IEC-62271-102.

The high speed make proof grounding switches shall conform to the requirements of IEC-62271- 102.

INSULATOR

The insulator shall conform to IS: 2544 and/or IEC-60168.

TECHNICAL PARAMETERS**2. 245 kV ISOLATORS**

- | | | |
|----|---|--|
| 1. | Type | SF6 insulated |
| 2. | Rated current at 50°C ambient temperature | 1600/2000 (As applicable).
-1600 for line and |

Transformer bays.
- 2000 bus coupler bay.

- | | | |
|----|--|-------------------------------|
| 1. | Rated short time withstand current of isolator and earth switch (for 3 Sec.) | 40 kA / 50 kA (as applicable) |
| 2 | Rated dynamic short circuit withstand current of isolator and earth switch | IEC-694. |
| | 100 kAp / 125 kAp (as applicable) | IEC-62271-102 |
| 3 | Temperature rise over design ambient temperature | |
| 4 | Rated mechanical terminal load | A.C. Motor operated |
| 5 | Operating mechanism of isolator/earth switch | 12 sec. or less |
| 6 | Operating time | |

INSTRUMENT TRANSFORMERS

The instrument transformers and accessories shall conform to the latest version of the standards specified below:-

Current transformers IEC: 60044-1 (or IS: 2705) Inductive Voltage Transformers IEC: 60044-

Insulating Oil

- a) Insulating oil to be used for instrument transformers shall be of EHV grade and shall conform to IS-335/ IEC-60296 (required for first filling).
- b) The SF6 gas shall comply with IEC-60376, 60376A and 60376B and shall be suitable in all respects for use in the switchgear under operating conditions. Suitable valve shall be provided for SF6 gas filling in the instrument transformers in live condition. A suitable Rupture Disc shall be provided on the SF6 filled instrument transformers to prevent any chance of explosion.

TECHNICAL PARAMETERS

A.	245 kV CURRENT TRANSFORMERS	
1.	Rated Primary current	
2.	Rated short time thermal current	1000A (as applicable)
3.	Rated dynamic current kA (peak)	40 kA for 3 sec./50 kA for 3 sec. (as applicable)
4.	Maximum temperature rise over design ambient temperature	100 / 125 (as applicable)
5.	One minute power frequency withstand voltage sec. terminal & earth	As per IEC:60044-1
6.	Number of terminals	All terminals of control circuits are to be wired upto marshaling box plus 20% spare terminals evenly distributed on all TBs.
7.	Type of insulation	Class A
B.	245 KV INDUCTIVE VOLTAGE TRANSFORMERS	
1.	System fault level(for 3 second)	40 kA / 50 kA (as applicable)
2.	Standard reference range of frequencies for which the accuracies are valid	96% to 102% for protection and 99% to 101% for measurement
3.	One minute power frequency withstand voltage :	
	i) For secondary winding	3 kV (rms)



4.	Maximum temperature rise over design ambient temperature	As per IEC:60044-2
5.	Number of terminals	All terminals of are wired upto marshaling box plus 12 terminals exclusively for Purchaser's use.
6.	Rated Total Thermal burden (VA)	300 (100VA/winding)

SURGE ARRESTERS

The Surge Arresters shall conform to IEC: 60099-4.

The surge arresters are being provided to protect the following equipment whose insulation levels are indicated in the table given below:-

Equipment to be protected	Lightning Impulse (kVp) for 245 kV system	Lightning Impulse (kVp) for 145 kV system	Lightning Impulse (kVp) for 36 kV system
Power transformer	± 950	± 550	± 170
Instrument Transformer	± 1050	± 650	± 170
CB/Isolator Phase to ground	± 1050	± 650	± 170
CB/Isolator Across open contacts	±1050 (for CB) ± 1200 (for Isolator)	± 750	± 195

TECHNICAL PARAMETERS:

A. 245 kV CLASS SURGE ARRESTER

- (a) Rated arrester voltage 198 kV
- (b) Nominal discharge current 10 kA of 8/20 microsecond wave
- (c) Minimum discharge capability 5kJ/kV (referred to rated arrester voltage corresponding to minimum discharge characteristics).
- (d) Continuous operating voltage at 50 deg.C 168 kV rms
- (e) Max. switching surge 500 kVp



	residual voltage (1kA)	
(f)	Max. residual voltage at	
	i) 5 kA	560 kVp
	ii) 10 kA nominal discharge current	600 kVp
(g)	Max. steep current impulse residual voltage at 10 kA.	650 kVp
(h)	Long duration discharge Class	3
(i)	High current short duration test value (4/10 micro second wave)	100 kAp
(j)	Current for pressure relief test	40 kA rms / 50 kA rms (as applicable)
(k)	Low current long duration test value (2400 micro sec)	As per IEC.
(l)	Pressure relief class	40 kA / 50 kA (as applicable)

B. 36 kV and 11 kV CLASS SURGE ARRESTER

	36 kV	11 kV	
(a)	Rated arrester voltage	30 kV	9 kV
(b)	Nominal discharge Current	---10 kA of 8/20 microsecond wave ---	
(c)	Minimum discharge capability	5kJ/kV (referred to rated arrester voltage corresponding to minimum discharge characteristics.)	
(d)	Continuous operating voltage at 50 deg.C	25 kV rms	7.2 kV rms
(e)	Max. switching surge residual voltage (1kA)	72 kVp	22.4 kVp
(f)	Max. residual voltage at		

i)	5 kA	85 kVp	26 kVp
ii)	10 kA nominal discharge current	90 kVp	28 kVp
(g)	Long duration discharge Class	2	2
(h)	Pressure relief class	25kA	25 kA

TECHNICAL SPECIFICATION FOR 220 kV XLPE CABLE

STANDARDS

IEC-60228	Conductor for insulated cable. IEC-60229 Tests on cable over sheaths.
IEC-60230	Impulse tests on cables and their accessories.
IEC-60270	Partial discharge measurements.
IEC-60287-1-1	Calculation of continuous current carrying capacity.
IEC-60502	Power Cables with extruded insulation and their accessories.
IEC-60067	Tests for Power cables with extruded insulation for rated voltage upto 500 kV.
BIS: 7098	XLPE Cable specification for working voltages from 66 kV upto and including 220 kV.
IEEE:48	Tests procedures and requirements for high voltage cable terminations.

DESIRED TECHNICAL PARTICULARS OF XLPE CABLE

S.NO.	PARTICULARS	TECHNICAL DETAILS
1.	Cable Applicable Standard	Single Core, Copper Conductor XLPE cable. Conforming to IEC 60502 – 2 and IEC 60840: 2004-04 or IS 7098 (Part - 3) amended up to date.
2.	System voltage & frequency	220 ± 10% kV, 50Hz ± 3%
3.	Rated & Highest System Voltage	245 kV
4.	Suitable for earthed system	Yes
5.	CONDUCTOR	
(i)	Material	Annealed Plain Copper wires Conforming



S.NO.	PARTICULARS	TECHNICAL DETAILS
		to IEC 60228/ IS 8130 with latest amendments
(ii)	Nominal cross-sectional area	800 Sq. mm
(iii)	Construction of conductor / flexibility class	Class -2, IEC 228/ IS: 8130 with latest amendments
(iv)	Shape and formation	Circular, stranded & very well compacted
(v)	Approx. overall diameter of conductor	To be indicated
6.	CONDUCTOR SCREENING	
(i)	Material & Type	Extruded, semi conducting compound layer
(ii)	Grade	As per IEC/ IS
(iii)	Thickness	1.0 mm
7.	INSULATION	
(i)	Material	Cross linked polyethylene (XLPE)
(ii)	Special Super clean grade Normal thickness of insulation	As per IEC 6207/ IS 7098 (Part-3) with latest amendments
8.	INSULATION SCREENING	
A.	Non-metallic part (extruded)	
(i)	Material	Extruded semi conducting compound layer
(ii)	Grade	As per IEC/ IS 7098 (Part-3) with latest amendments
(iii)	Min. Thickness	0.8 mm
B	Non-metallic part (taped) longitudinal water barrier over insulation screen	
(i)	Material	Synthetic Non-woven semi conducting Water swell-able tape
(ii)	Min thickness	As per standard
C	METALLIC SHEATH	
(i)	Material	Corrugated Aluminium/ Lead alloy "E" sheath IS 692 with latest amendments
(ii)	Min. Thickness(mm)	Conforming to IEC 60502-2/ IS 7098
(iii)	Short Circuit Current Withstand (Metallic sheath, together with copper screen (if required))	40 kA for three second
(D)	Bedding over lead sheath	Semi conducting tape(s)
(E)	CONCENTRIC COPPER WIRE SCREEN (IF REQUIRED)	
(i)	Material and type	Annealed plain copper wires applied helically with gap followed by open helix



S.NO.	PARTICULARS	TECHNICAL DETAILS
		of copper tape binder.
(ii)	Min. area (sq. mm.)	This and lead alloy E sheath shall meet earth fault current of 40 kA for a duration of 3 second
9.	OUTER SHEATH	
(i)	Material	Extruded Layer of Black PE or PVC type ST-2 as per IEC 62067/ IS 7098 (Part-3)
(ii)	Min. thickness of outer sheath	As per standard
10.	Conducting layer over outer sheath	Graphite coating
11.	Approx. weight overall diameter of cable (mm)	To be indicated
12.	Approx. weight per meter of cable (kg/m)	To be indicated
13.	Recommended minimum installation radius.	To be indicated
14.	Maximum D.C. Resistance of conductor at 90°C in ohm/km	As per standard
15.	Minimum continuous current rating for each circuit when laid in ground in trefoil formation and other condition given in specification.	1100 / 843 Amps. As applicable after all de-rated factors.
16.	Maximum allowable temperature for cable and accessories.	
(i)	At rated full load and at site conditions.	90° C
(ii)	The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuit as 90°C).	250°C
17.	Basic impulse insulation level (1.2 /	650 kV

S.NO.	PARTICULARS	TECHNICAL DETAILS
	50 micro second wave)	
18.	Power frequency withstand voltage	As per standard
19.	Symmetrical Short circuit rating for one second duration for lead sheath and copper screened combined	40 kA for 3 sec.
20.	Drum Length	500-600 mtr. / As per requirement.
21.	Expected cable life.	35 years.

TECHNICAL SPECIFICATION FOR 245kV CABLE TERMINATION AND JOINTINGKITS FOR 1

x 800 SQ. MM& 1x1000SQ.MM. XLPE CABLE

STANDARDS

IEC: 62067	Tests for power cables with extruded insulation for rated voltage above 150kV upto 500kV.
IEC: TS 60859	Cable connection for Gas insulated metal enclosed switchgear for rated voltages of 72.5 kV and above.
IEC: 62271-203	Gas-insulated metal enclosed switchgear for rated voltages of 72.5 kV and above.
IEC: 60228	Conductor for insulated cable
IEC: 60229	Tests on cable over sheaths
IEC: 60230	Impulse tests on cables and their accessories
IEC: 60270	Partial discharge measurements
IEC: 60287	Calculation of continuous current carrying capacity
IEC: 60502	Power Cables with extruded insulation and their accessories.
BIS: 7098 (Part-3)	XLPE cable specification for working voltages from 66 kV up to and including 220 kV.
IEEE 48- 1990	IEEE Standard Test, Procedure & requirement for high voltage alternating current cable terminations.

SYSTEM CONFIGURATION

The 220kV systems will be solidly grounded. Cables will be protected from over voltages caused by lighting strikes or switching surges by means of station type lightning arrestors located at terminal point/ substations. The terminal substation yard equipment and all overhead 220kV transmission lines will be shielded against direct lighting strokes by

overhead ground wires.

EARTHING

Earthing of sheath/ screen at both of termination ends of 245kV cable using insulation sheath bonding (earthing) cable of required size through Link box with/ without surge limiter at terminations.

Earthing shall be as per relevant standards.

The sheath/ screen shall bound in the earth station through disconnecting type link boxes.

DESIRED TECHNICAL PARTICULARS OF XLPE CABLES KITS AND ACCESSORIES

A. OUTDOOR CABLE END TERMINATION		
1.	Nominal System Voltage	220 kV (rms)
2.	Rated/ Highest System Voltage Um	245 kV (rms)
3.	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three (3)
4.	Installation	Outdoor
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit	To be indicated
7.	Type of kit	Pre-molded
8.	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/ IS 7098 (part-3) amended upto date and as per specification.	Yes
9.	Maximum conductor size	To be indicated
10.	Rated continuous current	Maximum current of the cable
11.	Applicable standard for testing	IEC 62067
12.	Maximum allowable Pd-level	As per IEC
13.	Type of Insulator	Silicone/ Composite
14.	Creepage distance	25 mm/KV
15.	Colour	Brown
16.	Maximum allowable temperature for cable and accessories i) At rated full load and at site condition The conductor temperature after a short ii) circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90°C).	90°C 250°C
17.	Basic impulse insulation level (1.2/50 micro second wave)	1050 kV



A.	OUTDOOR CABLE END TERMINATION	
18.	Power frequency withstand voltage	As per standard
19.	Symmetrical Short circuit rating	40 kA for 3 sec.
20.	Power frequency withstand voltage (a) Dry (kV rms.) (b) Wet (kV rms.)	To be indicated
21.	Flashover voltage: (a) Dry (kV rms.) (b) Wet (kV rms.)	To be indicated
22.	Stress relief cone made of	Silicone rubber
23.	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
24.	Craft sensitivity and reliability	To be indicated
25.	Time required for energisation after completing the joint (curing period)	To be indicated
26.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated
27.	Whether provision made for: a) Stress relief b) Track resistance c) Sealing	Yes
28.	Whether any additional support is required for kit?	If so, give details
29.	Make, Type and Material of lugs provided with kits.	Details to be given by bidder.
30.	Class of Kits.	Details to be given by bidder
31.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
32.	Expected life of cable joint and cable.	35 years
33.	(a) Shelf life of the kit (years) (b) Design life of the kit (years)	To be indicated To be indicated
34.	Guarantee of kit.	Five (5) years from date of commissioning
35.	Details of terminal connector	
B.	SF6 SWITCHGEAR TYPE CABLE END TERMINATION	
1.	Nominal System Voltage U	220 kV (rms.)
2.	Rated/ Highest System Voltage Um	245 kV (rms.)
3.	Rated frequency & No. of phase	50 Hz $\pm 3\%$, Three (3)
4.	Installation	Indoor/ Outdoor
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit	To be indicated
7.	Type of kit	Premoulded, Plug in type
8.	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/ IS 7098 (Part-3)	Yes

A.	OUTDOOR CABLE END TERMINATION	
	amended upto date and as per specification.	
9.	Maximum conductor size	To be indicated
10.	Rated continuous current	Maximum current of the cable
11.	Applicable standard for testing	IEC 62067
12.	Maximum allowable Pd-level	As per IEC
13.	Type of Insulator	Silicone/ Composite
14.	Creepage distance	25 mm/KV
15.	Colour	Brown
16.	Maximum allowable temperature for cable and accessories (i) At rated full load and at site condition (ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90°C).	90°C 250°C
17.	Basic impulse insulation level (1.2 / 50 micro second wave)	1050 kV
18.	Power frequency withstand voltage	As per standard
19.	Symmetrical Short circuit rating	40 KA for 3 sec.
20.	Power frequency withstand voltage (a) Dry (kV rms.) (b) Wet (kV rms.)	To be indicated
21.	Flashover voltage: (a) Dry (kV rms.) (b) Wet (kV rms.)	To be indicated
22.	Stress relief cone made of	Silicon rubber
23.	Details of terminal connector	As applicable
24.	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
25.	Craft sensitivity and reliability	To be indicated
26.	Time required for energisation after completing the joint (curing period)	To be indicated
27.	Special storage condition. If any, upto an ambient temperature of 50°C and period.	To be indicated
28.	Whether provision made for: Stress relief Track resistance Sealing	Yes
29.	Whether any additional support is required for kit?	If so, give details.
30.	Make, Type and Material of lugs provided with kits.	Details to be given by bidder.

A.	OUTDOOR CABLE END TERMINATION	
31.	Class of Kits.	Details to be given by bidder.
32.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes
33.	Expected life of Cable joint and cable.	30 years
34.	(a) Shelf life of the kit (years) (b) Design life of the kit (years)	To be indicated To be indicated
35.	Details of terminal connector	
36.	Guarantee of kit	Five (5) years from date of commissioning.
C.	LINK BOX FOR EARTHING CABLE WITH PVC INSULATION	
1.	Make	
2.	Type	
3.	Detailed dimension and internal arrangement of Single/ Three phase Link boxes with direct grounding	To be submitted
4.	Detailed dimension and internal arrangement of Three Phase Link boxes for cross bonding with SVL	To be submitted
5.	Earthing of sheath/ screen at cross bonding points and termination ends	Yes
6.	PVC insulated single core/ concentric/ coaxial cable to be used for sheath bonding (earthing) suitable for 40 kA for 3 second	Size, Type to be indicated
7.	Insulation of above a earthing cable	To be indicated (3 kV / 6 kV)
8.	Voltage rise of the insulation sheath controlled within voltage	65 Volts.
9.	Surge voltage limiter	Required (3 kV / 6 kV)
D.	SUPPORTING STRUCTURE & ANGLE BRACKET SUPPORTS FOR CABLE	
1.	Detail drawing enclosed	Yes
2.	Overall height of structure	Shall be as per approved drawing.

33KV XLPE CABLE & ACCESSORIES**33 KV XLPE Cable**

33KV XLPE cable shall be in accordance with the Internationally accepted standard and also conform to the requirement of IEC Publication 502.

TECHNICAL SPECIFICATION FOR 60 MVA 220/33 KV 3 PHASE POWER TRANSFORMER**STANDARDS**

The transformer should conform in all respect to latest addition of IS:2026 & CBIP.

PRINCIPAL PARAMETERS

The transformers shall be of core type constructions, three phase, oil immersed for outdoor service as both step up and step down transformers, with types of cooling mentioned below. The rating and electrical characteristics of transformers shall be as below :-

(i)	Maximum continuous capacity	60MVA
(ii)	Frequency	50 Hz
(iii)	No. of Phase	Three
(iv)	Rated Voltage of HV winding	220KV
(v)	Rated Voltage of LV winding	33KV
(vi)	Rated Voltage of Tertiary winding	11KV
(vii)	Percentage impedance	
(viii)	HV to LV at Normal tap No. 13 at 100% rating	12.5%
(ix)	HV to Tertiary at Normal tap	12.5% (min.)
(x)	LV to Tertiary at Normal tap	12.5% (min.)
(xi) a.	No load loss at rated voltage and frequency at Principal Tap (KW)	25 (max)
b.	No load loss at voltage corresponding to the highest tap (KW)	35 (max)
c.	Tolerance if any on the above value	No tolerance
(xii) a.	Load loss at rated output, rated frequency and corrected for 75 Deg C winding temperature at -Principal Tap (KW) - Highest Tap (KW) -Lower Tap (KW)	150 KW (max) at 220/33 KV 126 KW (approx.) at 220/37.95 KV 161 KW (approx.) at 220/31.35 KV
b.	Tolerance, if any, on the above value	No tolerance
(xiii) a.	Auxiliary losses at rated output, normal, rated voltage, rated frequency and ambient temperature (KW)	3.0 KW (max)
b.	Tolerance, if any, on the above value	NIL

(xix) Total Loss at normal ratio inclusive of auxiliary component losses (KW)	178 KW (Max.) at 220/33 KV@60MVA Base
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NOTE : No reactor either inside or outside the tank shall be used to achieve above percentage impedance value.

(xx) Connections for :-	
a) HV Winding /LV Winding	Star / Star
b) Tertiary winding	Delta
(xxi) Reference Voltage group and terminal markings	HV/LV/Tertiary -YNynOd11
(xxii) On load tap on HV side neutral	- 5% to +15% in equal steps. of 1.25 % each for IV variations.
(xxiii) Type of cooling	ONAN/ONAF/OFAF.
(xxiv) Rating corresponding to cooling system :-	
a) ONAN Cooling	30 MVA
b) ONAF Cooling	42 MVA
c) OFAF Cooling	60 MVA
(xxv) Rated capacity of tertiary winding	18 MVA
(xxvi) D.C. Voltage for relays etc.	110V
(xxvii) Maximum Noise Level	75 dB

INSULATION

The di-electric strength of winding insulation and of the bushing shall conform to the value given in IS:2026-1977.

For rated system, Voltage of 245 KV, 36 KV and 11 KV following test voltage shall be provided.

SYSTEM VOLTAGE	IMPULSE TEST VOLTAGE	ONE MINUTE POWER FREQUENCY TESTS
245 KV	950 KV	395 KV
36 KV	170 KV	70 KV
11 KV	95 KV	38 KV

The HV and LV windings of transformers shall have graded insulation. The insulation class of the neutral of the winding shall be graded to 95 KV impulse and 38 KV Power frequency withstand.

FREQUENCY

The normal frequency of the system is 50 Hz. It may vary $\pm 5\%$. The transformers shall be suitable for continuous operation at rated capacity without exceeding the specified temperature rise within this frequency range.

PARALLEL OPERATION

The transformer shall operate satisfactorily in parallel with similar units of different make having following parallel operation details:-

Sl.No.	Variable	Details
1	HV to IV %impedance of tap No.1(ëxtreme) of 100% rating	12.5%
2	HV to IV %impedance of tap No.13(Normal) of 100% rating	12.5%
3	HV to IV %impedance of tap No.17(2nd ëxtreme) of 100% rating	12.5%
4	Location of Tap Changer	HV side neutral
5	Voltage variation	-5% to + 15%
6	Step Voltage	1.25%
7	Vector group	YNyn0d11

CONSTRUCTION DETAILS

The features and construction details of power transformers shall be in accordance with the requirements stated hereunder:-

TANK AND TANK ACCESSORIES**TANK :-**

Tank shall be of welded construction and fabricated from tested quality low carbon steel of adequate thickness.

All seams and those joints not required to be opened at site shall be factory welded and wherever possible, they shall be double welded. After completion of tank construction and before painting, dye penetration test shall be carried out on welded parts of jacking bosses, lifting lugs and all load bearing members.

Tank stiffeners shall be provided for general rigidity and these shall be designed to prevent retention of water.

The tanks shall be designed to withstand :

- i) Mechanical shocks during transportation.
- ii) Vacuum filling of oil.

- iii) Continuous internal pressured of 35 kN/m² over normal hydrostatic pressured of oil.
- iv) Short circuit forces.

Wherever possible, the transformer tank and its accessories shall be designed without pockets, wherein, gas may collect. Where pockets can not be avoided, pipes shall be provided to vent the gas in to the main expansion pipes.

Adequate space shall be provided at the bottom of the tank for collection of sediments.

Lifting lug & eye bolts shall be so located that a safe clearance is obtained between slings and transformer bushings without use of spreader.

When transformers are provided with separately mounted radiators, flexible joints shall be provided on the main oil pipes connecting the transformer tank to the radiator banks to reduce vibration and facilitate erection and dismantling.

Transformer tank shall be of bell shape construction with an oil tight bolted flange joint near the base, such that during inspection or maintenance, it is possible to lift the upper portion of the tank to provide access to the core and coils.

The transformer tank shall be equipped with the following valves :-

One drain and lower filter valve located on low voltage side of transformer and placed to completely drain the tank.

One valve at the top and one at the bottom of the tank mounted diagonally opposite to each other for filtration purpose.

One relief valve to operate at the pressure below the test pressure for the tank.

One oil filling valve (inlet).

One oil sampling valve with plug.

Two nos. stop valves for each pump.

TANK COVER :-

- The tank cover shall be sloped to prevent retention of rain water and shall not distort when lifted.

- At least two adequately sized inspection openings, one at each end of the tank shall be provided for easy access to bushings and earth connections. The inspection covers shall not weigh more than 25 Kg. The inspection covers shall be provided with two handles.
- The tank covers shall be fitted with pockets at the position of maximum oil temperature of MCR (Maximum Continuous Rating) for bulbs of oil and winding temperature indicators. It shall be possible to remove these bulbs without lowering the oil in the tank.
- Bushings, turrets, covers of inspection openings, thermometer, pockets, etc. shall be designed to prevent ingress of water into or leakages of oil from the tank.
- All bolted connections shall be fitted with weather proof, hot oil resistant gasket in between, for complete oil tightness. If gasket is compressible, metallic stops shall be provided to prevent over compression.

AXELS AND WHEELS

- Transformer shall be provided with flanged bi-directional wheels for moving the transformer on rail tracks in directions parallel (X-X) and perpendicular (Y-Y) to the axis of HV bushings. Rail gauge for movement along the axis of HV bushing (i.e., X-X) shall be 1676.4 mm. The movement in direction perpendicular to transformer HV bushing (i.e., Y-Y axis) direction of rail gauge is 3048 mm.
- The transformer shall be rigidly mounted on wheels resting on rails in concrete foundations. The complete transformers shall be rigidly anchored through wheel assemblies to the foundation using anti-earthquake clamping and locking devices. Rails would be mounted flush with top surface of the foundations.
- Ladders with suitable locking arrangement shall be provided on the side of each transformer for purpose of maintenance.

ANTI EARTQUAKE CLAMPING DEVICE

- To prevent transformer movement during earthquake, clamping device shall be provided for fixing transformer to the foundation. The Supplier shall supply necessary bolts for embedding in the concrete foundation. The arrangements shall be such that the transformer can be fixed to or unfastened from these bolts as desired. The fixing of the transformers to the foundations shall be designed to withstand seismic events to the extent that a static co-efficient of 0.3 g., applied in the direction of least resistance to that loading will not cause the transformer or clamping devices as well as bolts to be over stressed.
- The details of the device used and its adequacy shall be brought out in the additional information schedule.

CONSERVATOR TANK

- The conservator tank shall have adequate capacity between highest and lowest visible level to meet the requirement of expansion of the total cold oil volume in the transformer and cooling equipment from minimum ambient temperature to 90 deg.C.
 - a) The conservator tank shall be bolted into position, so that it can be removed for cleaning purposes.
 - b) The conservator shall be fitted with magnetic oil level gauge with low level electrically alarm contact..
 - c) Conservator shall be provided in such a position as not to obstruct the electrical connections of the transformer.
 - d) Separate conservator shall be provided for OLTC.

PRESSURE RELIEF DEVICE

02Nos. of pressure relief devices may be provided at suitable locations, which shall be of sufficient size for rapid release of any pressure that may be generated in the tank and which may result in damage to the equipment. The device shall operate at a static pressure of less than the hydraulic test pressure of transformer tank, it shall be mounted direct on the tank. One set of electrically insulated contact shall be provided for alarm / tripping. Separate contact for N2 fire prevention system shall also be provided.

BUCHHOLZ RELAY

A double float type Buchholz relay shall be provided. All the gases evolved in the transformer shall collect in this relay. The relay shall be provided with a test cock suitable for flexible pipe connection for checking its operation and taking gas sample. A copper or stainless steel tube, shall be connected from the gas collector to a valve located about 1200 mm above ground level to facilitate sampling, with the transformer in service. The device shall be provided with two electrically independent ungrounded contacts, one for alarm on gas accumulation and the other for tripping on sudden rise of pressure. Separate contact for N2 fire prevention system shall also be provided.

TEMPERATURE INDICATOR**a) Oil Temperature Indicator (OTI)**

Transformer shall be provided with a 150mm dial type thermometer for top oil temperature indication. The thermometer shall have adjustable, electrically independent ungrounded alarm and trip contacts, maximum reading pointer and resetting device mounted in the cooler control cabinet. A temperature sensing element suitably located in

a pocket on top oil shall be furnished. This shall be connected to the OTI by means of capillary tubing. Accuracy class of OTI shall be plus or minus 1.0% or better.

b) Winding Temperature Indicator (WTI)

A device for measuring the hot spot temperature of each of the windings shall be provided (HV, IV, Tertiary). It shall comprise of the following :-

- i) Temperature sensing element.
- ii) Image Coil.
- iii) Auxiliary CTs, if required to match the image coil, shall be furnished and mounted in the cooler control cabinet.
- iv) 150 mm dia local indicating instrument with maximum reading pointer mounted in cooler control cabinet and with two adjustable electrically independent ungrounded contacts (besides that required for control of cooling equipment), one for high winding temperature alarm and one for trip.
- v) Calibration device.
- vi) In addition to the above, the following indication equipment shall be provided for each winding.
 - a) Signal transmitter.
 - b) Remote winding temperature indicator, it shall be suitable for flush mounting on RTCC panel (this shall not be repeater dial of local WTI and shall operate by signal transmitter). The difference between local and remote WTI indication at any given time shall not exceed 1 deg. C. One RWTI with four point selector.
 - c) Switch shall be provided for all the three windings (HV, IV and Tertiary).
- vii) Auxiliary supply, if required, in RTCC panel, for RWTI, shall be 110V DC only.
- viii) Accuracy class of WTI shall be plus or minus 1.0% or better.
- ix) Any special cables required for shielding purpose for connection between cooler control cabinet and remote winding temperature indicator control circuit shall be in supplier's scope of work.
- x) Provide current transducer with OTI & WTI to monitor these parameters on SCADA.

EARTHING TERMINALS

Two(2) earthing pads (each complete with two(2) Nos. tapped holes, M 10 bolts, plain and spring washers) suitable, for connection to 75 x 10 galvanized steel flat shall be provided each at position close to the two(2) diagonally bottom corners of tank. Earthing strip upto the ground level shall be provided by the Bidder.

CORE

- Core shall be constructed from high grade, non-ageing cold-rolled low loss and high Permeability grain oriented silicon steel laminations.
- Each lamination shall be insulated with a material that will not deteriorate due to pressure and the action of hot oil.
- Every care shall be exercised in the selection, treatment and handling core steel to ensure that as far as practicable the lamination are flat and the finally assembled core is free from distortion.
- Oil ducts shall be provided where necessary to ensure adequate cooling. The winding structure and major insulation shall not obstruct the free flow of oil through such ducts. Where the magnetic path is divided into packets by cooling ducts parallel to the plane of lamination or by insulating material above 0.254 mm thick, tinned copper strip bridging pieces shall be inserted to maintain electrical continuity between packets.
- All parts of the core shall be of robust design capable of withstanding any shocks to which they may be subjected to during lifting, transport. Installation and service. The bolts used in assembly of the core shall be suitably insulated and clamping structure shall be so constructed that the eddy currents are minimum.
- The core shall be provided with lugs suitable for lifting the complete core, coil, assembly of the transformers.
- Adequate provision shall be made to prevent movement of the transformer relative to the tank during transport and installation or while in service.
- The supporting frame work of the cores shall be so designed as to avoid the presence of pocket, which would prevent complete emptying of the tank through drain valve or trapping of air during filling.
- The maximum flux density in any part of the core and yoke at normal voltage and frequency and ratio must not exceed 1.53 Tesla.

WINDING



- The winding shall be so designed that all coil assemblies of identical voltage rating shall be inter-changeable and field repairs to the winding can be made readily without special equipment and also to reduce to a minimum the out of balances forces in transformer at all voltage ratios. The coils shall be supported between adjacent section by insulating spacers and the barriers, bracing and insulation used in the assembly of the windings shall be arranged to ensure a free circulation of oil and to reduced hot spots in the windings.
- Insulation of the coils shall be treated with a suitable insulating varnish or equivalent compound to develop the full electrical strength of the winding. All material used in the insulations and assembly of winding shall be insoluble, non-catalytic and chemically inactive in the hot transformer oil and shall be free from insulating composition liable to soften, doze out, shrink or collapse during service.
- All threaded connections shall be provided with locking facilities.
- All leads from the windings to the terminal Board and bushings shall be rigidly supported to prevent injury from vibration. Guide tubes shall be used where practicable.
- The windings shall be clamped securely in place, so that they will not displaced or deformed during transit or short circuits. The assembled core & winding shall be vacuum dried and suitably impregnated before removal from treating tank. The copper conductor used in the coil structure should be best suited to the requirements and all permanent current carrying joints in the windings and the leads shall be as per best manufacturing practice to given trouble free service.
- Any metal pieces in contact with laminated rings shall be so designed that they do not weaken the electrical or mechanical properties of the rings.
- Gasket joints shall be provided with mechanical steps to prevent crashing.
- It is desirable that the impulse voltage distribution is measured after the coils are wound (with the help of a surge oscilloscope) and compared with the design values and suitable modifications be done, if deviation found, so as to get stress relieved construction.
- To avoid damage to tertiary winding due to high stress at the time of severe short circuit, it is desirable the some special constructional features like encasing the tertiary winding in some epoxy compound etc., is done as per bidder practices. Suppliers shall elucidate the constructional features adopted by them for the same. Special constructional and design features adopted for avoiding displacement of coils / clamping structures during dynamic short circuit condition be given.

INSULATING OIL

- a) The quality of the oil supplied with transformer shall conform to the oil parameters specified below. No inhibitors shall be used in the oil. The oil used shall be non- PCB (Poly Chlorinated Biphenyl) type. The oil samples will be drawn as follows :-
- i) Prior to filling.
 - ii) Before and after heat run test.
 - iii) Before energizing.

All tests as per IS: 335 shall be conducted on all samples.

NEUTRAL BUSHING CTs

CT	RATIO	PROTECTION	BUR-DEN	ACCURACY CLASS	MIN. KNEE POINT VOLTAGE	MAX. EXCITING CURRENT	MAX. SEC. RESIS-TANCE IN OHMS
1	2	3	4	5	6	7	8
220 KV	500 / 1 A	REF (Restricted earth fault).	-	PS	300 V	40mA at $V_k/2$	5.0
33 KV	2000 / 1 A	Earth Fault Protection	-	PS	300 V	40mA at $V_k/4$	5.0

- 1 All 60 MVA transformers are to be provided with bushing CT's of following ratio and Particulars :
2. The metering core of all CT's shall be of 30 VA burden, class of accuracy (as per BSS).
3. Over voltage protection devices shall be provided for all the cores of each CT to protect them against heavy current in CT primary, open circuiting or heavy burden of secondary.
4. All CTs shall have bar primaries.
5. Only molded epoxy terminations shall be provided on all the CTs secondary terminals with suitable terminal and cable glands.

SPECIFICATIONS**250 KVA 33/0.415 KV Station Transformers**

PFC Consulting Limited



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STANDARDS

The transformers shall conform in all respects to IS:1180 (Part-1):-2014 subject to latest amendment and modifications. In case the provisions of ISS are not clear the provisions of IEC shall apply.



TECHNICAL SPECIFICATION FOR 245/145/36KV SOLID CORE POST INSULATORS**STANDARDS**

Insulators should conform to the latest publications of IS 2544 & IEC in all respects except BIL which should be 1050Kvp for 245 kV, and 650 kVp for 145 kV withstand. Equipment meeting any other authoritative standards which ensures equal or better quality than the IS mentioned above, is also acceptable.

REQUIREMENT FOR INSULATORS**FOR 245 AND 145 KV POST INSULATORS**

(1)	Nominal voltage	:	245 KV	145 kV
(2)	Highest system voltage	:	245 KV	145 kV
(3)	Sytem frequency	:	50Hz.	50 Hz.
(4)	Number of phases	:	3 (Three)	3 (Three)
(5)	Neutral	:	Effectively earthed	Effectively earthed
(6)	Short circuit current	:	40.0 KA	31.5 KA
(7)	Phase to phase spacing	:	4.5 meters	3.0 meters
(8)	Height of the insulator support structure.	:	2750 mm.	2750 mm
(9)	PCD of Top Flange	:	127 mm.	127 mm
(10)	PCD of Bottom Flange	:	184 + .2 mm.	184+ .2 mm
(11)	BIL	:	1050 KV	650 mm
(12)	Height of insulator	:	2300.00mm	1500 mm

2.2 FOR 36 KV POSTINSULATORS

(1)	Nominal voltage	:	36 KV
(2)	Highest system voltage	:	36 KV
(3)	Sytem frequency	:	50Hz.
(4)	Number of phases	:	3 (Three)
(5)	Neutral	:	Effectively earthed.
(6)	Short circuit current	:	25.0 KA
(7)	Phase to phase spacing	:	1.5 meters
(8)	Height of the insulator support structure.	:	2750 mm.
(9)	PCD of Top Flange	:	127 mm.
(10)	BIL	:	250 KV
(11)	Height of insulator	:	508.00 mm

TECHNICAL SPECIFICATIONS OF 198 KV/120 KV/30 KV 10KA METAL OXIDE GAPLESS SURGE ARRESTERS

PRINCIPAL PARAMETERS

•	Rated system voltage	245 KV	145 KV	36 KV
•	System neutral earthing	Effectively earthed		
•	Installation	Outdoor		
•	Rated arrester voltage	198 KV	120 KV	30 KV
•	Max. continuous operating voltage (MCOV) at 50°C	168 KV	102 KV	24 KV
•	Nominal discharge current	10 KA (8/20 microwave)		
•	Rated frequency	50 Hz		
•	Minimum line discharge capacity	2 KJ / KV		
•	Power frequency reference voltage	Not less than MCOV		
•	Max. Residual voltage at nominal discharge current of 10 KA and 8/20 Micro Sec.	550 KV _P	400 KV _P	100 KV _P
•	Peak & value of high current (4/10 Microwave)	100 KA		
•	Creepage distance	25 mm/KV		
•	Partial discharge test on 1.05 MCOV	Net more than 50 Pico coulombs		
•	One minute power frequency voltage of arrester housing	460 KV	275 KV	70 KV
•	Impulse withstand voltage of arrester housing with 1.2/50 micro second wave.	1050 KV _P	650 KV _P	170 KV _P
•	Minimum prospective fault current.	40 KA		
•	Radio interference voltage	Not more than 500 micro volts.		
•	Pressure relief class	Class-A		
•	Current for pressure relief.	40 KA		
•	Seismic acceleration	0.3 g.		
•	Long duration discharge class	Class 3 (as per IEC)		

The details of the equipments to be protected by these surge arresters are as under:-

Equipment Basic Insulation level

		220 KV	132 KV	33 KV
i)	Transformer 220 KV side	950 KV _P	550 KV _P	170 KV _P
ii)	Switchgears, CTs and CVTs	1050 KV _P	650 KV _P	170 KV _P



i.	Type of Installation	Indoor (non AC) /Outdoor
ii.	CT secondary	1 A
iii.	VT secondary	110 V/ $\sqrt{3}$ Volts
iv.	Auxiliary AC Supply	230 V+ 10 % to -15%
v.	Auxiliary DC Supply	110 V/220V/ + 10%
vi.	System frequency	50HZ + 5%
vii.	Earthing System	Solidly Grounded

GENERAL TECHNICAL REQUIREMENT

- i) Application: 3 phase 4 wire, -/01A
- ii) Rated Secondary Voltage: -/110V AC, 63.5 Volts (Phase to Neutral)
- iii) Rated secondary Current (I Basic): 1 Amp balanced & unbalanced load
- iv) Maximum Current : 2 Amps.
- v) Rated Frequency: 50 Hz.
- vi) Accuracy class: 0.2s
- vii) Power Factor: Unity to Zero (all power factor lag to lead).
- viii) Power Consumption: Not more than 1.5Watt per phase(Active)
10 VA (Apparent) Apparent power consumption in each current circuit at basic current and reference frequency shall not exceed 1.0 VA
- ix) Phase Sequence Immunity: Shall be unaffected to phase sequence.
- x) Data Transfer Speed from meter to MRI and from MRI to BCS: at least 19200 kbps.
- xi) Communication Port: Optical port for MRI and communication port for remote data transfer.
- xii) Degree of protection of encapsulation : shall be at IP 51/IP 54 or better.
- xiii) Minimum Starting Current – 0.1% of I basic.

RELAYS:

All relays shall conform to the requirements of IS: 3231 or other applicable approved standards. Relays shall be suitable for flush or semi-flush mounting on the front with connections from the rear. Relays shall be rectangular in shape and shall have dust tight, dull black or egg shell black enamel painted cases with transparent cover removable from the front.

TECHNICAL SPECIFICATIONS FOR 110/30A BATTERY CHARGERS AND 110V/30A DC DISTRIBUTION BOARDS

REQUIREMENT OF BATTERY CHARGER

TYPE & RATING

Each battery charger shall be of 3 phase type which must be able to meet the above requirement plus 20 Amps station load current on both float and boost charging modes with a voltage variation from 350 V to 470 V A.C. 50 Hz $\pm$ 5% separately or simultaneously.

The charger shall be stand-alone, floor mounted indoor type. The panels shall consist of fabricated sheet steel enclosures on the sides, front, rear and top. The rear door of panel shall be in the form of lockable, hinged tight fitting flap door which should close and open without keys. The front and rear sheets shall be folded construction for providing rigidity and strength (without using any frame works or screwed & bolted sheet steel sections) of not less than 14 SWG. All the switches, knob should be such mounted that only their operating handles protrude out of the panel. Suitable support channels shall be provided inside the cubicle. The charger unit will be completely vermin proof and neoprene gaskets will be provided around the edges of the door.

Important identifications/ markings shall be made on anodized plate with etching process (not with screening process) which shall be riveted.

All screws, nuts and bolts shall be rust proof and spring washers shall be provided wherever required.

Terminal blocks should be easily accessible and transparent flexible top covers (easily removable) shall be provided to cover the live parts.

TECHNICAL SPECIFICATIONS OF D.C. DISTRIBUTION BOARDS

The D.C. distribution board shall be similar in construction to the charger having preferably the same height using 14SWG sheet steel. The DCDB shall have single aluminum bus bar arrangement and arrangement for connecting the out put of charger. Automatic switching of D.C. emergency light circuit in the event of A.C. failure shall also be provided.

TECHNICAL SPECIFICATION OF DISC INSULATORS AND CONDUCTORS ETC

STANDARDS

The supply of accessory items covered by this specification shall comply with the latest editions of the Indian standards / IEC and codes of practice. Some of the applicable standards are given below :-

I.S.S No.	Particulars	Remarks
IS.731	Disc insulators	Or any other equivalent International standard
IS. 2544	Porcelain Insulators	- do -
IS. 6005	Code of practice for phosphating Iron & Steel	- do -
IS. 398	ACSR Conductor	- do -
IS. 226	M. S. Bars	- do -

REQUIREMENT OF ANTI-FOG TYPE DISC INSULATORS**A) 220 kV SWITCHYARD**

- (i) Single suspension string shall be complete with 14 nos. anti-fog type disc insulators and without suspension clamps & fittings.
- (ii) Single strain string shall be complete with 16 nos. anti-fog type disc insulators and without strain clamps & fittings.

B) 132 kV SWITCHYARD (For 220 kV & 132 kV Substations)

- (i) Single suspension string shall be complete with 9 nos. anti-fog type disc insulators and without suspension clamps & fittings.
- (ii) Single strain string shall be complete with 10 nos. anti-fog type disc insulators & without strain clamps & fittings.

PARAMETERS OF DISC INSULATORS

These are required for 220 kV, 132 kV and 33 kV tension and suspension strings. The minimum guaranteed requirements of one unit of each type of insulators shall be as follows :

Anti-fog type insulators shall be of ball and socket type.

For 220 kV & 132 kV Busbar Strings

i)	Types of insulator	Anti-fog type
ii)	Electromechanical strength (kN)	70
iii)	Size of Insulator (mm)	280 x 146
iv)	Creepage distance	
	a) Total mm	430
	b) protected mm	290
v)	Power Frequency Flashover Voltage	
	a) Dry kV	100
	b) Wet kV	60
vii)	Power frequency with stand Test voltage	
	a) Dry kV.	85
	b) Wet kV.	50
vii)	50% Impulse 1.2/50 micro sec. Flashover voltage (dry)	
	a) Positive polarity / kV.	175
	b) Negative polarity/ kV.	170
viii)	Impulse 1.2 / 50 micro sec. withstand test voltage.	155
ix)	Power Frequency Puncture Voltage kV.	140
x)	Size of in ball shank in mm	16
xi)	Minimum corona extinction voltage kV. R.M.S.	18
xii)	Max. RIV at 10 kV. RMS.	50 micro Volt

BUS BAR CONDUCTORS

Aluminum strands for ACSR and all aluminum conductors shall be hard drawn from 99.5% pure electrolytic aluminum rods with 61% conductivity.

The steel wire for ACSR conductor shall be manufactured from high tensile steel of 134 to 143 kg. / Sq. mm. quality produced either by the acid or basic open hearth process or by electric process. It shall not contain sulphur or phosphorous exceeding 0.05 percent and total of sulphur or phosphorous shall not exceed 0.085 percent. No wires drawn from Bessemer process steel shall be used.

The surface of the conductor shall be clear and dry . The surface strands shall be smooth and free from burrs and other projections which may cause in creasing corona losses above those occurring on perfectly smooth conductor when used on extra high voltage lines.

TECHNICAL SPECIFICATIONS FOR 63KVA DIESEL GENERATOR**ELECTRICAL SUPPLY SPECIFICATIONS**

Nominal voltage	: 415V $\pm$ 10%
No. of Phases	: 3 + Neutral
Frequency	: 50Hz $\pm$ 5%
Neutral earthing	: Solidly Grounded
Control supply	: 12 / 24V, 2-wire DC

PRINCIPAL TECHNICAL PARAMETERS

The Voltage Transformers shall conform to the following specific parameters:

Sl. No	Parameters	Specification
1	2	3
1.	Type of installation	Single Phase, Oil filled hermetically sealed and outdoor types
2.	Type of mounting	Pedestal type
3.	Suitable for system frequency	50 Hz $\pm$ 5%
4.	Highest system Voltage	245 Kv
5.	Transformation ratio on all windings	220,000 / 110 $\sqrt{3}$ $\sqrt{3}$
6.	Method of earthing	Effectively earthed
7.	1.2/50 micro second lightning impulse withstand voltage kV (peak)	1050
8.	1 minute dry power frequency withstand voltage kV (rms)	460
9.	Min. Creepage Distance mm.	6125
10.	Radio interference Voltage at 266 kV	Not exceeding 500 micro volts

REQUIREMENT OF 245 KV CVT

S.No.	DETAILS	PARTICULARS		
1.	Transformation ratio on all windings	220,000 / 110 $\sqrt{3}$ $\sqrt{3}$ (No. of secondary windings 3)		
2.	Supply frequency	50 Hz.		
3.	Type	Capacitor voltage type.		
4.	Rated voltage factor	1.2 continuous 1.5 for 30 seconds.		
5.	Application	Winding I Protection	Winding II Protection	Winding III Metering/Synchro.
6.	Accuracy	3P	3P	0.2
7.	Phase angle error	----- As per IS -----		
8.	Output burden	150 VA	150 VA	50 VA
9.	Rated capacitance	4400 + 10% - 5%		
10.	Rated total thermal burden	750 VA		
11.	Standard reference range of frequency for which the accuracies are valid.	97% to 103% for protection & 99% to 101% for measurement.		
12.	One minute power frequency test on secondary winding.	3 KV (r.m.s.)		
a)				
b)	Withstand voltage between low voltage terminal and earth terminal	4 KV (r.m.s.)		
(Note : This test voltage shall be 10 KV (r.m.s.) in the low voltage terminal exposed to weather).				
c)	Radio interference voltage of 266 KV (r.m.s.)	Not exceeding 500 microvolts.		
13.	Corona extinction voltage.	320 KV (r.m.s.)		
15.	Partial discharge level at rated voltage for capacitor divider.	Less than 10 pico coulombs		

TECHNICAL SPECIFICATION FOR 160 MVA, 220/132/11KV, AUTOTRANSFORMERS.**STANDARDS**

The transformers shall conform in all respect to latest edition of IS 2026 and CBIP specification.

TYPE RATING AND QUANTITY

The auto transformers shall be of core type constructions, three phase, oil immersed for outdoor service as both step up and step down transformers, with types of cooling mentioned below. The rating and electrical characteristics of transformers shall be as follows :-

i)	Maximum continuous capacity	160 MVA
ii)	Frequency	50 C/s
iii)	No. of phase	3
iv)	Rated Voltage of HV winding	220 KV
v)	Rated Voltage of IV winding	132 KV
vi)	Rated voltage of Auxiliary winding	11 KV
vii)	% age impedance	
	a) HV to IV at normal tap no. 13 at 100% rating.	10%
	b) HV to IV at tap no. 1 at 100% rating.	11%
	c) HV to IV at Tap no. 17 at 100% rating.	11%
	d) HV to tertiary	60% (min.)

		(Offers with lower % impedance will not be considered)
	e) IV to tertiary	50% (min.)
		(Offers with lower % impedance will not be considered)
Note: No reactor either inside or outside the tank shall be used to achieve above %age impedance value.		
viii)	Connections	
a)	Series and common winding	-----Star-----
b)	Auxiliary winding	-----delta-----
ix)	Reference voltage group and terminal markings	---HV/LV/Tertiary-- -----YNaod11.

x)	On load taps of	---(-5%) to (+15%) 1.25% each for IV	in equal steps variation.
xi)	Polarity	----Subtractive----	
xii)	Type of Cooling	ONAN/ONAF/OFAF 80/ 112/ 160 MVA	
xiii)	Rated capacity of auxiliary winding	45 MVA	
xiv)	D.C. Voltage for relays etc.	110 V /220 Volt DC	

All the transformers shall be oil immersed, weather proof Auto-type for outdoor installation in lightening areas. The windings of 3 phase transformers shall be connected Star/Star to conform to vector symbol YNaod11 group no. in accordance with IS 2026-1977 and any amendment thereof.

TECHNICAL SPECIFICATIONS FOR 36 kV ISOLATORS

TYPE OF ISOLATORS

- Three phase, 1250 A, 36 kV manually operated, Standard isolators without earth switch.
- Three phase, 1250 A, 36 kV manually operated, Standard isolators with one earth switch.

PRINCIPAL PARAMETERS

DETAILS	36 kV Isolator
Rated Voltage	36 kV
System frequency	50 Hz
System Earthing	Effectively earthed
Type of Isolator	Outdoor, Horizontal air break suitable for upright mounting
Continuous current rating	1250 A
Operating mechanism	Manual
Phase to phase spacing	1500 mm
Rated short time withstand current	25 kA (rms)
Rated peak short circuit current	62.5 kA (peak)
Temperature rise	As per IEC-129 derated for an ambient of 50°C

Seismic co-efficient	0.3 g.
1.2/50 microsecond full wave positive and negative impulse withstand voltage to earth	70 kV (peak)
One minute power frequency withstand voltage dry & wet to earth	70 kV (rms)
Auxiliary Contacts	4 normally open and 4 normally closed.
Insulation level of insulators	
i) Impulse voltage withstand test (1.2/50 micro second full wave)	170 kV (peak)
ii) Power frequency withstand voltage to earth (dry & wet)	70 kV (rms)
Creepage distance of insulators :	
i) Total	900 mm
ii) Protected	450 mm
Minimum strength :	Suitable to withstand wind, short circuit and operating forces
i) Torsional	
ii) Cantilever	
Interlocks with circuit breaker	1 set of electrical and casteltype interlocks.
Type of contacts	Hard drawn electrolytic copper with silver plating
Conductor take off	Horizontal/vertical according to actual requirement.
Phase-to phase clearance	1500 mm

TECHNICAL SPECIFICATIONS FOR 10 MVAR,33KV CAPACITOR BANK

CAPACITOR BANKS

Capacitor banks detailed above shall be complete with the Capacitor unit controlling breaker, manually operated OFF load isolators without earthing switch at bus bar side and with earthing switch at capacitor side, CT, NCT, VT, switching reactors, control & relay panel, necessary mounting racks, insulators, interconnecting materials, bi-metallic terminal connectors, junction boxes and any other material required for satisfactory operation and installation. As per system condition, switching reactor for harmonic suppression are not required.

General arrangements

The capacitor banks shall be out door type suitable for operation in the climatic conditions as detailed on page S-2 Mounting steel racks to be supplied by the tenderer shall be suitable for mounting on plinth. The Tenderers should offer compact design to occupy minimum ground area with least possible height. The bank shall suitable for mounting under the bus bars drawn on ganturies having height as mentioned in clause 3.1.6 of technical specification with due consideration for required clearances. The tender shall be complete with drawing showings the arrangements.

Each capacitor bank shall be in two double star groups of 5MVAR each with separate one number manually operated, OFF load type isolator with earthing switch for each group. Each group of 5MVAR shall be connected in double star formation with their neutral point ungrounded and protected through separate one number NCT. Each star formation shall be of 2.5 MVAR rating at 33KV.

Each capacitor bank shall be complete with all auxiliaries accessories and the following associated equipments:-

Sl. No.	Name of associated equipment	Qty. required for Bank
1	36KV, 3-ph, Circuit Breaker	1 No
2	36KV, 3-ph Isolator without earthing switch	1 No
3	36KV, 3-ph. Isolator with earthing switch	2 No
4	36KV, 1-ph. Current Transformer	3 No
5	36KV, 1-ph Neutral Current Transformer	2 No
6	3-ph. Switching reactor	4 Nos.
7	Control & Relay panel with relays	1 No
8	36KV, 3-ph/ 1-ph voltage Transformers	1/3 Nos.

The number of parallel units in each series group shall be such that failure of one unit shall not preferable creating.

- i) More than 5% voltage rise with internal fuse on other units in the bank.

INDIVIDUAL CAPACITOR UNIT

Individual Capacitor Units of 5.485 KV, 276.25 KVAR, rating of Bank shall be self contained, outdoor types, having two bushing to give the required total Bank Capacity at 50Hz. And the Bank compact to occupy minimum ground area with least possible height. The bushing should be of metal coated porcelain and shall be joined to the case by solder sealing method. The Creepage distance of bushing shall not be less than 25mm/KV of voltage stress appearing

between the terminal and the case. The bushing shall be suitable for heavily polluted. Atmospheric condition.

The impregnant used shall be non-PCB and the impregnation shall be carried out under high degree of vacuum and the unit shall be of totally sealed type.

Each capacitor unit shall be provided with internal discharge resistors designed to drain out the residual charge up- to 50 volts within less than 10 minutes after disconnection from supply.

Each capacitor unit shall be individually protected by fuse suitably rated for load current. Capacitor to be provided with additional external fuse should have arrangement for visual indication for detection of faulty units.

Each unit shall satisfactorily operate at 130% rated KVAR including the factor of over voltage (referred to rated voltage), harmonic currents and manufacturing tolerance.

Terminal and mounting arrangement may be in accordance with manufacturer's standard practice, but should be amply proportioned with adequate safety margins.

The Containers of capacitor units shall be of sufficiently thick sheet painted with suitable anti-rust synthetic enamel primer paint and the finishing coats of paint as per the standard practice.

The Capacitor banks shall conform to latest edition of IS: 13925(Part-I: 1998/ IEC-70).

ISOLATORS (WITH AND WITHOUT EARTH SWITCH)

The isolators (with and without earthing switch both) shall be outdoor, manually gang operated, double break, OFF load type, 36kV, 800 amps, 1000MVA, 3 phase, 50 Hz triple pole complying in all respects with the requirements of the latest edition of IS: 9921-1981 and complete with insulators, mechanical and electrical inter locks, bi-metallic terminal connectors suitable for ACSR panther conductor all auxiliaries and accessories.

Current Transformers

The current transformers shall be of the outdoor dead tank type single phase, 50Hz, oil immersed self cooled.

The current transformers shall have following ratings:-

a	Nominal system voltage	33 KV
b	Highest system voltage	36 KV
c	No. of cores	Two
d	system earthing	Effective
e	Transformation ratio	400-200/1/1/A

f	Basic insulation level	170 KV (peak)
g	Short time current rating	25 KA
h	Fault level	1000 MVA
i	Rated output of each core	15 VA
j	Class of accuracy	5-P for protection, 1for metering
k	Max. resistance of secondary winding	5 ohms
l	Accuracy limit factor (protection core)	10
m	Instrument security factor (metering core)	5
n	Cree page distance a) Total b) Protected	900 mm (Min) 450 mm (min)

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

Voltage Transformers

The voltage transformer shall be of outdoor type, three phase / single phase, 50 Hz, oil immersed, self cooled.

The voltage transformer shall have the following ratings:-

a	Nominal system voltage	33 KV
b	Highest system voltage	36 KV
c	Frequency	50 Hz
d	System earthing	Effective
e	No. of secondary windings per phase	One
f	Ratio	33000/110 volts $\sqrt{3}$ / $\sqrt{3}$
g	Basic insulation level	170KV (peak)
h	Rated burden	100 VA
i	Rated voltage factor (continuous)	1.1.
j	Rated voltage factor (30sec.)	1.5
k	Class of accuracy	3.p
l	Creepage distance a) Total b) Protected	900 mm (min) 450 mm (min)

The VTs shall conform to the latest edition of IS: 3156. The bushing shall comply with the latest edition of IS: 2099 and IS: 5347.

Neutral Current Transformer

Two NCT shall be required for one set of capacitor bank.

The neutral current transformer shall be as per specifications of CT except that it shall have single core, transformer ratio 5/1 and accuracy class for the protection core shall 5 P 10.

Required number of suitable and matching bimetallic terminal connectors along- with required number of cable glands shall be supplied along- with the NCTs. And accordingly the prices may be quoted.

Control & Relay Panel (SAS Based)

The control and relay panels shall conform in all respects to relevant Indian standards. Equipment meeting any other authoritative standard which ensures an equal or better standard than mentioned above may also be considered.

The control and relay panel shall be of floor mounted, indoor free, standing cubicle type. The panels shall consist of fabricated sheet enclosures on the sides, front, rear and top.

The rear of the panels shall be in the form of lockable hinged flap door. The front and rear sheets shall be of folded construction for providing rigidity and strength without using any frame work or screwed or bolted sheet steel sections. The front of the panels which accommodates most of the mountings shall be fabricated with sheet steel of thickness not less than 10 SWG. For the rest of the panel which carries no weight of the mountings, sheet steel of thickness not less than 14 SWG should be used.

FIBRE OPTIC EQUIPMENTS

Network Configuration and Equipment Characteristics

Introduction

This section describes the Fibre Optic Communication network configuration and the equipment characteristics for communication system to be installed under the project. The sub-systems addressed within this section are:

- (1) Fibre Optic Transmission System (FOTS)
- (2) Termination equipment Subsystems
- (3) Network Management System (NMS)
- (4) MDF, DDF and Cabling

Digital Tele-Protection Coupler (Stand (Stand-Alone type)

Protection coupler shall be of modular type having independent Command interfaces.

- Each coupler shall have redundant power supply source.
- Protection command signals shall be suitable for 110/220V DC (site programmable) directly from station battery without involving any intermediate converter. **Opto-coupler Interface shall be provided suitable for 110Volt & 220Volt DC.**
- **Power supply source 110V DC with additional provision for operation on 48V DC.**

BUS SCHEME FOR SUBSTATIONS			
400/220kV Jewar	220/33kV Cantt (Chaukaghat)	220/33kV Vasundhara	220/132/33kV Khaga
400- Double Main Bus Scheme 220- Double Main Bus Scheme	220- Double Main Bus Scheme 33- Single Main & Transfer Bus Scheme	220- Double main Bus scheme 33- Single Main & Transfer Bus Scheme	220- Double main Bus & Transfer Scheme 132- Double main Bus & Transfer Scheme 33- Single Main & Transfer Bus Scheme.

SPECIFIC TECHNICAL REQUIREMENT FOR COMMUNICATION
IN 220 kV, 132 kV and 33 kV SUBSTATION

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall conform to the following requirements.

On 220 kV and 132 kV D/C lines one OPGW containing 24 fibers is to be installed in place of conventional earth wire for grid management and substation operation purpose by STU/CTU and 48 fibers to be installed on LILO lines.

220 kV, 132 kV, 66 kV, 33 kV & 11 kV System

SL No	Description of parameters	220 kV System	132 kV System	66 kV System	33 kV System	11kV System
1.	System operating voltage	220 kV	132 kV	66 kV	33 kV	11 kV
2.	Maximum operating voltage of the system (rms)	245 kV	145 kV	72.5 kV	36 kV	12 kV
3.	Rated frequency	50	50 Hz	50 Hz	50 Hz	50 Hz
4.	No. of phase	3	3	3	3	3
5.	Rated Insulation levels					
	i. Fullwave impulse withstand voltage (1.2/50 micro sec.)	1050 kVp	650 kVp	325 kVp	170 kVp	75 kVp
	ii. One minute power frequency dry and wet withstand voltage (rms)	-	275 kV	140 kV	70 kV	28 kV
6.	Corona extinction voltage	156 kV	105 kV	-	-	-
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz at 92 kV rms for 132 kV system	1000 micro- volts	500 micro- volts	-	-	-
8.	Minimum creepage distance (25mm/kV)	6125mm	3625mm	1813mm	900mm	300mm
9.	Min. Clearances					
	i. Phase to phase	2100mm	1300mm	750mm	320mm	280mm



SL No	Description of parameters	220 kV System	132 kV System	66 kV System	33 kV System	11kV System
	ii. Phase to earth	2100mm	1300mm	630mm	320mm	140mm
	iii. Sectional clearances	5000mm	4000mm	3000m m	3000m m	3000mm
10.	Rated short circuit currentfor1 sec. Duration	40kA/50kA (as applicable)	31.5 kA	31.5 kA	25 kA	25 kA
11.	System neutral earthing	Effectively earthed	Effectively earthed	Effectively earthed	Effectively earthed	Effectively earthed

APPENDIX

**FOR
TRANSMISSION LINES
&
400/220 KV GIS SUBSTATION
&
COMMUNICATION SYSTEM**



SPECIFIC TECHNICAL REQUIREMENTS FOR 400 KV TRANSMISSION LINES

- 1.0** The Tower shall be fully galvanized using mild steel or/and high tensile steel sections. Bolts and nuts with spring washer are to be used for connection.
- 2.0** IS Steel section of tested quality in conformity with IS 2062:2011, grade E 250 (Designated Yield Strength 250 Mpa) and/or grade E 350 (Designated Yield Strength 350 MPa) are to be used in towers, extensions, gantry structures and stub setting templates. However, use of steel grade having designated yield strength more than 350 MPa is not permitted. The steel used for fabrication of towers shall be manufactured by primary steel producers only.
- 3.0** Towers shall be designed as per IS-802:1995 considering wind zone 4. However, drag coefficient of the tower shall be as follows:-

Solidity Ratio	Drag Coefficient
Upto 0.05	3.6
0.1	3.4
0.2	2.9
0.3	2.5
0.4	2.2
0.5 and above	2.0

As per Clause 12.1.2.1 b) 2) of IS 802:1995, Under security condition for tension and dead end towers, the transverse loads due to line deviation shall be the component of 100 percent mechanical tension of conductor and ground wire/ OPGW corresponding to 100% of design wind pressure at everyday temperature or 36% design wind pressure at minimum temperature after accounting for drag coefficient and gust response factor.

As per CEA's technical standards for construction of lines Regulation 2010, Transmission Service Provider (TSP) may adopt any additional loading/ design criteria for ensuring reliability of the line, if so desired and/ or deemed necessary.

- 4.0** The conductor configuration shall be as follows:-

4.1 For transmission lines with ACSR conductor:-

Transmission line	ACSR Conductor specified	Sub-conductor Spacing
400kV D/C (Twin Moose) transmission lines	Moose : Stranding 54/3.53mm-Al + 7/3.53 mm-Steel, 597sq mm, Total Sectional Area, 31.77mm diameter	450 mm
400kV D/C (Twin HTLS) transmission lines	HTLS. type- INVAR/ GAP/ Composite Core/ ACSS, 1596A ampacity, 28.62 mm diameter, 0.05552 (Ω /km) resistance	450 mm

Note: The transmission lines shall have to be designed for a maximum operating conductor temperature of 85 deg C for ACSR only.

- 5.0** The required phase to phase spacing and horizontal spacing for 400 kV D/C line shall be governed by the tower design as well as minimum live metal clearances for 400kV voltage level respectively under different insulator swing angles.

a) For 400 kV transmission lines:

The minimum live metal clearances for 400kV D/C transmission lines may be considered as follows:

- (i) Under stationary conditions

From tower body:

For 400 kV D/C: 3.05 m

- (i) Under swing conditions

Wind pressure Condition	Minimum electrical clearance
a) Nil	3.05 mtrs
b) Swing angle (22°)	3.05 mtrs
c) Swing angle (44°)	1.86 mtrs

However the phase to phase spacing for 400kV D/C line shall not be less than 8.0 m

- 6.0** The minimum ground clearance for 400 kV D/C transmission lines shall be 8.84 m so that maximum electric field does not exceed 10kV/m within the ROW and does not exceed 5kV/m at the edge of the ROW as per international guidelines.
- 7.0** The minimum mid span separation between earth wire and conductor shall be 9.0 m for 400 kV D/C transmission lines. Shielding angle shall not exceed 20 deg for 400 kV D/C line D/C transmission lines.
- 8.0** Transposition is to be done for all transmission lines whose length is greater than 100 km. Transposition should be carried out at 1/3 and 2/3 of the line length tower positions. Transposition of the transmission line after the construction of LILO shall be maintained by the developer. Transposition disturbed from construction of LILO will be set right by the TSP in the resulting Loop in and Loop out Lines as per regulation issued by the competent authority.
- 9.0** The switching impulse withstands voltage (wet) for 400 kV line shall be 1050 kVp. Lightning impulse withstand voltage (dry) for 400kV line shall be 1550 kVp.
- 10.0** The Fault current for design of line shall be 63 kA for 1 sec for 400 kV.
- 11.0** The lines shall be designed for very heavy pollution level (creepage of 31mm/kV as per IEC-60815). Porcelain/ glass/ polymer insulators shall be used in the line as per requirement and site conditions for the transmission lines.

12.0 Each tower shall be earthed such that tower footing resistance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided in accordance with relevant IS. If the value (before stringing) has been recorded higher than 10 ohm, earthing shall be changed to Counterpoise type. Additional earthing shall be provided on every 7 to 8 kms distance at tension tower for direct earthing of both shield wires.

13.0 The required grade of concrete and mix design for foundation of transmission line tower shall be as per relevant IS.

14.0 Technical specification for 400kv line on Monopole

i) The monopoles are of the following types:

400 kV Double Circuit (PA, PB, PC & PD)

Classification of Monopole/Towers

The Pole for 400 kV Lines are classified as given below:-

a) For Suspension Pole PA (0-2 deg.)

Normal Span	:	200m
Wind Span	:	200m
Weight Span	:	300m

b) For Tension Pole PB (2-15 deg.)

Normal Span	:	200m
Wind Span	:	200m
Weight Span	:	300m

c) For Tension Pole PC (15-30 deg.)

Normal Span	:	200m
Wind Span	:	200m
Weight Span	:	300m

d) For Tension Pole PD (30-60 deg.)

Normal Span	:	200m
Wind Span	:	200m
Weight Span	:	300m

ii) **Broken wire Conditions:**

For Suspension pole (PA)	:	One Earthwire or One Conductor broken at a time, whichever is more stringent for a particular section.
For Tension pole (PB)	:	One Earthwire and any One Conductor broken or any two conductor broken at a time on same side, whichever is more stringent for a particular section.
For Tension pole (PC)	:	One Earthwire and any One Conductor broken or any two conductor broken at a time on same side, whichever is more stringent for a particular section.
For Tension pole (PD)	:	One Earthwire and any Two Conductor broken or any Three conductor broken at a time on same side, whichever is more stringent for a particular section.

Code Reference

Load Calculation : IS 802

Sag & Clearance : IS: 5613 CBIP Manual

Deflection Criteria: 5% of height of pole @ ultimate load conditions and 2% of the height of pole @ everyday condition (safety normal)

iii) Ground Clearance

The minimum ground clearance from the bottom conductor shall not be less than 8840 mm for 400KV lines at the maximum sag conditions i.e. at 85° C and still air.

An allowance of 150mm shall be provided to account for errors in stringing.

Conductor creep shall be compensated by over tensioning the conductor at a temperature of 26°C lower than the stringing temperature for ACSR ,MOOSE conductor.

iv) Electrical System Data for 400 kV line

1.	Nominal Voltage	kV	400
2.	Maximum system voltage	kV	420
3.	BIL (Impulse)	kV (Peak)	1550
4.	Power frequency withstand voltage (Wet)	kV (rms)	680
5.	Switching surge withstand voltage (Wet)	kV (rms)	1050
6.	Minimum Corona extinction voltage at 50 Hz AC system under dry condition	kV (rms) phase to earth.	320(Min)

7.	Radio interference voltage at one MHz for phase to earth voltage of 305 KV under dry condition.	Micro Volts	1000 (Max)
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v) Details of line Material: earthwire & OPGW

Sl. No.	Description	Earthwire	OPGW (tentative)
1.	Type	7/3.66mm GS Earthwire	24 fibre OPGW
2.	Stranding and wire diameter		
	Aluminium	-	
	Steel	7/3.66	
3.	Conductor per phase	NA	NA
4.	Spacing between conductor of same phase(sub conductor spacing)(mm)	NA	NA
5.	Configuration	One continuously to run horizontally on top of the towers and conductors.	One continuously to run on top of the towers and conductors
6.	Overall Diameter (mm)	10.98	≈ 10.98
7.	Unit mass (kg/km)	583	≈ 583
8.	Min. UTS (kN)	68.4	Equivalent to earthwire

15.0 For crossings design, installation and maintenance of overhead power lines shall be as per IS:5613 or latest amendments.

SPECIFIC TECHNICAL REQUIREMENTS FOR 400/220 KV SUBSTATION

The proposed 400/220 kV Jewar (2x500 MVA) substation shall be Gas Insulated Switchgear (GIS) type generally confirming to the requirement of CEA regulation for construction of sub-station.

1.0 Salient features of 400/220kV GIS Substation Equipment and Facilities

The design and specification of substation equipment are to be governed by the following factors:

2.0 Insulation Coordination

400kV System would be designed to limit the Switching overvoltage to 2.5 pu and is expected to decay to 1.5 p.u. in 5 to 6 cycles. Consistent with these values and protective levels provided by lightning arrestors, the following insulation levels are proposed to be adopted for 400 KV & 220kV systems:

Sl. No.	Particulars	<u>400kV</u>	<u>220kV</u>
a.	Impulse withstand voltage for - Transformer and reactors - for Other Equipment - for insulator strings	1300kVp 1425 kVp 1550kVp	950kVp 1050 kVp 1050 kVp
b.	Switching surge withstand voltage	1050 kVp	-NA-
c.	Minimum creepage distance - for insulator strings - for other equipment	13020mm 13020mm	7595 mm 7595 mm
d.	Max. fault current	63 kA	40 kA
e.	Duration of fault	1 Sec	1 Sec
f.	Corona extinction voltage	320kV rms	156kV rms

3.0 Switching Schemes

It is essential that the system should remain secured even under conditions of major equipment or bus-bar failure. Sub-stations being the main connection points have large influence on the security of the system as a whole. The selection of the bus switching scheme is governed by the various technical and other related factors. One & Half breaker bus scheme has been considered for 400kV side of the substation due to their merits in terms of reliability, security, operational flexibility and ease of maintenance of equipment.

Substation	Bus Scheme
400/220 kV (2×500 MVA) GIS Substation at Jewar	400 kV- Double Main Bus Scheme 220 kV- Double Main Bus Scheme

4.0 Substation Equipment and Facilities

The switchgear shall be designed and specified to withstand operating conditions and duty requirements. All equipments shall be designed considering the transmission line capacity.

Current rating for various feeders & bus bar are as follows

Sl. No	Description of bay	400 kV	220 kV
1	Bus Bar	4000A	3000A
2	Line bays	3150	1600A
3	ICT bays	3150	1600A
4	Bus Reactor bays	3150	NA
5	Bus coupler bays	NA	2500A

4.1 400/220KV GIS Substation equipment

GIS (Gas Insulated Switchgear) shall be indoor type and in accordance to IEC: 62271-203. The switchgear shall be designed and specified to withstand operating conditions and duty requirements. All the switchgear such as Circuit Breaker, isolator, earth switch including CT, PT etc. shall be GIS type. Surge Arrestors used for transformer/Reactor connections will be AIS or GIS type. 400kV scheme shall be designed in such a way that it shall be possible to use line reactors (if provided) as bus reactors, in case of outage of line, to control bus voltage. Local control cabinets (LCC) shall be provided as per requirement. The alarm & annunciation of GIS equipment shall be wired to SCADA System.

4.1.1 Circuit Breakers

GIS Circuit breakers shall in general be of C2-M2 class and comply to IEC- 62271-100. The rated break time shall not exceed 40 ms for 420KV breaker and 60 ms for 245kV breaker. 420 kV & 245 kV Circuit breakers shall be provided with single phase and three phase auto reclosing. The Circuit breakers controlling 400kV lines of more than 200km length shall also be provided with pre insertion closing resistor of about 400 ohms maximum with 9 ms minimum insertion time. The short line fault capacity shall be same as the rated capacity and this is proposed to be achieved without use of opening resistors. The short line fault capacity shall be same as the rated capacity and this is proposed to be achieved without use of opening resistors. Control switching device shall be provided in Circuit breaker of switchable line reactor and in Main & Tie circuit breakers of Transformers, line with non-switchable line reactors and Bus reactors. Further, it shall be possible to use line reactors as bus reactors, in case of outage of line.

4.1.2 Isolators

The isolators shall comply to IEC 62271-102 in general. Isolators shall be motor (DC powered) operated. Earth switches are provided at various locations to facilitate maintenance. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. All earth switches shall be motor operated type.

4.1.3 Current Transformers

Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps. Generally, Current Transformers (CT) shall have five cores (four for protection and one for metering) whereas; CT in Tie bays shall have six cores (four for protections & two for metering) suitably distributed on both sides of CB. The burden and knee point voltage shall be in accordance with the requirements of the system including possible feeds for telemetry. Accuracy class for protection core shall be PX and for metering core it shall be 0.2S.

4.1.4 Voltage Transformer

The voltage transformers shall conform to IEC- 61869 Voltage transformers shall be of the electromagnetic type with SF6 gas insulation. The earth end of the high voltage winding and the ends of the secondary winding shall be brought out in the terminal box. The voltage transformers shall be located as a separate bay module and will be connected phase to ground and shall be used for protection, metering and synchronization. The voltage transformers shall be of inductive type, nonresistant and shall be contained in their own- SF6 compartment, separated from other parts of installation. The voltage transformers shall be effectively shielded against high frequency electromagnetic transients. The voltage transformers shall have three secondary windings. The voltage transformer should be thermally and dielectrically safe when the secondary terminals are loaded with the guaranteed thermal burdens. The accuracy class for core –I & II for 400 kV shall be 0.5/3P and for 220 kV shall be 3P. The accuracy of 0.2 on secondary III should be maintained throughout the entire burden range up to 50VA on all the three windings without any adjustments during operation.

4.1.5 SF6 to Air Bushing

Outdoor bushings, for the connection of conventional external conductors to the SF6 metal enclosed switchgear, shall be provided. Bushings shall generally be in accordance with the requirements of IEC -60137. The creepage distance over the external surface of outdoor bushings shall not be less than 31 mm/kV considering polluted area. SF6 to air Bushing shall be of Polymer / composite type and shall be robust and designed for adequate cantilever strength to meet the requirement of seismic condition. The electrical and mechanical characteristics of bushings shall be in accordance with IEC: 60137. Polymer / composite insulator shall be seamless sheath of a silicone rubber compound. The housing & weather sheds should have silicon content of minimum 30% by weight. It should protect the bushing against environmental influences, external pollution and humidity. The hollow silicone

composite insulators shall comply with the requirements of the IEC publications IEC 61462 and the relevant parts of IEC 62217.

4.1.6 Capacitor Voltage Transformers

Capacitive Voltage transformers shall comply to IEC 61869-1 & 61869-5 in general. These shall have three secondaries out of which two shall be used for protection and one for metering. Accuracy class for protection cores shall be 3P and for metering core shall be 0.2. The capacitive voltage transformers on lines shall be suitable for Carrier Coupling. The Capacitance of CVT for 400kV and 220kV shall be of 4400/8800 pF depending on PLCC requirements.

4.1.7 Surge Arresters

Station class current limiting, heavy duty gapless type Surge arresters conforming to IEC 60099-4 in general shall be provided.

The rated voltage of Surge arrester and other characteristics are chosen in accordance with system requirements. Surge arresters shall be provided near line entrances, transformers so as to achieve proper insulation coordination. Surge arrester should be providing with porcelain / polymer housing.

4.1.8 Power Transformers

CODES AND STANDARDS

The latest revisions of the following Codes and Standards shall be applicable for the equipment/material covered in this Specification. In case of conflict, the manufacturer may propose equipment/material conforming to one group of Industry Codes and Standards quoted hereunder without jeopardizing the requirement of this specification:

IEC60044	Instruments transformers	
IEC60076	Power transformers	
IEC60137	Insulating bushing for alternating voltages above 1000 V	
IEC60214	On-load tap-changers	
IEC60273	Characteristics of indoor and outdoor post insulators for	systems with
	nominal voltages greater than 1000V	
IEC 60282-2	High-voltage fuses	
IEC60289	Reactors	
IEC60529	Degrees of protection provided by enclosures (IPCode)	
IEC60815	Guide for the selection of insulators in respect of polluted conditions	
IEC60947	Low-voltage switchgear and control gear	

Design and Construction Requirements

Core

1. The core shall be assembled with oriented grain steel, cold rolled sheet, and treated with an insulating layer heat and oil resistant.
2. The core supports shall be designed to counter the effects of marine and overland transport under poor conditions. The air core reactance of the core shall be less than 20%.

Over Fluxing

The transformer shall withstand without injurious heating combined voltage and frequency fluctuations which produce the following overfluxing conditions and give desired performance:

- 105% for 10minutes
 - 125% for 1minute
 - 140% for 5seconds
 - Bidder shall provide the overvoltage withstand time for 150% and 170% over fluxing
- (a) Transformer shall conform to IEC 60076 in general. The transformer and all its accessories including bushing/ built in CTs etc shall be designed to withstand thermal and mechanical stresses caused by symmetrical or asymmetrical faults on any terminals. Mechanical strength of the transformer shall be such that it can withstand 3-phase and 1- phase through fault for transformer rated voltage applied to HV and / or IV terminals of transformer. The short circuit shall alternatively be considered to be applied to each of the HV, IV and tertiary (LV) transformer terminals. Tertiary is not considered to be connected to source.

Core shall be constructed from high grade, non-ageing cold rolled super grain oriented silicon steel laminations (HI-B or better grade). The maximum flux density in any part of the core and yoke at the rated MVA, voltage and frequency shall not exceed 1.9 Tesla at all tap positions during 10% continuous over voltage condition. Transformers shall withstand without damage and over-heating due to over fluxing conditions of 110 % for continuous, 125 % for 1 minute and 140 % for 5seconds.

All the windings shall be capable of withstanding the Dielectric, mechanical and thermal stresses which may be caused by switching, dead short circuit on its terminals. Transfer surge at tertiary shall not exceed 250kVp during impulse and switching impulse from HV & IV Terminals. The tertiary windings shall be suitable for connection of reactors or capacitors which would be subjected to frequent switching and shall be suitable for connection to LT

Transformer for auxiliary supply. The air core reactance of HV winding of transformer shall not be less than 20% for 400kV class Transformer. External or internal reactors shall not be used to achieve the specified HV/LV and IV/LV impedances.

Transformers shall be fitted with two cooler banks, each capable of dissipating 50 per cent of the loss at continuous maximum rating. Transformer shall be capable of operating at full load for 20 minutes in the event of failure of the oil circulating pump or blowers associated with one cooler bank and for at least ten (10) minutes in the event of total failure of power supply to cooling fans and oil pumps, without winding hot spot temperature exceeding 140 deg C. Transformer shall be designed so that tank hotspot shall not exceed 130 deg C, considering maximum ambient temperature of 50°C.

The transformer shall be complete with all required accessories, Bushing CTs, Neutral CT (outdoor type), cooler control cabinet, individual and common marshalling box, RTCC etc as required for satisfactory operations of transformer. The transformer shall be provided with IEC 61850 compliant digital RTCC relay having automatic voltage regulating features to operate OLTC including parallel operation of transformers. Neutral of the transformer shall be solidly grounded.

HV and IV bushing shall be RIP (Resin Impregnated Paper)/RIS (Resin Impregnated Synthetic) with composite insulator type. LV bushing shall be OIP/RIP/RIS. 36kV Neutral bushing shall be solid porcelain or oil communicating type.

The major technical particulars / parameters of transformer are given below:

(A) 500MVA, 400/220/33kV, 3-Phase Auto transformer (applicable standard: IEC-60076)

Sl. No.	Description	Unit	Technical Parameters
1.	Rated Capacity: HV/IV/LV (Tertiary)	MVA	500/500/167 (Active loading of tertiary: 5 MVA)
2.	Voltage ratio (Line to Line)		400/220/33
3.	Frequency	Hz	50
4.	No. of Phase	Nos	3
5.	Vector Group (unless specified differently elsewhere)		YNa0d11
6.	Cooling		ONAN/ONAF/(OFAF or ODAF) OR ONAN/ONAF1/ONAF2
7.	Rating at different cooling above	%	60/80/100
8.	Type of Transformer		Constant Ohmic impedance type
9.	Impedance at 75 Deg C		



Sl. No.	Description	Unit	Technical Parameters
a)	HV – IV (with tolerance as per IEC)	%	At Max./ Principal/ Min. Voltage Tap: 10.3/12.5/15.4
b)	HV - LV	%	At Principal tap(minimum) : 60
c)	IV - LV	%	At Principal tap (minimum): 45
10.	Losses		
a)	Maximum No-Load Loss at rated voltage and frequency	kW	90
b)	Maximum Load Loss at rated current and 75°C	kW	500
c)	Maximum I ² R Loss at rated current and frequency and at 75°C for HV and IV windings	kW	375
d)	Maximum Auxiliary Loss at rated voltage and frequency	kW	15
11.	Max. Temperature rise over 50 deg C ambient Temp	Deg. C	Top oil: 50 & Winding: 55
12.	Windings		
i)	Insulation Level (LI/SI/PF)		kVp/kVp/kVrms
	HV		1300/1050/570
	IV		950/-/395
	LV		250/-/95
	Neutral		95/-/38
ii)	Tan delta of winding	%	< 0.5
13.	Tap Changer & Tappings		OLTC with range ± 10% for HV variation in the step of 1.25%, 17 steps, on 220kV side of series winding
14.	Maximum Partial discharge (PD) level at 1.58*Ur/√3	pC	100
15.	Noise level at rated voltage and at principal tap at no load and all cooling active	dB	< 80
16.	Bushing		
i)	Rated voltage (HV/IV/LV/Neutral)	kV	420/245/52/36
ii)	Rated current(Min.) HV/IV/LV/Neutral	A	1250/2000/3150/2000
iii)	Insulation Level (LI/SI/PF)		kVp/ kVp/ kVrms
	HV		1425/ 1050/ 630



Sl. No.	Description	Unit	Technical Parameters
	IV		1050/ -/ 460
	LV		250/ -/ 95
	Neutral		170/ -/ 75
iv)	Tan delta of bushings HV/IV/LV	%	< 0.4
v)	Max. PD of bushings at level @ 1.5 pu	pC	100
17.	Insulating Oil		virgin high grade inhibited, conforming to IEC-60296

4.1.9 125 MVAR Bus Reactors

Reactor shall conform to IS:5553 and IEC 60076-6 in general.

The Technical Particulars / Parameters of Shunt Reactor are given below:

REACTOR (3-Phase)

(i)	Power	125 MVAR Bus Reactor
(ii)	Rated voltage	420 kV(1.0 p.u)
(iii)	System fault level	50 kA
(iv)	Connection	Star with neutral brought out
(v)	Winding Insulation level	
a)	Lightning impulse 1.2/50microseconds withstand voltage	1300 kV (peak)
b)	Switching surge withstand voltage	1050 kV (peak)
)`	One minute power frequency withstand voltage	NA
(vi)	Maximum admissible Temperature Rise over an ambient temp of 50 deg. C and at highest Voltage	
a)	Winding measured by resistance method	45 degree C
b)	Top oil measured by thermometer	40 degree C
(vii)	Cooling system	ONAN
(viii)	Insulation level of Neutral	
a)	Impulse withstand voltage	550 kV (peak)
b)	Power frequency voltage	230 kV (rms)
c)	Whether neutral is to be brought out	Yes (through 145kV class bushing)

(ix)	Ratio of zero sequence reactance to positive reactance (X_0/X_1)	Between 0.9 and 1.0 (The bidder must clearly specify the exact figure)
(x)	Range of constant impedance	Upto 1.5 p.u. voltage (The bidder shall furnish complete saturation characteristics of the reactor up-to 2.5 p.u. voltage).
(xi)	Tolerance on current	0 to +5%
(xii)	Harmonic content in phase	The crest value of the third harmonic current component in phase current not to exceed 3% of the crest value of fundamental, when reactor is energized at rated voltage with sinusoidal wave form.
(xiii)	Permissible current unbalance among different phases	$\pm 2\%$
(xiv)	Minimum clearance in air at rated voltage of 420 kV with terminal connector	
	a) Phase to Phase	4000mm
	b) Phase to ground	3500mm
(xv)	Noise level at rated voltage and frequency	80 db.
(xvi)	Vibration level at rated voltage and frequency	Not more than 200 microns peak. Average vibration shall not exceed 60 microns peak to peak Tank stresses shall not exceed 2.0 kg/mm ² at any point on the tank
(xvii)	Bushings	Line side Neutral side
	a) Rated voltage	420 kV 145 kV
	b) Creepage distance (total)	10500 mm 3625 mm

c)Mounting	Tank Cover	Tank Cover
d)Lightning impulse withstand voltage (kVp)	1425	650
e)Switching impulse withstand voltage (kVp)	1175	-
f) Power frequency with stand voltage (kV) (rms)	630	275
g) Rated current (Amps)	800	800

4.1.10 Protection and Control

The protective relaying system proposed to be provided for transmission lines, auto-transformers, reactors and bus bars to minimize the damage to the equipments in the events of faults and abnormal conditions, is dealt in this section. All main protective relays shall be numerical type with IEC 61850 communication interface. All numerical relays shall have built in disturbance recording feature.

a) Transmission Line Protection

400 kV, 220 kV and 132 kV lines shall have MAIN-I numerical three zone distance protection scheme with carrier aided inter-tripping feature. 400 kV, 220 kV and 132 kV lines shall also have MAIN-II numerical distance protection scheme like Main-I but from different make that of MAIN-I. Line Current Differential as Main-I & Main-II may be considered, for short lines (line length below 30 km) having Fibre Optic communication link. In case of loop in loop out of transmission lines, the existing protection scheme shall be studied and suitable up-gradation (if required) shall be carried out.

All 400 kV lines shall also be provided with two stages over voltage protection. Further, all 400 lines shall be provided with single and three phase auto-reclosing facility to allow reclosing of circuit breakers in case of transient faults. These lines shall also be provided with distance to fault locators to identify the location of fault on transmission lines.

b) These shall have the following protections:

- i) Numerical Differential protection
- ii) Numerical Restricted earth fault protection
- iii) Numerical Over-current and earth fault protection on HV & MV side
- iv) Numerical Over fluxing protection on HV & MV side
- v) Numerical Overload alarm

Besides these, power transformers shall also be provided with BUCHOLZ relay, protection against high oil and winding temperature and pressure relief device etc.

c) 420kV Reactor Protection

Reactor shall be provided with the following protections:

- i) Numerical Differential protection
- ii) Numerical Restricted earth fault protection
- iii) Numerical Back-up impedance protection

Besides these, reactors shall also be provided with Bucholz relay, protection against oil and winding temperatures & pressure relief device etc.

d) Numerical Bus Bar Protection

The high speed bus bar differential protection, which is essential to minimize the damage and maintain system stability at the time of bus bar faults, shall be provided for 400kV, 220kV and 132kV buses. Duplicated busbar protection is envisaged for 400kV bus-bar protection. Bus bar protection scheme shall be such that it operates selectively for each bus and incorporate necessary features required for ensuring security. The scheme shall have the provision for future expansion. For existing substations, the existing bus bar protection shall be augmented wherever required.

e) Numerical Local Breaker Back up Protection

This shall be provided for each 420 kV, 245 kV and 145 kV breakers and will be connected to de-energize the affected stuck breaker from both sides.

f) Substation Automation System

For all the new substations, state of art Substation Automation System (SAS) conforming to IEC-61850 shall be provided. The distributed architecture shall be used for Substation Automation system, where the controls shall be provided through Bay control units. The Bay control unit is to be provided bay wise for voltage level 132kV and above. All bay control units as well as protection units are normally connected through an Optic fibre high speed network. The control and monitoring of circuit breaker, dis-connector, re- setting of relays etc. can be done from Human Machine Interface (HMI) from the control room. SAS shall be equipped with the facility of remote operation and by providing remote HMI and suitable communication link, the substation can be controlled from a remote location. Necessary gateway & modems (as required) shall be provided to send data to RLDC/SLDC.

The functions of control, annunciation, disturbance recording, event logging and measurement of electrical parameters shall be integrated in Substation Automation System. The Automation System shall be provided with the facility of communication and control for remote end operation. In existing Substations where Substation automation is not provided, control functions shall be done through control panels.

g) Time Synchronization Equipment

Time synchronization equipment complete in all respect including antenna, cable, processing equipment required to receive time signal through GPS or from National Physical Laboratory(NPL) through INSAT shall be provided. This equipment shall be used to synchronize SAS & IEDs etc.

4.1.11 Control Concept

All the EHV breakers in substation/switching stations shall be controlled and

synchronized from the switchyard control room and remote control centre. Each breaker would have two sets of trip circuits which would be connected to separately fused DC supplies for greater reliability. All the isolators shall have control from remote/local whereas the earth switches shall have local control only.

4.1.12 PLCC

Power line carrier communication (PLCC) equipment complete for speech transmission line, tele-protection commands and data channels shall be provided on each 400 kV, 220 kV and 132 kV transmission line. The protections for transmission line and the line compensating equipment shall have hundred percent back up communication channels. The PLCC equipment shall in brief include the following:-

Coupling device, line traps, carrier terminals, protection couplers, HF cables, PABX and maintenance and testing instruments.

A telephone exchange (PABX) of 24 lines shall be provided at new substations as means of effective communication among various buildings of the substation, remote end substations and with control centres (RLDC/SLDC) etc.

Coupling devices shall be suitable for 4400pF 400kV, 220 kV and 132 kV CVT. Phase to phase coupling for 400 kV line, 220 kV and 132 kV single circuit line shall be provided. For D/c line Inter circuit coupling can be provided. The pass band of coupling devices shall have sufficient margin for adding communication channel in future if required. Necessary protection devices for the safety of personnel and low voltage part against power frequency voltages and transient over voltage shall also be provided.

The line traps shall be broad band tuned suitable for blocking the complete range of carrier frequencies. Line Trap shall have the necessary protective devices such as lightning arresters for the protection of tuning device and shall be equipped with corona rings. Decoupling network consisting of line traps and coupling capacitors may also be required at certain substation in case of extreme frequency congestion.

The carrier terminals shall be of single side - band (SSB) amplitude modulation (AM) type and shall have 4 kHz band width. PLCC Carrier terminal & Protection coupler shall be considered at both ends of line.

Wherever Fiber Optic/OPGW based telecommunication terminal equipment (i.e. SDH/MUX) are being provided; the same shall be utilized for Data, Voice and line protection applications. For protection purposes, both end Digital Protection Couplers (DPCs) shall be included at both ends. However, for line protection application, back up communication channel/link may be considered as per requirement so as to take care of OPGW/Telecommunication equipment outage.

Addition /Modification /shifting/re-commissioning etc. as required of PLCC due to LILO of transmission lines shall be covered under the scope according to element wise detailed given below:-

Sr. No	Detail of element (line)	Coverage under the scope
1	LILO of one ckt. of 400 kV Gr. Noida (765 kV) – Sector-148 (400) Noida DC line at 400/220 kV GIS substation Jewar (GautamBudh Nagar) (for LILO, twin HTLS conductor and OPGW stringing work on Narrowbase multi circuit towers)	Addition/Modification/ shifting/re-commissioning of PLCC shall be covered under the scope.

PLCC equipment for the transmission lines at serial 01 covered under the package (Consisting of one set of analog PLCC channel along with circuit protection coupler and one set of Digital Protection Coupler for both ends of one line segment due to LILO of existing line) shall be provided by the bidder. All other associated equipment for ends cabling, coupling device and HF cable shall also be provided by the bidder. 48 V DC Power supply for PLCC panels shall be provided by the respective substation bay owner. The wave traps, CVT's required for communications from PLCC shall be provided by respective substation owner.

4.1.13 Substation Support Facilities

Certain facilities required for operation & maintenance of substations as de- scribed below shall be provided in new substation. In existing substation, these facilities have already been provided and would be extended/ augmented, wherever required.

4.1.14 AC & DC Power Supplies

For catering to the requirements of three phase & single phase AC supply and DC supply for various substation equipment, the following arrangement is envisaged:-

- i) For LT Supply at each new Substation, two (2) nos. 630 kVA LT Transformers shall be provided out of which one shall be connected with SEB supply and other one shall be connected to tertiary of 400/220 kV transformer.
- ii) SEB supply at 33kV level shall be connected to 630kVA LT transformer through 33kV AIS equipments i.e. LA, CT, PT, Isolators and breaker where as tertiary supply of 400/220kV transformer shall be connected to LT transformer through 72.5kV AIS equipments.

- iii) 2 Nos. batteries of 220V for control & protection and 2 Nos. 48V batteries for PLCC/ Communication equipment shall be provided at each new Substation. Each battery bank would have a float-cum-boost charger. Battery shall be of VRLA type.
- iv) Suitable AC & DC distribution boards and associated LT Switchgear would be provided at new Substations. For Substation Extensions, existing facilities shall be augmented as required. For new substations following switch boards with minimum rating as is specified here under shall be considered with duplicate supply
 - a) 415V Main switch board – 1no.
 - b) AC distribution board – 1no.
 - c) Main lighting distribution board –1no.
 - d) Emergency lighting distribution board –1no.
 - e) 220 volt DC distribution board –2nos.
 - f) 48 volt DC distribution board –2nos.
- v) In new Substations, one No. 250 KVA DG set shall be provided for emergency applications Sizing of Auxiliary system (like battery, charger, LT switchgear) may be done considering future bay requirements to avoid replacement in future with higher sizes.

4.1.15 Fire Fighting System

Fire fighting system in general conforms to fire insurance regulations of India. The fire fighting system is proposed with both AC motor & diesel engine driven pumps housed in a fire fighting pump house building along with water storage tank of adequate capacity. Automatic heat actuated multisystem is proposed for transformers & reactors. In addition for alarm system based on heat/smoke detectors are proposed to be installed at sensitive points in a substation e.g. Cable Vault, Control Room building and other buildings etc. Further, adequate water hydrants and portable fire extinguishers shall be provided in the substations. At existing substations the fire fighting systems if already available, would be extended for meeting the additional requirements.

4.1.16 Oil evacuating, filtering, testing & filling apparatus

To monitor the quality of oil for satisfactory performance of transformers, shunt reactors and for periodical maintenance necessary oil evacuating, filtering, testing and filling apparatus would be provided at new substations. Oil tanks of adequate capacities for storage of transformer oil would be provided.

4.1.17 Illumination

Adequate normal & emergency AC & DC illumination shall be provided in the control room, GIS hall & other buildings of the substation. The switchyard shall also be provided with adequate illumination. The entire control room building, fire fighting pump house lighting shall be done by LED based low power consumption luminaries

4.1.18 Control Room

Substation control room would be provided to house substation work station for station level control (SAS) along with its peripheral and recording equipments, AC & DC distribution boards, DC batteries & associated battery chargers, Fire Protection panels, Telecommunication panels & other panels as per requirements. Air conditioning will be provided in the building as functional requirements.

4.1.19 GIS Hall

The Gas Insulated Switchgear (GIS) of each voltage other associated equipment shall be housed separately and inside in the GIS buildings. The panels i.e. Bay level units, bay mimic, relay and protection panels, RTCC panels, PLCC panels etc. are to be placed in a separate room in the GIS building. The size of the room shall be such that all the panels for the future bays/ diameters shall be accommodated in the above room. The panel room shall be air-conditioned. Further, the temperature of the room shall be monitored through substation automation system by providing necessary temperature transducers.

One EOT Crane each for GIS hall of suitable capacity shall be provided for erection & maintenance of largest GIS component/assembly and all plant installed in the GIS switchgear room. The crane shall capable of fulfilling all special requirements for erection & maintenance of GIS equipment The capacity of the crane shall be sized to lift the heaviest GIS switchgear component.

SPECIFIC TECHNICAL REQUIREMENT FOR 400 kV and 220 kV COMMUNICATION

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall conform to the following requirements.

On 400 kV D/C transmission lines one earth wire and one OPGW containing 24 fibers is to be installed by the TSP in place of conventional earth wire during the construction of line for grid management and substation operation purpose by STU/CTU and 48 fibers to be installed on LILLO lines. The installation of OPGW shall be done from gantry of one substation up to gantry of another substation and shall be terminated in a joint box by the TSP at both ends.

On 220 kV and 132 kV D/C lines one OPGW containing 24 fibers is to be installed in place of conventional earth wire for grid management and substation operation purpose by STU/CTU and 48 fibers to be installed on LILLO lines.

400 kV & 220 kV System Parameters

Sr. No	Description of parameters	400 kV System	220 kV System
1.	System operating voltage	400 kV	220 kV
2.	Maximum operating voltage of the system	420 kV	245 kV
3.	Rated frequency	50 HZ	50 HZ
4.	No. of phase	3	3
5.	Rated Insulation levels		
	i. Full wave impulse withstand voltage (1.2/50 micro sec.)	1550 kVp	1050 kVp
	ii. Switching impulse withstand voltage (250/2500 micro sec.) dry and wet	1050 kVp	-
	iii. One minute power frequency dry withstand voltage (rms)	630 kV	-
	iv. One minute power frequency dry and wet withstand voltage (rms)	-	460 kV
6.	Corona extinction voltage	320 kV	156 kV
7.	Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz at 508 kV rms for 765 kV system, 266kV rms for 400kV system and 156kV rms for 220 kV system	1000 micro-volts	1000 micro-volts

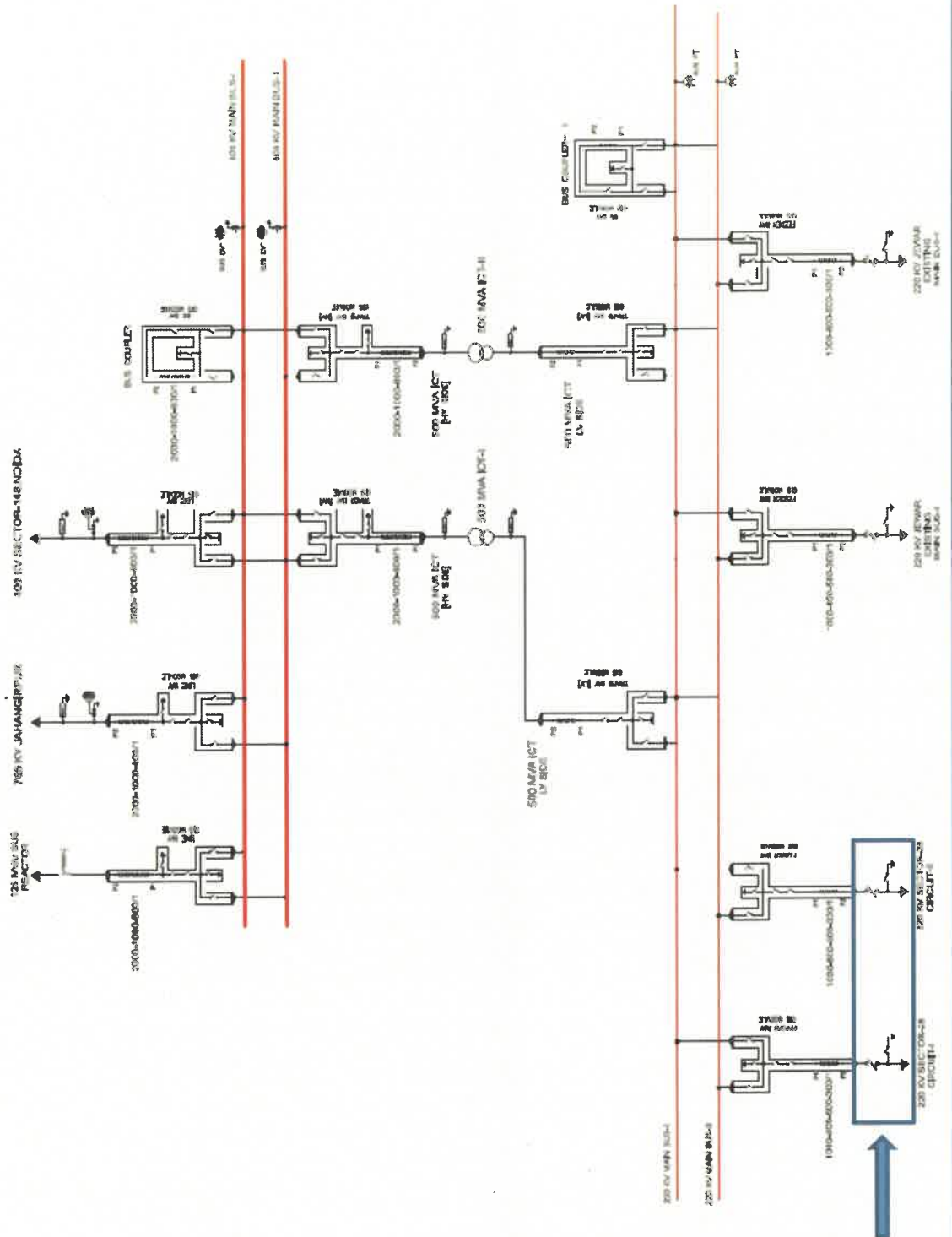


8.	Minimum Creepage distage (25mm/kV)	10500 mm	6125 mm
9.	Min. Clearances		
	i. Phase to phase	4000mm	
		(for conductor-conductor configuration) 4200 mm (for rod-conductor configuration)	2100 mm
	ii. Phase to earth	3500 mm	2100mm
	iii. Sectional clearances	6500mm	5000mm
10.	Rated short circuit current for 1 sec. duration	40kA/50kA /63kA(as applicable)	40kA/50kA (as applicable)
11.	System neutral earthing	Effectively earthed	Effectively earthed
12.	DC Voltage	220V	110V

Note:

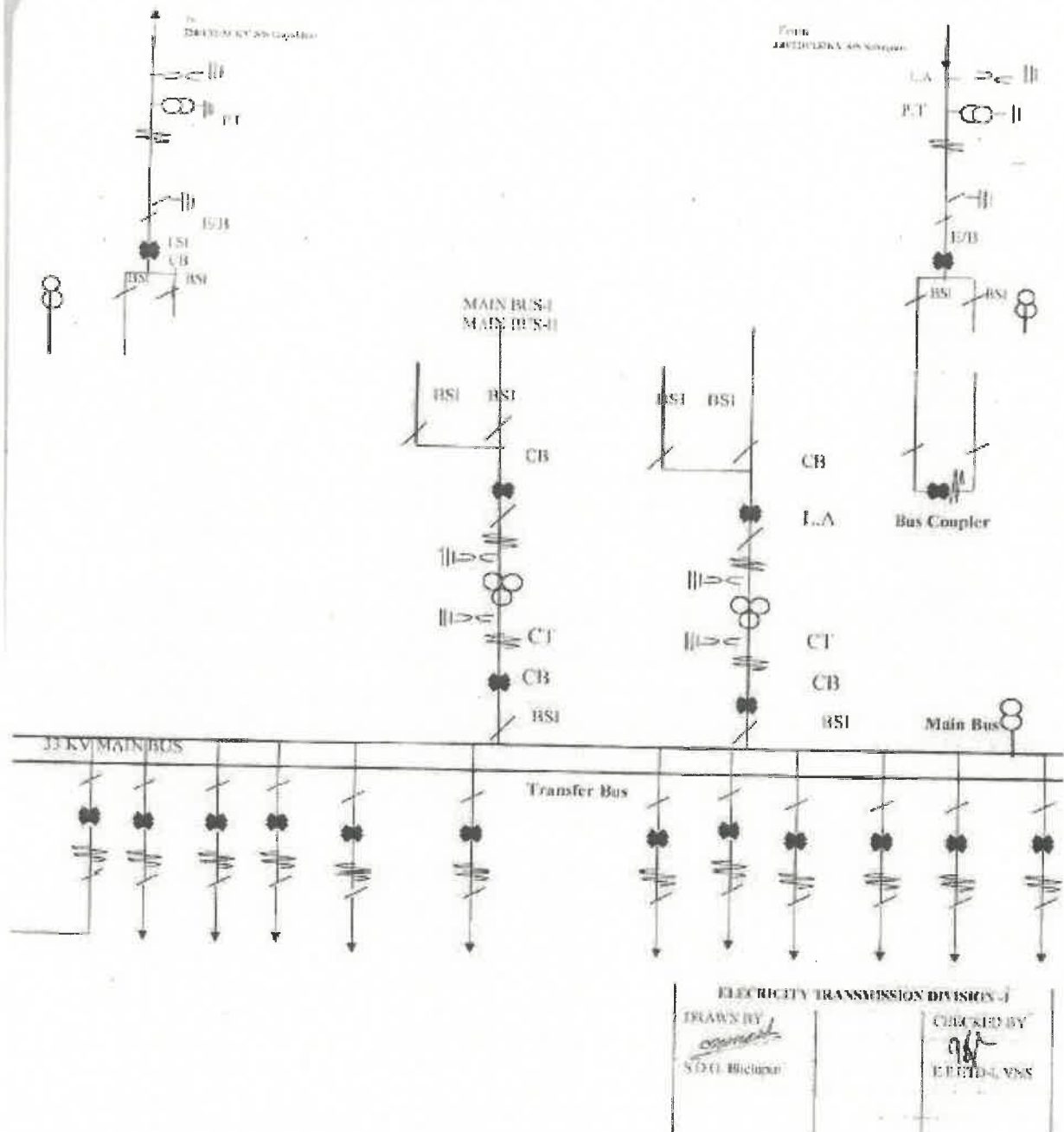
1. The above parameters are applicable for installations up to an altitude of 1000m above mean sea level. For altitude exceeding 1000m, necessary altitude correction factor shall be applicable.
2. The insulation and RIV levels of the equipments shall be as per values given in the respective chapter of the equipments.

SINGLE LINE DIAGRAM 400/220 KV JEWAR



220 kV Jewar to Sector 28 Line shall be constructed by UPPTCL, however, associated 2 nos. of 220 kV bays for Sector 28 shall be under the scope of TSP and I

**SINGLE LINE DIAGRAM FOR CONSTRUCTION OF 220/33 KV, 2 x 60MVA GIS SUB
STATION CANTT CHAUKAGHAT WITH DOUBLE MAIN SCHEME**







पीएफसी कंसल्टिंग लिमिटेड

(पावर फाइनेंस कॉर्पोरेशन लिमिटेड की पूर्णतः स्वामित्वाधीन सहायक कम्पनी)

PFC CONSULTING LIMITED

(A wholly owned subsidiary of Power Finance Corporation Limited)

CIN U74140DL2008GOI175858

Ref. No. 04/ITP-62/22-23/RFP

May 15, 2023

To,
Secretary,
Uttar Pradesh Electricity Regulatory Commission,
Vidyut Niyamak Bhawan, Vibhuti Khand,
Gomti Nagar, Lucknow,
Uttar Pradesh 226010

Subject: Intimation about initiation of the bid process for selection of Transmission Service Provider (TSP) for establishing transmission system for "Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines" and issuance of RFP Document.

Dear Sir,

UP Power Transmission Corporation Limited (UPPTCL) vide Letter of Intent (LoI) dated 23.02.2023 has appointed PFC Consulting Limited (PFCCL) as Bid Process Coordinator (BPC) to undertake the bid process for selection of Transmission Service Provider (TSP) for establishing transmission system for "Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines" in accordance with the Guidelines namely "Tariff based Competitive Bidding Guidelines for Transmission Service" and "Guidelines for encouraging Competition in Development of Transmission Projects" issued by Ministry of Power.

The Request for Proposal (RFP) process has been initiated on May 04, 2023 with the publication of RFP notification in:

1. Times of India (English) – All Edition
2. Navbharat Times (Hindi) – All Editions
3. Economic Times (English) – All Edition
4. The Financial Times – Worldwide (All Editions)

The same has also been made available along with the RFP documents on PFCCL website 'www.pfcclindia.com' w.e.f. May 04, 2023. It may be noted that these RFP Documents are based on the Single Stage Two Envelope based Standard Bidding Documents (SBD) issued by Ministry of Power on August 06, 2021 and project specific inputs furnished by UPPTCL. The last date for submission of Responses to RFP is July 07, 2023.

As per the requirements of the Guidelines (Clause 4.2 of Tariff based Competitive-bidding Guidelines for Transmission Service), we hereby intimate the Commission about initiation of the bid process for selection of Transmission Service Provider (TSP) for establishing transmission system for "Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines". We are also enclosing herewith the RFP documents for your kind information, perusal and records please.

Thanking You,

Yours sincerely,

(Sanjay Nayak)

General Manager

Encl.: As Above



पंजीकृत कार्यालय : प्रथम तल 'ऊर्जानिधि', 1, बाराखम्बा लेन, कर्नाट प्लेस, नई दिल्ली-110001

Regd. Office : First Floor, "Urjanidhi", 1, Barakhamba Lane, Connaught Place, New Delhi-110001

कंपनी मुख्यालय: नौवाँ तल (ए विंग) स्टेट्समैन हाउस, कर्नाट प्लेस, नई दिल्ली-110001 दूरभाष : 011-23443900 फैक्स : 011-23443990

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ई-मेल / E-mail : pfcconsulting@pfcindia.com वेबसाइट / Website : www.pfcclindia.com

पीएफसी कन्सल्टिंग लिमिटेड (पीएफसीसीएल)

(पावर फाइनेंस कॉर्पोरेशन लिमिटेड की पूर्ण स्वामित्वाधीन सहायक कंपनी)

पंजीकृत कार्यालय: प्रथम तल, कलानिधि, 1, बाराबाग जंक्शन, कनॉट प्लेस, नई दिल्ली-110001, फ़ैक्स: 011-23443990

देशीय आपूर्ति (बूट) ई-निविदा के माध्यम से
अन्तर-राज्यीय पारिषद परियोजना के लिए निर्माण, स्वामित्व, प्रचालन और स्थानांतरण
(बूट) आधार पर ट्रांसमिशन सेवा प्रदाता के चयन हेतु

पीएफसी कन्सल्टिंग लिमिटेड भारत सरकार की पूर्ण स्वामित्व वाली सहायक कंपनी "प्रस्ताव हेतु अनुरोध" (आरएफपी) के एकल वारण दो स्तरीय प्रक्रिया का पहला चरण है। निर्माण, स्वामित्व, प्रचालन एवं हस्तांतरण (बूट) आधार पर पारिषद परियोजना की स्थापना के लिए प्रस्ताव आमंत्रित करता है।

इच्छुक निविदादाता वेबसाइट <https://www.mstcecommerce.com> या <https://www.pfcclindia.com> पर उपलब्ध आरएफपी अधिसूचना और आरएफपी दस्तावेजों का प्रत्यक्ष रूप से जांच कर सकते हैं।

निविदादाता अ-प्रतिदेय शुल्क रु. 5,00,000/- या यूएसडी (यूएस डॉलर) 7,000 प्लस 18 प्रतिशत की दर से लागू जीएसटी का भुगतान करके आरएफपी दस्तावेज 04.05.2023 से गिनतिलिखित परियोजना के लिए निविदा जमा तिथि से एक कार्यदिवस पूर्व तक 10:30 बजे (आईएसटी) से 16:00 बजे (आईएसटी) के बीच सभी कार्यदिवसों में ऑनलाइन बिडिंग-एस्टेड्समैन हाउस, कनॉट प्लेस, नई दिल्ली-110001, फ़ोन: 91-11-23443998; फ़ैक्स: 91-11-23443990; ई-मेल: pfccl.itp@pfclindia.com से प्राप्त कर सकते हैं। आरएफपी दस्तावेज <https://www.mstcecommerce.com> एवं <https://www.pfcclindia.com> से भी डाउनलोड किए जा सकते हैं, यद्यपि ऐसे मामले में इच्छुक पार्टियां आरएफपी के उत्तर जमा करने समय अलग से अ-प्रतिदेय शुल्क रु. 5,00,000/- या यूएसडी 7,000 प्लस 18 प्रतिशत लागू जीएसटी जमा कर सकते हैं। संवेधान विचारों पर आरएफपी दस्तावेजों में संशोधन केवल उन निविदादाताओं को जारी किया जाएगा जो निविदा जमा तिथि से न्यूनतम एक कार्यदिवस पूर्व तक किसी भी संशोधन के अपेक्षित शुल्क का भुगतान करके आरएफपी दस्तावेज खरीद/प्राप्त कर चुके हैं। निविदादाता किसी भी संशोधन/सहायक/समय विस्तार आदि, यदि कोई हो, के बारे में नवीनतम जानकारी हेतु वेबसाइट नियमित रूप से देखते रहें। इस तथ्य में महत्वपूर्ण समय-समय पर निगरानी रखें।

क्र. सं.	पारिषद योजना का नाम	संशोधन प्राप्त करने की अंतिम तिथि (दिन/माह/वर्ष)	आरएफपी के उत्तर जमा करने की अंतिम तिथि (दिन/माह/वर्ष)	आरएफपी के उत्तर खोलने की तिथि (दिन/माह/वर्ष)
1.	सहायक लाइनों के साथ 400/220 केवी, 2x500 एनवीए सीआईएस सबस्टेशन जेवर, 220/33 केवी, 2x500 एनवीए सीआईएस सबस्टेशन (चौकाघाट) वाराणसी, 220/33 केवी, 2x500 एनवीए सीआईएस सबस्टेशन वसुन्धरा (गजियाबाद), 220/33 केवी, 2x180+2x40 केवी, सबस्टेशन खागा (फतेहपुर) का निर्माण।	24/05/2023	07/07/2023 को 1500 बजे (आईएसटी) तक	07/07/2023 को 1630 बजे (आईएसटी) तक

टिप्पणी: पीएफसी कन्सल्टिंग लिमिटेड बिना कोई कारण बताए और बिना कोई जिम्मेदारी लिए प्रक्रिया को निरस्त या संशोधित करने का अधिकार रखता है। यह कोई प्रस्ताव नहीं है।

पहल कर्ता



उत्तर प्रदेश सरकार

निविदा प्रक्रिया संपन्न

PFCL CONSULTING LTD.

(पावर फाइनेंस कॉर्पोरेशन लिमिटेड की पूर्ण स्वामित्वाधीन सहायक कंपनी)

(भारत सरकार का उपक्रम)

अग्रणी भागीदार



यूपी पावर ट्रांसमिशन
कॉर्पोरेशन लिमिटेड

Marketed By
Date: May 04, 2023



PFC CONSULTING LIMITED (PFCCL)

(A wholly owned subsidiary of Power Finance Corporation Limited)

Regd. Office: 9th Floor, Statesman House, Connaught Place, New Delhi-110001, India. Tel: 91-11-23443990, Fax: 91-11-23443990

GLOBAL INVITATION (THROUGH E-BIDDING ONLY)

FOR SELECTION OF TRANSMISSION SERVICE PROVIDER ON BUILD, OWN, OPERATE AND TRANSFER (BOOT) BASIS FOR INTRA-STATE TRANSMISSION PROJECT

PFC Consulting Limited, a wholly owned subsidiary of Power Finance Corporation Limited (A Government of India Undertaking) invites proposals for selection of transmission project on Build, Own, Operate and Transfer (BOOT) basis following information and documents available on the website

Interested bidders may refer to the RFP documents and documents available on the website <https://www.mstscconcrete.com/2023/07/07/pfccl-rfp-for-selection-of-transmission-project/>

The Bidders may obtain the RFP documents on all working days between 10:30 hrs (IST) and 16:00 hrs (IST) from 04.05.2023 to 07.07.2023 prior to the submission date for the project mentioned below on payment of a non-refundable fee of Rs. 5,00,000/- or INR 7,000/- (whichever is applicable) GST @18% from 9th Floor, Wing-A, Statesman House, Connaught Place, New Delhi-110001, Tel: 91-11-23443990, Fax: 91-11-23443990; e-mail: pfccl@pfcclindia.com. The RFP and documents are available on the website www.mstscconcrete.com and <https://www.pfcclindia.com>. However, in such cases, interested party can submit Response to RFP only on submission of non-refundable fee of Rs. 5,00,000/- or INR 7,000/- (whichever is applicable) GST @18% separately. The survey report and clarification to RFP is also issued as per the schedule to those bidders, who have obtained/purchased RFP documents by paying the fee of at least one working day prior to bid submission date. Bidders should regularly visit website to keep themselves updated regarding clarifications/amendments/timeline etc. If any. The important details in this regard are as follows:

S. No.	Name of Transmission Scheme	Last Date for seeking clarification (dd/mm/yyyy)	Last Date for submission of response to RFP (dd/mm/yyyy)	Date of opening of Response to RFP (dd/mm/yyyy)
1.	Construction of 400/220 KV, 2x160 MVA GIS substation at Jewar, 220/33 KV, 2x40 MVA GIS substation at Chaurkaghat, Yamuna 220/33 KV, 2x40 MVA GIS substation Vasundhara (Ghazipur), 220/132 KV, 2x160+2x40 MVA substation Kurga (Farrukh) with associated lines	04/05/2023	07/07/2023 up to 1500 hrs (IST)	07/07/2023 up to 1530 hrs (IST)

Note: PFC Consulting Limited reserves the right to cancel or modify the process without assigning any reason and without any liability. This is not an offer.

An Initiative of



Government of Uttar Pradesh

Bid Process Coordinator



(A wholly owned subsidiary of PFC Ltd.)
(A Govt. of India Undertaking)

Initiative Partner



UP Power Transmission Corporation Limited





पीएफसी कंसल्टिंग लिमिटेड

(पावर फाइनेंस कॉर्पोरेशन लिमिटेड की पूर्णतः स्वामित्वाधीन सहायक कम्पनी)

PFC CONSULTING LIMITED

(A wholly owned subsidiary of Power Finance Corporation Limited)

CIN U74140DL2008GOI175858

Ref. No. 04/ITP-62/22-23/RFP

May 15, 2023

To,

Director (Works & Projects)
U.P Power Transmission Corporation Limited
7th Floor, Shakti Bhawan, 14-Ashok Marg,
Lucknow-226001 (UP)

Subject: Intimation about initiation of the bid process for selection of Transmission Service Provider (TSP) for establishing transmission system for "Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines" and issuance of RFP Document.

Dear Sir,

UP Power Transmission Corporation Limited (UPPTCL) vide Letter of Intent (LoI) dated 23.02.2023 has appointed PFC Consulting Limited (PFCL) as Bid Process Coordinator (BPC) to undertake the bid process for selection of Transmission Service Provider (TSP) for establishing transmission system for "Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines" in accordance with the Guidelines namely "Tariff based Competitive Bidding Guidelines for Transmission Service" and "Guidelines for encouraging Competition in Development of Transmission Projects" issued by Ministry of Power.

The bid process for selection of Transmission Service Provider (TSP) for establishing transmission system for "Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines" has been initiated with the publication of RFP notification on May 04, 2023 (copy of the RFP notification enclosed). The same has also been made available along with the RFP document on PFCL website 'www.pfcclindia.com' w.e.f. May 04, 2023. It may be noted that these RFP Document are based on the Single Stage Two Envelope based Standard Bidding Documents (SBD) issued by Ministry of Power on August 06, 2021. The last date for submission of Responses to RFP is July 07, 2023.

We are enclosing herewith the RFP Notification and RFP documents for your kind information, perusal and records please.

Thanking You,

Yours sincerely,

(Sanjay Nayak)

General Manager

Encl.: As Above



पंजीकृत कार्यालय : प्रथम तल "ऊर्जानिधि", 1, बारखम्बा लेन, कनॉट प्लेस, नई दिल्ली-110001

Regd. Office : First Floor, "Urjanidhi", 1, Barakhamba Lane, Connaught Place, New Delhi-110001

कंपनी मुख्यालय: नौवाँ तल (ए विंग) स्टेट्समैन हाउस, कनॉट प्लेस, नई दिल्ली-110001 दूरभाष : 011-23443900 फैक्स : 011-23443990
Corporate Office : 9th Floor (A Wing) Statesman House, Connaught Place, New Delhi-110001 Phone : 011-23443900 Fax : 011-23443990

ई-मेल / E-mail : pfcconsulting@pfcclindia.com वेबसाइट / Website : www.pfcclindia.com

पीएफडी कन्सलिंग लि. लि. (पीएफडीसीएल)

(भातुर फाइनैस कर्माधिकारी विभिन्न प्रकार के आर्थिक मामलों में सहायक होती है)

तैरिवाज आसुतना (केवल) निविद भाषण हो

अन्तर-राष्ट्रीय पारिषद परिवर्धन के लिए निर्माण, स्थापित, प्रचारण और स्थानांतरण

(नूट) बाजार पर ट्रांसमिशन सेवा प्रणाली को मजबूत हेतु

पीएफसी के नाटिक विभाग के द्वारा प्रस्तुत की गई फिल्म "प्रस्ताव हेतु अनुरोध" (अंतराष्ट्रीय जल परियोजना के लिए) को प्रदर्शित करने के लिए प्रार्थना की जाती है।

इष्टक निषिद्धात संघ
अधिसूचना और आरएफपी

निविदादाता अ-प्रतिदेय शुल्क रु. 5.00 (पाँच रुपये) के साथ निविदा पत्र प्राप्त करने पर से लागू जीएसटी का भुगतान करके आरएफपी दरतावेज 84.C5.2023 को निविदादिहसिली में जमा कर देना है। निविदा पत्र प्राप्त होने के बाद कार्यदिग्गस पूर्व तक 10:30 बजे (आईएसटी) से 16:00 बजे (आईएसटी) के बीच सभी कार्यदिग्गसों में प्रवेश किया जायेगा। कार्यालय का पता: कर्नाट स्लेस, नई दिल्ली-110001, फोन: 91-11-23443998; फैक्स: 91-11-23443990; ई-मेल: nfeel@nfeelindia.com से प्राप्त कर सकते हैं। आरएफपी दरतावेज

[illegible][illegible]

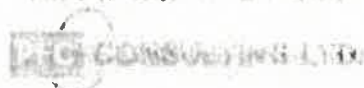
टिप्पणी : सीएफसी कन्सल्टिंग लिमिटेड बिना कोई कारण बताए और बिना ब्रोड कन्सेन्सस लिए प्रक्रिया को निरस्त या संशोधित करने का अधिकार रखता है। यह कोई गारंटी नहीं है।

पहल कर्ता



उत्तर प्रदेश सरकार

विश्वविद्यालयी शिक्षण



1968-1969

सिद्धा पुराणः ॥ ३ ॥ ३३५ ॥

अग्रणी मागीदार



सूची पावर ट्रांसमिशन
कॉर्पोरेशन लिमिटेड

10/10/10





GOVERNMENT OF INDIA
MINISTRY OF CORPORATE AFFAIRS

Central Registration Centre

Certificate of Incorporation

[Pursuant to sub-section (2) of section 7 and sub-section (1) of section 8 of the Companies Act, 2013 (18 of 2013) and rule 18 of the Companies (Incorporation) Rules, 2014]

I hereby certify that JEWAR TRANSMISSION LIMITED is incorporated on this SIXTH day of JULY TWO THOUSAND TWENTY THREE under the Companies Act, 2013 (18 of 2013) and that the company is Company limited by shares

The Corporate Identity Number of the company is **U42201DL2023GOI416714**

The Permanent Account Number (PAN) of the company is **AAGCJ0728D***

The Tax Deduction and Collection Account Number (TAN) of the company is **DELJ17518E***

Given under my hand at Manesar this SIXTH day of JULY TWO THOUSAND TWENTY THREE

Signature Not Verified

Digitally signed by
DS MINISTRY OF CORPORATE
AFFAIRS 10
Date: 2023.07.20 18:07:00 IST

DrJaya Gautam

Assistant Registrar of Companies/ Deputy Registrar of Companies/ Registrar of Companies

For and on behalf of the Jurisdictional Registrar of Companies

Registrar of Companies

Central Registration Centre

Disclaimer: This certificate only evidences incorporation of the company on the basis of documents and declarations of the applicant(s). This certificate is neither a license nor permission to conduct business or solicit deposits or funds from public. Permission of sector regulator is necessary wherever required. Registration status and other details of the company can be verified on mca.gov.in

Mailing Address as per record available in Registrar of Companies office:

JEWAR TRANSMISSION LIMITED

Urjanidhi, First Floor, 1, Barakhamba Lane, Connaught Place, New Delhi, Central Delhi-110001, Delhi

*as issued by Income tax Department



Form No. INC-33

e-MOA (e-Memorandum of Association)

[Pursuant to Schedule I (see Sections 4 and 5) to the Companies Act, 2013]]



Form language

☒ English☐ Hindi

Refer instruction kit for filing the form

All fields marked in * are mandatory

* Table applicable to company as notified under schedule I of the Companies Act, 2013

(A - MEMORANDUM OF ASSOCIATION OF A COMPANY LIMITED BY SHARES

B - MEMORANDUM OF ASSOCIATION OF A COMPANY LIMITED BY GUARANTEE AND NOT HAVING A SHARE CAPITAL

C - MEMORANDUM OF ASSOCIATION OF A COMPANY LIMITED BY GUARANTEE AND HAVING A SHARE CAPITAL

D - MEMORANDUM OF ASSOCIATION OF AN UNLIMITED COMPANY AND NOT HAVING SHARE CAPITAL

E - MEMORANDUM OF ASSOCIATION OF AN UNLIMITED COMPANY AND HAVING SHARE CAPITAL)

A - MEMORANDUM OF
ASSOCIATION OF A COMPANY
LIMITED BY SHARES

Table A/B/C/D/E

1 The name of the company is

JEWAR TRANSMISSION LIMITED

2 The registered office of the company will be situated in the State of

Delhi

3 (a) The objects to be pursued by the company on its incorporation are:

1. To develop Power System Network
To plan, promote and develop an integrated and efficient power transmission system network in all its aspects including planning, investigation, research, design and engineering, preparation of preliminary, feasibility and definite project reports, construction, operation and maintenance of transmission lines, sub-stations, load dispatch stations and communication facilities and appurtenant works, coordination of integrated operation of state, regional and national grid system, execution of turn-key jobs for other utilities/organizations and wheeling of power in accordance with the policies, guidelines and objectives laid down by the Central Government from time to time.
2. To study, investigate, collect information and data
To study, investigate, collect information and data, review operation, plan, research, design and prepare Report, diagnose operational difficulties and



weaknesses and advise on the remedial measures to improve, undertake development of new and innovative product connected with business of the Company as well as modernize existing EHV, HV lines and Sub-Stations.

3. To act as Consultants/ Technical Advisers of public/ private sector enterprises etc.

To act as consultants, technical advisors, surveyors and providers of technical and other services to Public or Private Sector enterprises engaged in the planning, investigation, research, design and preparations of preliminary, feasibility and definite project reports, manufacture of power plant and equipment, construction, generation, operation and maintenance of power transmission system from power generating stations and projects, transmission, distribution and sale of power.

(b) *Matters which are necessary for furtherance of the objects specified in clause 3(a) are

1. To obtain authority etc. to carry out its objects

To obtain license, approvals and authorization from Governmental Statutory and Regulatory Authorities, as may be necessary to carry out and achieve the Objects of the Company and connected matters which may seem expedient to develop the business interests of the Company in India and abroad.

2. To obtain charters, concession etc.

To enter into any arrangement with the Government of India or with any State Government or with other authorities/ commissions, local bodies or public sector or private sector undertakings, Power Utilities, Financial Institutions, Banks, International Funding Agencies and obtain such charters, subsidies, loans, advances or other money, grants, contracts, rights, sanctions, privileges, licenses or



concessions whatsoever (whether statutory or otherwise) which the Company may think it desirable to obtain for carrying its activities in furthering the interests of the Company or its members.

3. To enter into Implementation/ Construction Agreement

To enter into any agreement, contract or any arrangement for the implementation of the power generation, evacuation, transmission and distribution system and network with Power/ Transmission Utilities, State Electricity Boards, Vidyut Boards, Transmission Companies, Generation Companies, Licensees, Statutory bodies, other organizations (whether in Private, Public or Joint Sector Undertaking) and bulk consumers of power etc.

4. To carry on the business or purchasing, importing, exporting and trading power To carry on the business or purchasing, importing, exporting and trading of power subject to the provisions of Electricity Act, 2003 and to supply electric power generated by other plants to distribution companies, trading companies, other generation companies and other Persons, and in this regard execute agreements with Central and State generating authorities, departments or companies, Independent Power Producers and other Persons.

5. To enter into Agreements; etc. To secure the payments of money, receivables on transmission and distribution of electricity and sale of fuel, as the case may be, to the State Electricity Boards, Vidyut Boards, Transmission Utilities, Generating Companies, Transmission Companies, Distribution Companies, State Governments, Licensees, statutory bodies, other organizations (whether in Private, Public or Joint Sector Undertaking) and bulk consumers of power etc. through



Letter of Credits/ESCROW and other security documents.

6. To execute transmission service Agreements

To execute Transmission Service Agreements or other agreements for transmission of power to distribution, trading, and other companies, State Electricity Boards, State Utilities and any other organization and Persons.

7. To co-ordinate with Central Transmission Utility
To coordinate with the Central Transmission Utility for transmission of electricity under the provisions of Electricity Act 2003.

8. To borrow money
Subject to provisions of Sections 73, 179, 180 and other applicable provisions of the Companies Act, 2013 and subject to other laws or directives, if any, of SEBI/RBI, to borrow money in Indian rupees or foreign currencies and obtain foreign lines of credits/ grants/aids etc. or to receive money or deposits from public for the purpose of the Company's business in such manner and on such terms and with such rights, privileges and obligations as the Company may think fit. The Company may issue bonds/ debentures whether secured or unsecured; bills of exchange, promissory notes or other securities, mortgage or charge on all or any of the immovable and movable properties, present or future and all or any of the uncalled capital for the time being of the Company as the Company may deem fit and to repay, redeem or pay off any such securities or charges.

9. To lend money
To lend money on property or on mortgage of immovable properties or against Bank guarantee and to make advances of money against future supply of goods and services on such terms as the Directors may consider necessary and to invest money of the Company in such manner as the Directors may



think fit and to sell, transfer or to deal with the same.

10. To acquire, own, lease or dispose off the property

To own, possess, acquire by purchase, lease or otherwise rights, title and interests in and to, exchange or hire real estate, equipment, Transmission lines, lands, buildings, apartments, plants, equipment, machinery, fuel blocks and hereditaments of any tenure or descriptions situated in India or abroad or any estate or interest therein and any right over or connected with land so situated and turn the same to account in any manner as may seem necessary or convenient for the purpose of business of the Company and to hold, improve, exploit, re-organize, manage, lease, sell, exchange or otherwise dispose of the whole or any part thereof.

11. To deal in Scrips/Govt. Securities

Subject to applicable provisions of law, to subscribe for, underwrite, or otherwise acquire, hold, dispose of and deal with the shares, stocks, debentures or other securities and titles of indebtedness or the right to participate in profits or other similar documents issued by any Government authority, Corporation or body or by any company or body of persons and any option or right in respect thereof.

12. To create funds and appropriate profits

To create any depreciation fund, reserve fund, sinking fund, insurance fund, gratuity, provident fund or any other fund, for depreciation or for repairing, improving extending or maintaining any of the properties of the Company or for any other purposes whatsoever conducive to the interests of the Company.

13. To purchase or otherwise acquire companies
To acquire shares, stocks, debentures or securities of any company carrying on any business which this Company is



entitled to carry on or acquisition of undertaking itself which may seem likely or calculated to promote or advance the interests of the Company and to sell or dispose of or transfer any such shares, stocks or securities and the acquired undertaking.

14. To enter into partnership Agreement or Merge / amalgamate

To enter into partnership or into any agreement for joint working, sharing or pooling profits, joint venture, amalgamation, union of interests, co-operation, reciprocal concessions or otherwise or amalgamate with any person or company carrying on or engaged in or about to carry on or engaged in any business or transaction in India or abroad which the Company is authorized to carry on or engage in any business undertaking having objects identical or similar to, as are being carried on by this Company.

15. To have agencies and branch offices in India and abroad

To establish and maintain agencies, branch offices and local agencies, to procure business in any part of India and world and to take such steps as may be necessary to give the Company such rights and privileges in any part of the world as deemed proper in the interest of the Company.

16. To promote institutions or other companies

To promote and undertake the formation of any institution or Company or subsidiary company or for any aforesaid objects intended to benefit the Company directly or indirectly and to coordinate, control and guide their activities.

17(a) To acquire know how and import-export of machinery and tools etc.

To negotiate and enter into agreements and contracts with domestic and foreign companies, persons or other organizations, banks and financial institutions,



in relation to the business of the Company including that of technical know-how, import, export, purchase or sale of plant, machinery, equipment, tools, accessories and consumables, financial assistance and for carrying out all or any of the objects of the Company.

17(b) To negotiate and enter into agreements etc.

To negotiate and enter into agreements and contracts for execution of turnkey jobs, works, supplies and export of plant, machinery, tools and accessories etc.

18. To enter into contracts/arrangements in connection with issue of shares/securities. Upon and for the purpose of any issue of shares, debentures or any other securities of the Company, to enter into agreement with intermediaries including brokers, managers of issue/commission agents and underwriters and to provide for the remuneration of such persons for their services by way of payment in cash or issue of shares, debentures or other securities of the Company or by granting options to take the same or in any other manner as permissible under the law.

19. To enter into contracts of indemnity and/or guarantee
To enter into contracts of indemnity and get guarantee and allocations for the business of the Company.

20. To arrange for Training and Development

To make arrangements for training of all categories of employees and to employ or otherwise engage experts, advisors, consultants etc. in the interest of achieving the Company's objects.

21. To promote conservation, protect environment, theft etc.
To promote conservation and protection of electricity from theft, safety of life and to protect environments including air, land and water etc.



22. To provide for welfare of employees

To pay and provide for the remuneration, amelioration and welfare of persons employed or formerly employed by the Company and their families providing for pension, allowances, bonuses, other payments or by creating for the purpose from time to time the Provident Fund, Gratuity and other Funds or Trusts. Further to undertake building or contributing to the building or houses, dwellings or chawls by grants of money, or by helping persons employed by the Company to effect or maintain insurance on their lives by contributing to the payment of premium or otherwise and by providing or subscribing or contributing towards educational institutions, recreation, hospitals and dispensaries, medical and other assistance as the Company may deem fit.

23. To take Insurance

To ensure any rights, properties, undertakings, contracts, guarantees or obligations or profits of the Company of every nature and kind in any manner with any person, firm, association, institution or company.

24. To share the profits pay, dividends and provide bonus etc To distribute among members of the Company dividend including bonus shares out of profits, accumulated profits or funds and resources of the Company in any manner permissible under law.

25. To institute and defend the legal proceedings

To institute, conduct, defend, compound or abandon any legal proceedings by or against the Company or its officers or otherwise concerning the affairs of the Company and also to compound and to allow time for payment or satisfaction of any debts or recovery due, claims or demands by or against the Company and to refer any claims



or demands by or against the Company or any differences arising in execution of contracts to conciliation and arbitration and to observe, comply with and/or challenge any awards preliminary, interim or final made in any such arbitration.

26. To pay and subsequently write off preliminary expenses

To pay out of the funds of the Company all costs, charges, expenses and preliminary and incidental to the promotion, formation, establishment and registration of the Company or other expenses incurred in this regard.

27. To contribute and make donations

Subject to provisions of Companies Act, 2013 to contribute money or otherwise assist to charitable, benevolent, religious, scientific national, defense, public or other institutions or objects or purposes.

28. To open accounts in Banks

To open an account or accounts with any individual, firm or company or with any bank bankers or shrofs and to pay into and withdraw money from such account or accounts.

29. To accept gifts, donations etc.

To accept gifts, bequests, devises and donations from members and others and to make gifts to members and others of money, assets and properties of any kind.

30. To pursue the objects of the Company as principal, agents, trustee or in any other capacity

To carry out all or any of the objects of the company and do all or any of the above things in any part of the world and either as principal, agent, contractor or trustee or otherwise and either alone or in conjunction with others.

31. To enter into Contracts

To negotiate and/or enter into agreement and contract with individuals, companies,



corporations, foreign or Indian, for obtaining or providing technical, financial or any other assistance for carrying on all or any of the objects of the Company and also for the purpose of activating, research, development of projects on the basis of know-how and/or financial participation and for technical collaboration, and to acquire or provide necessary formulate and patent rights for furthering the objects of the company.

32. To contribute towards promotion of trade and industry To aid pecuniary or otherwise, any association, body or movement having for its object the solution, settlement or surmounting of industrial or labour problems or trouble or the promotion of industry or trade.

33. To take all necessary steps for winding up of the company

Subject to the provisions of Companies Act, 2013 or any amendment or re-enactment thereof in the event of winding up to distribute among the members in specie any property of the Company or any proceeds of sale on disposal of any property in accordance with the provisions of the Act.

34. To do and perform all coincidental and ancillary acts for the attainment of its objects

To do all such other things as may be deemed incidental or conducive to the attainment of the above Objects or any of them and to carry on any business which may seem to the Company capable of being conveniently carried in connection with any of the Company's Objects or calculated directly or indirectly to enhance the value of or render profitable any of the Company's property or rights.

35. To take up studies and research experiments. To establish, provide, maintain and conduct or otherwise subsidies research laboratories



and experimental workshops for scientific, technical or researches, experiments and to undertake and carry on directly or in collaboration with other agencies scientific and technical research experiments and tests of all kinds and to process, improve and invent new products and their techniques of manufacture and to promote, encourage, reward in every manner studies and research, scientific and technical investigations and inventions of any kind that may be considered likely to assist, encourage and promote rapid advances in technology, economies, import substitution or any business which the Company is authorized to carry on.

36. To evolve scheme for restructuring or arrangement. Subject to provisions of the Companies Act, 2013, to evolve scheme for restructuring or arrangement, to amalgamate or merge or to enter into partnership or into any consortium or arrangement for sharing of profits, union of interests, co-operation, joint venture with any Person or Persons, partnership firm/firms, or company or companies carrying on or engaged in any operation capable of being conducted so conveniently in co-operation with the business of the Company or to benefit the Company or to the activities for which the Company has been established.

37. To apply for purchase, or otherwise acquire. To apply for purchase, or otherwise acquire any trademarks, patents, brevets, inventions, licenses, concessions and the like, conferring any exclusive or nonexclusive or limited rights to use, or any secret or other information as to any invention which may be capable of being used for any of the purposes of the Company, or the acquisition of which may benefit the Company and to use, exercise, develop or grant



licenses in respect of or otherwise turn to account the property, rights or information so acquired.

38. To sell, dispose or hive off an undertaking of the Company

To sell, dispose or hive off an undertaking of the Company or any part thereof for such consideration as the Company may think fit and in particular for shares, debentures or securities of any other association, corporation or company.

39. To sell, improve, manage, develop

To sell, improve, manage, develop, exchange, loan, lease or let, under-lease, sub - let, mortgage, dispose of, deal with in any manner, turn to account or otherwise deal with any rights or property of the Company.

40. To outsource parts of its activities

To outsource parts of its activities to achieve higher efficiencies and throughputs in the achievement of its business goals.

4 The liability of the member(s) is limited, and this liability is limited to the amount unpaid if any, on the shares held by them.

The liability of the member(s) is limited

The liability of the member(s) is Unlimited

5 Every member of the company undertakes to contribute:

(i) to the assets of the company in the event of its being wound up while he is a member, or within one year after he ceases to be a member, for payment of the debts and liabilities of the company or of such debts and liabilities as may have been contracted before he ceases to be a member; and

(ii) to the costs, charges and expenses of winding up (and for the adjustment of the rights of the contributories among

themselves), such amount as may be required, not exceeding * rupees.

(iii) The share capital of the company is rupees, divided into

100000

Equity Share	Shares of	10	Rupees each		10000
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6

☐ We, the several persons, whose names and address are subscribed, are desirous of being formed into a company in pursuance of this memorandum of association, and we respectively agree to take the number of shares in the capital of the company set against our respective names:

☐ I, whose name and address is given below, am desirous of forming a company in pursuance of this memorandum of association and agree to take all the shares in the capital of the company:

☐ We, the several persons, whose names and addresses are subscribed, are desirous of being formed into a company in pursuance of this memorandum of association:

Subscriber Details					
S. No.	*Name, Address, Description and Occupation	DIN / PAN / Passport number	No. of shares taken	DSC	Dated
1	NEERAJ SINGH S/o Sh. Dayashankar Singh R/o Flat C-703, The Crescent Apartment, Plot F-2, Sector-50, Noida, Gautam Budh Nagar, UP-201301 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08613892	100 Equity,0 Preference	Neera Singh Digitally signed by Neera Singh Date: 2023.06.20 15:38:53 +05:30	17/06/2023
2	SANJAY KUMAR NAYAK S/o Sh. Jagabandhu Nayak R/o K 713, Jalvayu Tower, Sector 56 Gurgaon-Haryana 122011 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08197193	100 Equity,0 Preference	Sanjay Kumar Nayak Digitally signed by Sanjay Kumar Nayak Date: 2023.06.20 15:38:11 +05:30	17/06/2023
3	SACHIN SHUKLA S/o Sh. Raj Kumar Shukla R/o 4th Floor, House No. 6, H1 Block, Good Earth City Centre, south City 2, Gurgaon - 122018 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08613963	100 Equity,0 Preference	Sachin Shukla Digitally signed by Sachin Shukla Date: 2023.06.20 15:35:54 +05:30	17/06/2023
4	PFC CONSULTING LIMITED having its registered office at Urjanidhi, 1, Barakhamba Lane, Connaught Place, New Delhi-110001 Through Sh. Sachin Arora S/o Sh. Prem Lal Arora R/o F5 1903, Supertech Eco Village 1, Near Park, Greater Noida ? 201301 (as authorized representative of PFC Consulting Limited) Oc	AKGPA1434J	9400 Equity,0 Preference	SACHIN ARORA Digitally signed by SACHIN ARORA Date: 2023.06.20 15:38:29 +05:30	17/06/2023
	DHARUMAN MANAVALAN S/o Sh. Pamandi Chinnian Dharuman R/o A-703, Saheta Apartment, Plot No. 30,			D Manavalan Digitally signed by D Manavalan Date: 2023.06.20 15:37:42 +05:30	17/06/2023



5	Dwarka, Sector-4, South West Delhi, Delhi-110078 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08102722	100 Equity,0 Preference		
6	MANOJ KUMAR RANA S/o Sh. Sube Singh R/o A-32/E, DDA Flats, Munirka, New Delhi-110067 (As a Nominee of PFC Consulting Limited) Occupation:- Service	02263302	100 Equity,0 Preference	Manoj Kumar Rana Digitally signed by Manoj Kumar Rana Date: 2023.06.20 11:17:29 +05'30'	17/06/2023
7	MILIND MADHUSUDAN DAFADE S/o Sh. Madhusudan Gurinath Dafade R/o Aishwaryam Appt., Flat C-31, Sec-4, Plot No. 17, Dwarka, New Delhi-110078 (As a Nominee of PFC Consulting Limited) Occupation:- Service	09587967	100 Equity,0 Preference	MILIND MADHUSUDAN AN DAFADE Digitally signed by MILIND MADHUSUDAN AN DAFADE Date: 2023.06.20 15:17:29 +05'30'	17/06/2023
Total shares taken			10000 Equity,0 Preference		

Signed before me

Membership type of the witness (ACA/FCA/ACS/FCS/ ACMA/FCMA)	Name of the witness	*Address, Description and Occupation	DIN / PAN / Passport number / Membership number	DSC	Dated
FCS	Naresh Kumar Sinha	121, Vinayak Apartment, C58/19, Sector-62, Noida-201307, UP	1807	NARESH KUMAR SINHA Digitally signed by NARESH KUMAR SINHA Date: 2023.06.20 15:32:40 +05'30'	17/06/2023

7 Shri / Smt

Of

resident of

aged

years shall be the nominee in the event of death of the sole member.



Form No. INC-34**e-AOA (e-Articles of Association)**

[Pursuant to Section 5 of the Companies Act, 2013
and rules made thereunder read with Schedule I]



Form language

☒ English☐ Hindi

Refer instruction kit for filing the form.

All fields marked in * are mandatory

Table applicable to company as notified under schedule I of the Companies Act, 2013
(F, G, H)

F

Table F / G / H (basis on the selection of above-mentioned field) as notified under schedule I of
the companies Act, 2013 is applicable to

(F – a company limited by shares

G – a company limited by guarantee and having a share capital

H – a company limited by guarantee and not having share capital)

F - A COMPANY LIMITED BY
SHARES

The name of the company is

JEWAR TRANSMISSION LIMITED

Check if not applicable	Check if altered	Article No.	Description
			Interpretation
☐	☒	I	
			Share Capital and Variation of rights
☐	☒	II 1	
☐	☒	2	•
☐	☒	3	•
☐	☒	4	•
☐	☒	5	•
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☐	☒	8	•



		Lien		
☐	☒	9	23. Company to have lien on sharesThe Company shall have a first and paramount lien upon all shares (other than fully paid up shares) registered in the name of each member (whether solely or jointly with others) and upon the sale proceeds thereof, for all moneys (whether presently payable or not) called or payable at a fixed time in respect of all such shares (not being fully paid up) for all moneys presently payable by him or his estate to the Company. Any such lien shall extend to all dividends payable and bonuses declared from time to time declared in respect of such shares.24. Enforcing lien by saleFor the purpose of enforcing such lien, the Board may sell the shares subject thereto in such manner as they shall think fit, and for that purpose it may cause to be issued a duplicate certificate in respect of such shares and may authorize one of their Directors to execute a transfer thereof on behalf of and in the name of the Board. No sale shall be made until notice period for making call as aforesaid have expired and until notice in writing of the intention to sell shall have been made known to the shareholder for default in payment and default has been made by him in the payment of money called in respect of such shares for thirty days after the date of such notice. Upon issue of a duplicate certificate or certificates in lieu of the original share, the certificate or certificates originally issued shall stand cancelled and become null and void and the same shall have no effect.25. Application of proceeds of sale The net proceeds of any such sale shall be received by the Company and applied in or towards payment of such part of the amount as is presently payable and the residue, if any, shall (subject to a like lien for sums not presently payable as existed upon the shares before sale) be paid to the person entitled to the shares, at the date of the sale.	
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		Calls on shares		
☐	☒		CALLS ON SHARES?26. Directors may make callsThe Board may, from time to time, subject to the terms on which any shares may have been issued and subject to the conditions of allotment, by a resolution passed at a meeting of the Board (and not by resolution by circulation) make such call as it thinks fit upon the Members in respect of all moneys unpaid on the shares held by them respectively and each member shall pay the amount of every call so made on him to the person or persons and at the times and places appointed by the board. A call may be made payable by installments.27. Notice of callsNot less than thirty days? notice in writing of any call shall be given by the Company specifying the time and place of payment, and the person or persons to whom such call shall be paid.28. When call madeA call shall be deemed to have been made at the time when the resolution of the Board authorizing such call was passed at a meeting of the Board and demand notice is issued.29. Calls may be revoked or postponedA	



		13	call may be revoked or postponed at the discretion of the Board.30. Directors may extend time??? The Board may, from time to time at its discretion, extend the time fixed for the payment of any call, and may extend such time as to all or any of the Members for reasons which the Board may consider satisfactory, but no Member shall be entitled to such extension save as a matter of grace.31. Calls to carry interestIf any Member fails to pay any call due from him on the day appointed for payment thereof, or any such extension thereof as aforesaid, he shall be liable to pay interest on the same from the day appointed for the payment thereof to the time of actual payment at rate not exceeding 10 per cent per annum as maybe decided by the Board, but the Board may in its absolute discretion and in special circumstances waive or reduce the levy of interest as deemed appropriate.32. Sums deemed to be callAny sum, which by the terms of issue of a share becomes payable on allotment or at any fixed date, whether on account of the nominal value of the share or by way of premium, shall, for the purposes of these Articles be deemed to be a call duly made and payable on the date on which by the terms of issue the same becomes payable, and in case of non-payment all the relevant provisions of these Articles as to payment of interest and expenses, forfeiture or otherwise shall apply as if such sum had become payable by virtue of a call duly made and notified.33. Partial payment not to preclude ForfeitureNeither the receipt by the Company of a portion of any money which shall from time to time be due from any Member to the Company in respect of his shares, either by way of principal or interest nor any indulgence granted by the Company in respect of the payment of any such money, shall preclude the Company from thereafter proceeding to enforce a forfeiture of such shares as hereinafter provided.34. Payment in anticipation of calls may carry interestThe Board may, if it thinks fit, agree to and in anticipation receive from any Member willing to advance the same, all of calls money or any part of the amounts of his respective shares beyond the sums actually called up, and upon the moneys so paid in advance, or upon so much thereof, from time to time, and at any time thereafter as exceeds the amount of the calls then made upon and due in respect of the shares on account of which such advances are made, the Board may pay or allow interest, at such rate as the Member paying the sum in advance and the Board agree upon. The Board may agree to repay at any time any amount so advanced or may at any time repay the same upon giving to the Member three months? notice in writing.PROVIDED that moneys paid in advance of calls on any shares may carry interest but shall not confer a right to dividend or to participate in profits. (b) No Member paying any such sum in advance shall be entitled to voting rights in respect of the moneys so paid by him until the same would but for such payment become presently payable.
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☐	☒	18	•
			Transfer of shares
☐	☒	19	35. Register of TransfersThe Company shall maintain a Register of Transfers and therein shall be fairly and distinctively enter the particulars of every transfer or transmission of any share in the physical form. 36. Form of transferThe instrument of transfer shall be in writing and in such form as prescribed under the Act. All the provisions of Section 56 of the Act shall be duly complied with in respect of all transfers and of the registration thereof. The Company shall not charge any fee for registration of a transfer of shares or debentures. 37. Instrument of Transfer to be completed and presented to the CompanyThe Instrument of Transfer duly stamped and executed by the transferor and the transferee shall be delivered to the Company in accordance with the provisions of the Act. The instrument of transfer shall be accompanied by the Share Certificate or such evidences the Board may require to prove the title of transferor and his right to transfer the shares and every registered Instrument of Transfer shall remain in the custody of the Company until destroyed by order of the Board. Any instrument of transfer which the Directors may decline to register shall be returned to the person depositing the same. 38. Transferor deemed to be holderThe transferor shall be deemed to be the holder of such shares until the name of the transferee shall have entered in the Register of Members in respect thereof. Before the registration of a transfer, the certificate or certificates of the shares must be delivered to the Company along with Transfer Deed. 39. No transfer to insolvent etc.No transfer shall be made to a person of unsound mind or to an insolvent. 40. Closure of Register of Members/ Debenture holdersThe Directors shall have power, on giving not less than seven days' previous notice as required by Section 91 of the Act, to close the Register of Transfer, Register of Members or Register of Debenture holders or the register of other security holders of the Company for any period or periods not exceeding in the aggregate forty-five days in each year (but not exceeding thirty days at any one time) as they may determine. 41. Nomination by shareholderEvery share-holder or debenture holder may at any time, nominate in the prescribed manner, a person to whom his shares or debenture shall vest in the event of his death, as provided in Section 72 of the Act. 42. Title to shares of deceased holderIn the event there is no nomination, the executors or administrators of a deceased Member or the holder of a Succession Certificate in respect of the shares of a deceased Member (not being one of two or more joint holders) shall be the only persons whom the Company will be bound to recognize as having any title to the shares registered in the name of such Member, and the Company shall not be bound to recognize such executors or administrators or holders unless such executors, administrators or holders shall have first obtained probate or Letters of Administration or Succession Certificate as the case may be, from a duly constituted Court in India. PROVIDED that the Directors may, at their absolute discretion dispense with production of Probate, Letters of Administration or Succession Certificate upon such terms as to indemnity or otherwise as they think fit and may enter the name of the person who claims to be absolutely entitled to the shares standing in the name of a deceased Member, as a Member.



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			Transmission of shares
☐	☒	23	43. Transmission of Shares Subject to the provisions of the Act, any person becoming entitled to any share in consequence of the death, lunacy or insolvency of any Member or by any lawful means other than by a transfer in accordance with these Articles, may, with the consent of the Directors (which they shall be under no obligation to give) and upon producing such evidence that he sustains the character in respect of which he proposes to act under this. Article or of his title as the Directors may require, and upon such indemnity as the Directors may require, either be registered as a Member in respect of such shares or elect to have some person nominated by him and approved by the Directors registered as a Member in respect of such shares. PROVIDED that if such persons shall elect to have his nominee registered, he shall testify his election by executing in favor of his nominee an instrument of transfer in accordance with these Articles, and until he does so he shall not be freed from any liability in respect of such shares.44 Right of Board to decline or suspend registration ?????? (i) Any person becoming entitled to a share in consequence of the death or insolvency of a member may, upon such evidence being produced as may from time to time properly be required by the Board and subject as hereinafter provided, elect, either --(a) to be registered himself as holder of the share; or(b) to make such transfer of the share as the deceased or insolvent member could have made.(ii) The Board shall, in either case, have the same right to decline or suspend registration as it would have had, if the deceased or insolvent member had transferred the share before his death or insolvency.???????? 45. The Company not liable for disregard of notice prohibiting registration of transferThe Company shall incur no liability or responsibility whatever in consequence of its registering or giving effect to any transfer of shares made or purported to be made by any apparent legal owner thereof (as shown or appearing in register of Members) to the prejudice of persons having or claiming any equitable right, title or interest to or in the same shares, notwithstanding that the Company may have had notice of such equitable right, title or interest or notice prohibiting registration of such transfer, and may have entered such notice or referred to it in any book, or attended or given effect to any notice which may have been given to it of any equitable right, title or interest or be under any liability whatsoever for refusing or neglecting so to do though it may have been entered or referred to in some book of the Company, but the Company shall nevertheless be at liberty to regard and attend to any such notice and give effect thereto, if the Directors shall so think fit.46. Rights of successors A person becoming entitled to a share by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would have been entitled if he were the registered holder of the shares, except that he shall not, before being registered as a Member in respect of the shares, be entitled to exercise any right conferred by membership



			in relation to meetings of the Company. PROVIDED that the Directors shall, at any time, give notice requiring any such person to elect to be registered himself or to transfer the shares, and if the notice is not complied within ninety days from the date of issue of the notice, the Directors may thereafter withhold payment of all dividends, bonuses or other moneys payable in respect of the shares until the requirements of the notice have been complied with.
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			Forfeiture of shares
☐	☒		• FORFEITURE OF SHARES47. If money payable on shares not paid notice to be given to membersIf any Member fails to pay any call, or installment of a call, on or before the day appointed for the payment of the same or any such extension thereof as aforesaid, the Board may, at any time thereafter, during such time as any part of the call or installment remains unpaid, serve a notice on him requiring him to pay the same together with any interest which may have accrued and all expenses that may have been incurred by the Company by reason of such non-payment.48. Contents of NoticeThe notice shall name a further day (not being less than fourteen days from the date of the service of notice) and a place or places on and at which such call or installment and such interest thereon at such rate as the Directors shall determine from the day on which such call or installment ought to have been paid and expenses as aforesaid are to be paid. The notice shall also state that in the event of the non-payment on or before the day, at or before the time and at the place appointed, the shares in respect of which the call was made or installment is payable, shall be liable to be forfeited.49. In default of payment, shares to be Forfeited If the requirement of any such notice as aforesaid are not complied with, every or any share in respect of which such notice has been given may, at any time thereafter, but before payment of all calls or installments, interest and expenses due in respect thereof, be forfeited by a resolution of the Board to that effect. Such forfeiture shall include all dividends declared or any other moneys payable in respect of the aforesaid share and not actually paid before the forfeiture. In default of payment, shares to be Forfeited50. Notice of forfeiture to a MemberWhen any share shall have been so forfeited, notice of the forfeiture shall be given to the Member in whose name it stood immediately prior to the forfeiture, and an entry of the forfeiture, with the date thereof, shall forthwith be made in the Register of Members, but no forfeiture shall be in any manner invalid by any omission or neglect to make any such entry as aforesaid in the Register.51. Forfeited share to be property of the Company and may be sold etc.???????????? Any share so forfeited shall be deemed to be the property of the Company, and may be sold, re-allotted, or otherwise disposed of, either to the original holder thereof or to any person, upon such terms and in



		28	such manner as the Board shall think fit.52. Member still liable to pay calls owing at the time of forfeiture and interestAny members whose shares have been forfeited shall notwithstanding the forfeiture be liable to pay and shall forthwith pay to the Company, on demand, all calls, installment, interest and expenses owing upon or in respect of such shares at the time of the forfeiture together with interest accrued thereon at the time of the forfeiture at such rate as the Board may determine, and the Board may enforce the payment thereof, if it thinks fit.53. Effect of forfeitureThe forfeiture of a share shall involve extinction, at the time of the forfeiture, of all interest in and all claims and demands against the Company, in respect of the share and all other rights incidental to the share, except only such of those rights as by these Articles are expressly saved.54. Evidence of forfeitureA declaration in writing by Chairman or Managing Director of the Company or by any person duly authorised in this regard that certain shares in the Company have been duly forfeited on a date stated in the declaration, shall be conclusive evidence of the facts therein stated as against all persons claiming to be entitled to the shares and such declaration, and the receipt of the Company for the consideration, if any, given for the shares on the sale or disposition thereof shall constitute a good title to such shares and the person to whom the shares are sold shall be registered as the holder of such shares and shall not be bound to see as to the application of the purchase money nor shall his title to such shares be affected by any irregularity or invalidity in the proceedings in reference to such forfeiture, sale or disposition.55. Validity of sale under Articles of forfeited sharesUpon any sale after forfeiture or for enforcing a lien in purported exercise of the powers herein before given, the board may appoint some person to execute an instrument of transfer of the shares sold and cause the purchaser's name to be entered in the Register of Members in respect of the shares sold, and the purchaser shall not be bound to see the regularity of the proceedings, or to the application of the purchase money, and after his name has been entered in the Register in respect of such shares the validity of the sale shall not be impeached by any person and the remedy of any person aggrieved by the sale shall be in damages only and against the Company exclusively.56. Cancellation of Share Certificates in respect of forfeited sharesUpon any sale, re-allotment or other disposal under the provisions of the preceding Articles, the certificate or certificates originally issued in respect of the relative shares shall (unless the same shall on demand by the Company have been (previously) surrendered to it by the defaulting member) stand cancelled and become null and void and of no effect, and the Directors shall be entitled to issue a duplicate certificate or certificates in respect of the said shares to the person or persons entitled thereto.57. Power to annul forfeiture The Board may at any time before any share so forfeited, shall have been sold, re-allotted or otherwise disposed of, annul the forfeiture thereof upon such terms and conditions as it thinks fit.
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☐	☒	34	•
			Alteration of capital
☐	☒	35	58. Alteration of Share Capital??? The company may, from time to time, by ordinary resolution increase the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution. Subject to the provisions of section 61, the company may, by ordinary resolution, the Company may from time to time:-- (a) consolidate and divide all or any of its share capital into shares of larger amount than its existing shares; (b) convert all or any of its fully paid-up shares into stock, and reconvert that stock into fully paid-up shares of any denomination; (c) Sub-divide its shares, or any of them into shares of smaller amount than is fixed by the memorandum, so, however, that in the sub-division the proportion between the amount paid and the amount, if any, unpaid on each reduced share shall be the same as it was in the case of the share from which the reduced share is derived.; (d) Cancel any shares which as the date of the passing of the resolution, have not been taken or agreed to be taken by any person and diminish the amount of its share capital by the amount of the shares so cancelled. The resolution whereby any share is sub-divided may determine that, as between the holders of the shares resulting from such sub-division, one or more of such shares shall have some preference or special advantage as regards dividend, capital, voting or otherwise over or as compared with the others or other, subject, to the provisions of the Act. Subject to the provisions of Sections 66 of the Act, the Board may accept from any member the surrender on such terms and conditions as shall be agreed of all or any of his shares. The company may, by special resolution, reduce in any manner and with, and subject to, any incident authorised and consent required by law, --(a) its share capital; (b) any capital redemption reserve account; or (c) any share premium account.
☐	☒	36	•
☐	☒	37	•
☐	☒	38	•
			Capitalisation of profits
☐	☒		59. Capitalization of Profits(1) Any General Meeting of the Company may resolve that any amounts standing to the credit of the Free Reserve or Share Premium Account or the Capital Redemption Reserve Account or any moneys, investment or other assets forming part of the undivided profits including profits or surplus moneys arising from the realization and (when permitted by the law) from the appreciation in value of any capital assets of the Company standing to the credit of the General Reserve or any other Reserve or Reserve Fund or any other Fund of the Company or in



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the hands of the Company and available for dividend be capitalized:- (a) by the issue and distribution of shares, as fully paid-up, and to the extent permitted by the Act, debentures, debenture stock, bonds or other obligations of the Company; or (b) by crediting share of the Company, which may have been issued and are not fully paid-up, with the whole or any part of the sum remaining unpaid thereon; PROVIDED that any amounts standing to the credit of the Share Premium Account or the Capital Redemption Reserve Account shall be applied only in crediting the payment of capital on shares to be issued to Members as fully paid bonus shares (Further capitalization of reserve created by the revaluation of assets are not to be used for issuance of Bonus Shares as per section 63 of the Act). (2) Such issue and distribution under sub-clause (1) (a) of this Article and payment to the credit of unpaid share capital under sub-clause (1) (b) of this Article shall be made among and in favour of the Members or any class of them or any of them entitled thereto and in accordance with their respective rights and interests and in proportion to the amount of capital paid-up on the shares held by them respectively in respect of which such distribution or payment shall be made, on the footing that such Members become entitled thereto as capital. (3) The Directors shall give effect to any such resolution and for the said purpose the Board may settle any difficulty which may arise in regard to distribution as it thinks expedient including in regard to fractional entitlements, and shall apply such profits, General Reserve, other Reserve or any other Fund or account as aforesaid as may be required for the purpose of making payment in full on the shares, or other obligations of the Company so distributed under sub-clause (1) (a) of this Article or (as the case may be) for the purpose of paying, in whole or in part, the amount remaining unpaid on the shares which may have been issued and are not fully paid-up under sub-clause (1)(b) above. PROVIDED that no such distribution or payment shall be made unless recommended by the Directors, and, if so recommended, such distribution and payment shall be accepted by such Members as aforesaid in full satisfaction of their interest in the said capitalized fund. (4) For the purpose of giving effect to any such resolution, the Directors may settle any difficulty which may arise in regard to the distribution or payment as aforesaid as they think expedient, and, in particular, they may issue fractional certificates and may fix the value for distribution of any specific asset and may determine that any cash payment be made to any Members on the footing of the value so fixed and may vest any such cash, shares, debentures stock, bonds or other obligations in trustees upon such trusts for the persons entitled thereto as may seem expedient to the directors, and generally may make arrangement for the acceptance, allotment and sale of such shares, debentures, debentures stock, bonds or other obligations and fractional certificates or otherwise as they may think fit. (5) When deemed requisite, a proper contract shall be filed in accordance with the Act and the Board may appoint any person to sign such contract on behalf of the Members entitled as aforesaid. Subject to the provisions of the Act and these Articles, in cases where some of the shares of the Company are fully paid and others are partly paid, such capitalization may be effected by the distribution of further shares in respect of the fully paid shares and by crediting the partly paid shares with the whole or part of the unpaid liability thereon, but so that as between the holders of the fully paid shares and the partly paid shares, the sums so applied in the payment of such further shares and in the extinguishment or diminution of the



			liability on the partly paid shares shall be applied pro rata in proportion to the amount then already paid or credited as paid on the existing fully paid and partly paid shares respectively.
☐	☒	40	•
			Buy-back of shares
☐	☒	41	60. Buy Back of Shares Notwithstanding anything contained in these articles but subject to the provisions of sections 68 to 70 and any other applicable provision of the Act or any other law for the time being in force, the company may purchase its own shares or other specified securities.
			General meetings
☐	☒	42	61. Annual General MeetingThe Company shall in each year hold a General Meeting as its Annual General Meeting in addition to any other meeting in that year. All General Meetings other than Annual General Meetings shall be called Extraordinary General Meetings. If for any reason beyond the control of the Board, the general meeting (including an Annual General meeting) cannot be held on the appointed day, the Board shall have power to postpone the General meeting of which a notice should be given to the members. Every member of the Company shall be entitled to attend either in person or by proxy and the Auditor of the Company shall have the right to attend and to be heard at any General Meeting which he attends on any part of the business which concerns him as Auditor.62. Extraordinary General MeetingThe Board may, whenever it thinks fit, call an Extraordinary General Meeting of the Company. The Board? shall at the? requisition in writing by a Member or Members holding in the aggregate not less than one-tenth of such of the paid-up capital of the company on that date and carries the right of voting in regard to the matter in respect of which the requisition has been made.63. Requisition of Members to state object of MeetingAny valid requisition so made by Members must state the object or objects of the meeting proposed to be called, and must be signed by the requisitionists and deposited at the registered office of the company. PROVIDED that such requisition may consist of several documents in like form, each signed by one or more requisitionists.65. On receipt of requisition Directors to call meeting and in default requisitionists may do so Upon the receipt of any such requisition, the Board shall forthwith call an Extraordinary General Meeting, and if they do not proceed within twenty-one days from the date of the requisition being deposited at the Registered Office to cause a meeting to be called on a day not later than forty-five days from the date of deposit of the requisition, the requisitionists, or such of their number as represent either a majority in value of the paid-up share capital held by all of them or one-tenth of such of the paid-up share capital of the Company as is referred to in Section 100(2) of the Act, whichever is less, may themselves call the meeting, but in either case, any meeting so called shall be held within three months from the date of the deposit of the requisition, as aforesaid.66. Meeting called by requisitionistsAny meeting called under the foregoing Articles by the requisitionists shall be called in the same manner, as nearly as possible, as that in which meetings are to be called by the



			Board.67. Twenty-one days? notice of meeting to be givenA general meeting of a Company may be called by giving not less than clear twenty-one days? notice either in writing or through electronic mode in such a manner as may be prescribed, Every notice of a meeting shall specify the place, date, day and the hour of meeting, and shall contain statement of the business to be transacted at such meeting. And, The notice of every meeting shall be given to every member of the Company, Legal Representative of any deceased member or the assignee of an insolvent member, auditor or auditors of the Company and every director of the Company and all such persons as are under these Articles entitled to receive notice from the Company"Provided that a general meeting may be called after giving shorter notice than that specified in this sub-section if consent, in writing or by electronic mode, is accorded thereto (i) in the case of an annual general meeting, by not less than ninety-fiveper cent. of the members entitled to vote thereat; and(ii) in the case of any other general meeting, by members of the company?(a) holding, if the company has a share capital, majority in numberof members entitled to vote and who represent not less than ninety-fiveper cent. of such part of the paid-up share capital of the company as givesa right to vote at the meeting; or(b) having, if the company has no share capital, not less thanninty-five per cent. of the total voting power exercisable at that meeting: Provided further that where any member of a company is entitled to vote only on some resolution or resolutions to be moved at a meeting and not on the others, those members shall be taken into account for the purposes of this sub-section in respect of the former resolution or resolutions and not in respect of the latter."
☐	☒	43	•
			Proceedings at general meetings
☐	☒	44	
☐	☒	45	•
☐	☒	46	•
☐	☒	47	•
☐	☒	48	•
			Adjournment of meeting
☐	☒	49	83. Adjournment of Meeting (i) The Chairperson may, with the consent of any meeting at which a quorum is present, and shall, if so directed by the meeting, adjourn the meeting from time to time and from place to place.(ii) No business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place.(iii) When a meeting is adjourned for thirty days or more, notice of the adjourned meeting shall be given as in the case of an original meeting. (iv) Save as aforesaid, and as provided in section 103 of the Act, it shall not be necessary to give any notice of an adjournment or of the business to be transacted at an adjourned



		meeting.
		Voting rights
☐	☒	50 84. Members in arrears not to voteNo member shall be entitled to vote either personally or by proxy at any General Meeting or Meeting of a class of shareholders either upon a show of hands or upon a poll in respect of any shares registered in his name on which any calls or other sums presently payable by him have not been paid or in regard to which the Company has exercised any right of lien. 85. Number of votes to which Member Entitled? Subject to the provisions of these Articles and without prejudice to any special privileges or restrictions as to voting for the time being attached to any class of shares for the time being forming part of the capital of the Company, every Member shall be entitled to be present, and to speak and vote at such meeting by show of hand for which the Member present in person shall have one vote. On a poll taken at a meeting of a company, a member entitled to more than one vote, or his proxy, need not to use all his votes or cast in the same way all the votes he uses. 86. Votes by a Member entitled to more than one voteOn a poll taken at a meeting of the Company, a Member entitled to more than one vote by virtue of his share-holding or his proxy or other person entitled to vote for him, as the case may be, need not, if he votes, use all his votes or cast in the same way all the votes he uses and he may vote in different manner as he deems fit. 87. Vote of Member who is a minorIf any shareholder be a minor, the vote in respect of his share or shares shall be by his guardian, or any one of his guardians, if more than one, to be selected in case of dispute by the Chairman of the meeting. 88. Votes of Joint MembersIf there be joint registered holders of any shares, the vote of the senior who tenders a vote, whether in person or by proxy, shall be accepted to the exclusion of the votes of the other joint holders. For this purpose, seniority shall be determined by the order in which the names stand in the register of members. 89. Voting in person or by proxy or RepresentativeSubject to the provisions of these Articles, votes may be given either personally or by proxy. A body corporate being a Member may vote either by proxy or by a representative duly authorised in accordance with Section 113 of the Act and such representative shall be entitled to exercise the same rights and powers (including the right to vote by proxy) and by postal ballot, on behalf of the body corporate which he represents as that body could exercise if it were an individual Member of the Company. 90. Votes in respect of shares of DeceasedAny person entitled under the Transmission Clause to transfer any shares may vote at any General Meeting in respect thereof in the same manner as if he were the registered holder of such shares. PROVIDED that forty-eight hours at least before the time of holding the meeting or adjourned meeting, as the case may be, at which he proposes to vote he shall satisfy the Chairman of his right to transfer such shares and give such indemnity (if any) as the Chairman may require or the Chairman shall have previously admitted his right to vote at such meeting in respect thereof. 91. Time for objection to voteNo objection shall be made to the validity of any vote, except at the meeting or poll at which such vote was tendered, and every vote whether given personally or by proxy, not disallowed at such meeting or poll, shall be deemed valid for purposes of such meeting or poll whatsoever. 92. Chairman of the meeting to be the judge of the validity of any Vote The Chairman of



			any meeting shall be the sole judge of the validity of every vote tendered at such meeting. The Chairman present at the taking of a poll shall be the sole judge of the validity of every vote tendered at such poll.
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☐	☒	52	•
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☐	☒	56	•
			Proxy
☐	☒	57	93. Appointment of proxy A person can act as proxy on behalf of members not exceeding fifty and holding in the aggregate not more than ten percent of the total share capital of the company carrying voting rights: Provided that a member holding more than ten percent of the total share capital of the Company carrying voting rights may appoint a single person as proxy and such person shall not act as proxy for any other person or shareholder. Every proxy shall be appointed in writing under the hand of the Member or if such Member is a body corporate under the common seal of such corporation, or be signed by an appointer or his attorney duly authorised in writing. The proxy so appointed shall not have any right to speak at the meetings. 94. Deposit of instrument of Proxy etc. The instrument appointing a proxy and the power of attorney or other authority (if any), under which it is signed or a notarized copy of that power or authority, shall be deposited at the Registered Office of the Company not later than forty-eight hours before the time for holding the meeting at which the person named in the instrument proposes to vote, and in default, the instrument of proxy shall not be treated as valid. No instrument appointing a proxy shall be valid after the expiration of twelve months from the date of its execution. 95. Form of proxy An instrument appointing a proxy shall be in the form No. MGT-11 as prescribed in the rules made under section 105 of the Companies Act, 2013. 96. Proxy either for specified meeting or for a period An instrument of proxy may appoint a proxy either for the purpose of a particular meeting specified in the instrument and any adjournment thereof or it may appoint for the purpose of every meeting of the Company, or of every meeting to be held before a date specified in the instrument and every adjournment of any such meeting. 97. Validity of votes given by proxy notwithstanding death of Member A vote given in accordance with the terms of an instrument of proxy shall be valid, notwithstanding the previous death or insanity of the principal or the revocation of the proxy or of the authority under which the proxy was executed, or the transfer of the shares in respect of which the proxy is given. Provided that no intimation in writing of such death, insanity, revocation or transfer shall have been received by the company at its office before the commencement of the



			meeting or adjourned meeting at which the proxy is used.
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☐	☒	59	•
			Board of Directors
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☐	☒	62	•
☐	☒	63	•
☐	☒	64	•
☐	☒	65	•
☐	☒	66	•
			Proceedings of the Board
☐	☐	67	• The Board of Directors may meet for the conduct of business, adjourn and otherwise regulate its meetings, as it thinks fit. • A director may, and the manager or secretary on the requisition of a director shall, at any time, summon a meeting of the Board.
☐	☒	68	
☐	☒	69	•
☐	☒	70	•
☐	☒	71	•
☐	☒	72	•
☐	☒	73	•
☐	☒	74	•
☐	☒	75	•
☐	☒	76	•
			Chief Executive Officer, Manager, Company Secretary or Chief Financial Officer
☐	☒		• 127. CEO, MANAGER, CS AND CFO Subject to the provisions of the Act, --(i) A chief executive officer, manager, company secretary or



		77	chief financial officer may be appointed by the Board for such term, at such remuneration and upon such conditions as it may think fit; and any chief executive officer, manager, company secretary or chief financial officer so appointed may be removed by means of a resolution of the Board;(ii) A director may be appointed as chief executive officer, manager, company secretary or chief financial officer As per provisions of the Act or these regulations requiring or authorising a thing to be done by or to a director and chief executive officer, manager, company secretary or chief financial officer shall not be satisfied by its being done by or to the same person acting both as director and as, or in place of, chief executive officer, manager, company secretary or chief financial officer.
☐	☒	78	•
			The Seal
☐	☒	79	128. The Seal its custody and useThe Board shall provide a Common Seal for the purpose of the Company, and shall have power, from time to time, to destroy the same and substitute a new Seal in lieu thereof, and the Board shall provide for the safe custody of the Seal for the time being, and the seal shall never be used except on the authority of the Board or by Committee of the Board as authorised.'129. Deeds how executedEvery deed or other instrument, to which the Seal of the Company is required to be affixed, shall unless the same is executed by a duly constituted attorney issued under the seal; be signed by two Directors or one Director and Secretary or some other person authorised by the Board for the purpose: PROVIDED that in respect of the Share Certificate, the Seal shall be affixed in accordance with Article as mentioned? above.
			Dividends and Reserve
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☐	☒	81	•
☐	☒	82	•
☐	☒	83	•
☐	☒	84	•
☐	☒	85	•
☐	☒	86	•
☐	☒	87	•
☐	☒	88	•
			Accounts



✓			
	89		• 142. Directors to keep true accounts(a) Every company shall prepare and keep at its? registered office including its branch office or offices or at such other place in India as the Board thinks fit, Books of Accounts and other relevant books and papers and financial statement for every financial year which give a true and fair view of the state of the affairs of the company in accordance with Section 128 of the Act with respect to-(i) all sums of money received and expended by the Company and the matters in respect of which the receipts and expenditure take place;(ii) all sales and purchases of goods by the Company;(iii) the assets and liabilities of the Company.(iv) state of affairs of the company.(b) Where the Board decides to keep all or any of the Books of Account at any place other than the Office of the Company, the Company shall within seven days of the decision file with the Registrar a Notice in writing giving the full address of that other place in accordance with Section 128 of the Act.(c) The company may keep such books of account or other relevant papers in electronic mode in such manner as may be prescribed.(d) The Company shall preserve in good order the Books of Account relating to a period of not less than eight financial years immediately preceding a financial year.? The books of account and other relevant books and papers maintained in electronic mode shall remain accessible in India so as to be usable for subsequent reference together with the vouchers relevant to any entry in such Books of Account.143. Inspection of accounts or record by membersNo Member (not being a director) shall have any right of inspecting any account or books or documents of the Company except as conferred by Section 94 of the Act or authorised by the Board or by the company in general meeting.The Board may determine whether and to what extent and at what time and place and under what conditions or regulations the accounts and books of the Company or any of them may be open to inspection of the Members. Notwithstanding anything to the contrary contained hereinabove, the authorised representative of Promoters shall have a right to inspect the accounts books, plant, facility, documents, records, premises, equipment and machinery and all other property of the Company at convenient time(s), after giving advance notice to the Company.144. Statement of Accounts to be furnished to General Meeting? The Directors shall, from time to time, in accordance with Sections 129 and 134 and other applicable provisions of the Act, cause to be prepared and to be laid before the Company in General Meeting, such Balance Sheets, Profit and Loss Accounts and Reports as are required by these Sections.145. Copies shall be sent to each MemberWithout prejudice to the provisions of Section 101 and subject to the provisions of Section 136 of the Act, a copy of the financial statements, including consolidated financial statements, auditors? report and every other document required by law to be annexed or attached to the Balance Sheet shall at least twenty-one days before the General Body Meeting at which the same are to be laid before the members, be sent to the members of the company, to every trustee for every holder of any debenture issued by the company and to all persons other than such members or trustee, being the person so entitled to attend the General Body Meeting.146. Copy of financial statement to be filed with registrar The Company shall comply with Section 137 of the Act as to filing copies of the Balance Sheet and Profit and Loss Account and documents required to be annexed or attached thereto with the Registrar.

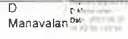
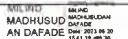


			Winding up
☐	☒	90	147. Procedure for winding up If the Company shall be wound up and the assets available for distribution among the members as such shall be insufficient to repay the whole of the paid up capital such assets shall be distributed so that as nearly as may be the losses shall be borne by the members in proportion to the capital paid up or which ought to have been paid up at the commencement of the winding-up on the shares held by them respectively. And if in a winding-up the assets available for distribution among the members shall be more than sufficient to repay the whole of the capital paid up at the commencement of the winding-up, the excess shall be distributed amongst the members in proportion to the capital at the commencement of the winding-up paid up or which ought to have been paid up on the shares held by them respectively. But this Article is to be without prejudice to the rights of the holders of shares issued upon special terms and conditions. If the Company shall be wound up, whether voluntarily or otherwise, the liquidators may, with the sanction of a Special Resolution, divide among the contributions, in specie or kind, any part of the assets of the Company and may, with the like sanction, vest any part of the assets of the Company in Trustees upon such trusts for the benefit of the contributories, or any of them, as the liquidators, with the like sanction, shall think fit.
			Indemnity
☐	☒	91	148. Officers to be indemnified Subject to provisions of the Act, every Officer of the company shall be indemnified out of the assets of the Company against any liability incurred by him in defending any proceedings, whether civil or criminal, in which judgment is given in his favour or in which he is acquitted or in which relief is granted to him by the court or the Tribunal. Provided that if such person is proved to be guilty, the premium paid on such insurance shall be treated as part of the remuneration.
			Others
☐	☒	92	

Subscriber Details

S. No.	Subscriber Details				
	*Name, Address, Description and Occupation	DIN / PAN / Passport number	*Place	DSC	Dated
1	M/s PFC Consulting Limited having its registered office at Urjanidhi, 1, Barakhamba Lane, Connaught Place, New Delhi-110001 Through Sh. Sachin Arora S/o Sh. Prem Lal Arora R/o F5 1903, Supertech Eco Village 1, Near Park, Greater Noida ? 201301	AKGPA1434J	New Delhi	SACHIN Arora ARORA Date: 2023.06.20 15:42:58 +05:30	19/06/2023



	(as authorized representative of PFC Consulting Limited)				
2	DHARUMAN MANAVALAN S/o Sh. Pamandi Chinnian Dharuman R/o A-703, Saheta Apartment, Plot No. 30, Dwarka, Sector-4, South West Delhi, Delhi-110078 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08102722	New Delhi	 Dharuman Manavalan Date: 2023.06.20 15:32:41 +0530	19/06/2023
3	MANOJ KUMAR RANA S/o Sh. Sube Singh R/o A-32/E, DDA Flats, Munirka, New Delhi-110067 (As a Nominee of PFC Consulting Limited) Occupation:- Service	02263302	New Delhi	 Manoj Kumar Rana Date: 2023.06.20 15:32:41 +0530	19/06/2023
4	MILIND MADHUSUDAN DAFADE S/o Sh. Madhusudan Gurinath Dafade R/o Aishwaryam Appt., Flat C-31, Sec-4, Plot No. 17, Dwarka, New Delhi-110078 (As a Nominee of PFC Consulting Limited) Occupation:- Service	09587967	New Delhi	 MILIND MADHUSUDAN DAFADE Date: 2023.06.20 15:41:19 +0530	19/06/2023
5	NEERAJ SINGH S/o Sh. Dayashankar Singh R/o Flat C-703, The Crescent Apartment, Plot F-2, Sector-50, Noida, Gautam Budh Nagar, UP-201301 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08613892	New Delhi	 Neeraj Singh Date: 2023.06.20 15:40:14 +0530	19/06/2023
6	SANJAY KUMAR NAYAK S/o Sh. Jagabandhu Nayak R/o K 713, Jalvayu Tower, Sector 56 Gurgaon- Haryana 122011 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08197193	New Delhi	 Sanjay Kumar Nayak Date: 2023.06.20 15:42:17 +0530	19/06/2023
7	SACHIN SHUKLA S/o Sh. Raj Kumar Shukla R/o 4th Floor, House No. 6, H1 Block, Good Earth City Centre, south City 2, Gurgaon - 122018 (As a Nominee of PFC Consulting Limited) Occupation:- Service	08613963	New Delhi	 Sachin Shukla Date: 2023.06.20 15:41:02 +0530	19/06/2023

Signed before me

Name Prefix (ACA/FCA/ACS/ FCS/ACMA/ FCMA)	*Name of the witness	*Address, Description and Occupation	*DIN / PAN / Passport number / Membership		DSC	Dated
FCS	Nareish Kumar Sinha	121, Vinayak Apartment, C58/19, Sector-62, Noida-201307, UP	1807	New Delhi	1807	19/06/2023



NARESH

Digitally signed by NARESH

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