

**Amendment - XX dated 08.07.2021 on the Request for Proposal for selection of Transmission Service Provider (TSP) through tariff based competitive bidding process to establish transmission system for Transmission System for evacuation of power from RE Projects in Osmanabad area (1 GW) in Maharashtra through tariff based competitive bidding process**

Sl. No.	Name of the Document	Existing Provision	Revised Provision
1.	RFP Annexure-B Technical Specifications of Transmission System	<p><b>5.0</b></p> <p>A) For power line crossing of 400 kV or above voltage level, large angle &amp; dead end towers (i.e. D/DD/QD) shall be used on either side of power line crossing.</p> <p>B).....</p> <p>C).....</p>	<p><b>5.0</b></p> <p>A) For power line crossing of 400 kV or above voltage level, large angle &amp; dead end towers (i.e. D/DD/QD) shall be used on either side of power line crossing.</p> <p>B).....</p> <p>C).....</p> <p><b><u>D) For crossing of railways, national highways and state highways, the rules / regulations of appropriate authorities shall be followed.</u></b></p>
2.	RFP Annexure-B Technical Specifications of Transmission System	<p><b>8.0</b> All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and conductor shall be as per Central Electricity Authority (Measures Relating to Safety &amp; Electric Supply) Regulations as amended from time to time and IS: 5613.</p> <p><b><u>The minimum live metal clearances for 400 kV D/c transmission lines shall be considered as follows:</u></b></p> <p><b><u>(i) Under stationary conditions:</u></b></p> <p>From tower body: 3.05m</p> <p><b><u>(ii) Under Swing conditions</u></b></p>	<p><b>8.0</b> All electrical clearances including minimum live metal clearance, ground clearance and minimum mid span separation between earth wire and conductor shall be as per Central Electricity Authority (Measures Relating to Safety &amp; Electric Supply) Regulations as amended from time to time and IS: 5613.</p> <p><b><u>Minimum live metal clearances for 400 kV line:</u></b></p> <p>a). (i) Under stationary conditions:</p> <p>From tower body: 3.05m</p> <p>a). (ii) Under Swing conditions</p>

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3.	RFP Annexure-B Technical Specifications of Transmission System	<b>13.0</b> Multi-circuit (4 circuits) towers shall be used for the LILO portion.	<b>13.0</b> Multi-circuit (4 circuits) towers shall be used for the LILO portion. <b><u>400kV towers shall be designed for reliability level 2.</u></b>												
4.	RFP Annexure-B Technical Specifications of Transmission System	<b><u>14.0 Pile foundation shall be used for towers located in the river bed, or on river banks or in areas where river flow or river course is anticipated to change based on previous years' hydrology data.</u></b>	<b><u>14.0 Pile type foundation shall be used for towers located in river or creek bed or on bank of river having scourable strata or in areas where river flow or change in river course is anticipated, based on detailed soil investigation and previous years' maximum flood discharge of the river, maximum velocity of water, highest flood level, scour depth &amp; anticipated change in course of river based on river morphology data of at least past 20 years to ensure availability and reliability of the transmission line.</u></b>												
5.	RFP Annexure-B Technical Specifications of	<b>New Insertion</b>	<b><u>16.0 The transmission lines shall be designed with porcelain disc insulators or porcelain long rod insulators / Composite Long rod Insulators/ Glass insulators with the specific creepage distance required as per Site</u></b>												

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	Transmission System		<p align="center"><b><u>Pollution Severity level in the concerned area.</u></b></p> <p><b><u>17.0 Wherever, transmission lines are passing through coastal/ creek regions, the fabricated tower parts and stubs shall have a minimum overall zinc coating of 900 gram/sq m of surface area except for plates and sections below 5mm which shall have a minimum overall zinc coating of 610 gram/ sqm of surface area. The average zinc coating for all sections and plates 5mm and above shall be maintained as 127 microns and that for plates and sections below 5mm shall be maintained as 87 microns.</u></b></p> <p><b><u>18.0 For foundation in creek or aggressive soil areas, Concrete of M30 Grade design Mix conforming to IS 456 and epoxy coated reinforcement as per IS 13620 shall be used.</u></b></p> <p><b><u>19.0 For the transmission lines to be laid within 50 Kms of the border of the two wind zones specified in the Wind Map, towers shall be designed for the higher of the two wind zones.</u></b></p>
6.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION</b></p> <p>The proposed <b><u>new substation</u></b> shall be conventional AIS type generally conforming to the requirement of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2010, as amended from time to time.</p>	<p><b>SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION</b></p> <p>The proposed <b><u>400/220kV substation near Kallam PS</u></b> shall be conventional AIS type generally conforming to the requirement of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2010, as amended from time to time.</p>

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8.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>1.2 Switching Scheme</b></p> <p>The switching schemes, as mentioned below, shall be adopted at various voltage levels of substation / switchyard:</p> <p>.....</p> <p>i. ....</p> <p>ii. <u>Transformers and Bus reactor of same HV rating shall be placed in different diameters.</u></p>	<p><b>Switching Scheme</b></p> <p>The switching schemes, as mentioned below, shall be adopted at various voltage levels of substation / switchyard:</p> <p>.....</p> <p>i. ....</p> <p>ii. <u>Transformers and bus reactors of same HV rating shall be placed in different diameters (i.e transformers of same HV rating shall not be in the same diameter and similarly bus reactors of same HV rating shall also not be in the same diameter).</u></p>
9.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.1 400/220kV, 3-Phase Transformer</b></p> <p><u>Transformer shall conform to IEC 60076 in general. The 500 MVA transformers shall be designed based on design of dynamic short circuit tested 315 MVA or 500 MVA transformers. 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 shall be considered not connected to source. The maximum short circuit output current at the tertiary terminals shall be limited to a safe value to make the transformer short circuit</u></p>	<p><b>2.1 400/220kV, 3-Phase Transformer</b></p> <p><u>500MVA 400/220/33kV 3 Phase transformer shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above)" available on CEA website.</u></p>

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		<p><u>proof. The Tertiary winding shall be designed to withstand mechanical and thermal stresses due to dead short circuit on its terminals. However, the cooling for continuous thermal rating of the tertiary winding shall be for at least 5 MVA capacity.</u></p> <p><u>Core shall be constructed from non-ageing, cold rolled high permeability grade or better grain oriented silicon steel laminations with requisite BIS certification. 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 5 seconds</u></p> <p><u>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 from HV &amp; 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/IV, HV/LV and IV/LV impedances.</u></p>	

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		<p><u>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 110 deg C, considering maximum ambient temperature of 50 Deg. C</u></p> <p><u>The transformer shall be complete with all required accessories, Bushing CTs, cooler control cabinet, individual and common marshalling box, etc as required for satisfactory operations of transformer. Remote tap changer control and monitoring system including parallel operation of transformers shall be carried out using Bay control unit or digital RTCC relay (IEC 61850 compliant) through Substation Automation System.</u></p> <p><u>Neutral of the transformer shall be solidly grounded.</u></p> <p><u>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.</u></p> <p><u>The major technical particulars/parameters of 3-phase,</u></p>	

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b)	<u>Maximum Loss rated at Load current and 75<sup>0</sup> C</u>	<u>kW</u>	<u>500</u>																																																								

**Amendment - XX dated 08.07.2021 on the Request for Proposal for selection of Transmission Service Provider (TSP) through tariff based competitive bidding process to establish transmission system for Transmission System for evacuation of power from RE Projects in Osmanabad area (1 GW) in Maharashtra through tariff based competitive bidding process**

Sl. No.	Name of the Document	Existing Provision			Revised Provision
		c)	<u>Max I<sup>2</sup>R loss at rated current and frequency and at 75<sup>0</sup> C for HV and IV windings</u>	<u>kW</u>	<u>375</u>
		d)	<u>Maximum Auxiliary Loss at rated voltage and frequency</u>	<u>kW</u>	<u>15</u>
		9.	<u>Max. Temperature rise over 50 deg C ambient Temp</u>	<u>Deg. C</u>	<u>Top oil: 45 &amp; Winding: 50</u>
		10.	<u>Windings</u>		
		i)	<u>Insulation Level (LI/SI/PF)</u>		<u>kVp/kVp/kVrms</u>
		a)	<u>HV</u>		<u>1300/1050/570</u>
		b)	<u>IV</u>		<u>950/-/395</u>
		c)	<u>LV</u>		<u>250/-/95</u>
		d)	<u>Neutral</u>		<u>95/-/38</u>
		ii)	<u>Tan delta of winding</u>	<u>%</u>	<u>&lt; 0.5</u>
		11.	<u>Tap Changer &amp; Tappings</u>		<u>OLTC with range ±10% for HV variation in the step of 1.25%, on common end of series winding</u>
		12.	<u>Maximum Partial discharge (PD) level at 1.58*Ur/√3</u>	<u>pC</u>	<u>100</u>
		13.	<u>Noise level at rated voltage and at principal tap at no load and all cooling active</u>	<u>dB</u>	<u>&lt; 80</u>
		14.	<u>Bushing</u>		
		i)	<u>Rated voltage (HV/IV/LV/Neutral)</u>	<u>kV</u>	<u>420/245/52/36</u>

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Sl. No.	Name of the Document	Existing Provision	Revised Provision																																				
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10.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.2 420kV, 3-Phase, Shunt Reactor</b></p> <p><u>Reactor shall conform to IEC 60076-6 in general. The reactor shall be designed to withstand the over-voltages repeatedly without risk of failure at 1.05 Ur continuously, 1.25 Ur for 1 minute and 1.50 Ur for 5 seconds (where Ur is 420kV). The reactors shall be designed for switching surge overvoltage of 2.5 p.u. and temporary overvoltage of 2.3 p.u. for few cycles followed by power frequency overvoltage up to 1.5 p.u. The reactor must withstand the stress due to above transient dynamic conditions which may cause additional current flow as a result of changed saturation characteristics/slope beyond 1.5 p.u. voltage.</u></p>	<p><b>2.2 420kV, 3-Phase, Shunt Reactor</b></p> <p><u>125 MVar, 420 kV, 3-Phase Shunt Reactor shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above)" available on CEA website.</u></p>																																				

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Sl. No.	Name of the Document	Existing Provision	Revised Provision															
		<p><u>The reactor shall be of gapped core type construction. The impedance ratio (X0/X1) specified shall be achieved by adopting either single phase construction in separate tanks or three phase with 3 limb or 5 limb core construction. Core shall be constructed from non-ageing, cold rolled grain oriented silicon steel laminations with requisite BIS certification.</u></p> <p><u>Shunt Reactors shall be capable of operating continuously at a voltage 5% higher than their rated voltage without exceeding winding and tank hot spot temperature 140 Deg and 110 Deg Celsius respectively, considering maximum ambient temperature as 50 Deg C.</u></p> <p><u>The reactor shall be complete with all required accessories, Bushing CTs, marshalling box etc as required for satisfactory operations of reactor. HV and Neutral bushings shall be RIP (Resin Impregnated Paper) / RIS (Resin Impregnated Synthetic) with composite insulator type.</u></p> <p><u>The Technical Particulars / Parameters of 3-phase, 125 MVAR, 420 kV and 3-phase 50 MVAR, 420 kV Shunt Reactor are given below:</u></p> <table border="1" data-bbox="421 1222 1225 1437"> <thead> <tr> <th>S. No</th> <th>Description</th> <th>Unit</th> <th colspan="2">Technical Parameters</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td><u>Rated Capacity at 420kV</u></td> <td><u>MVAR</u></td> <td><u>125</u></td> <td><u>50</u></td> </tr> <tr> <td>2.</td> <td><u>Rated Voltage (Ur)</u></td> <td><u>kV</u></td> <td colspan="2"><u>420</u></td> </tr> </tbody> </table>	S. No	Description	Unit	Technical Parameters		1.	<u>Rated Capacity at 420kV</u>	<u>MVAR</u>	<u>125</u>	<u>50</u>	2.	<u>Rated Voltage (Ur)</u>	<u>kV</u>	<u>420</u>		
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Sl. No.	Name of the Document	Existing Provision			Revised Provision
			<u>(1.0 pu)</u>		
		3.	<u>Number of phases</u>		<u>3 (three)</u>
		4.	<u>Connection</u>		<u>Star</u>
		5.	<u>Cooling type</u>		<u>ONAN</u>
		6.	<u>Frequency</u>	<u>Hz</u>	<u>50</u>
		7.	<u>Reference standard</u>		<u>IEC 60076-6</u>
		8.	<u>Service</u>		<u>Outdoor</u>
		9.	<u>Permissible unbalance current among phases</u>	<u>%</u>	<u>±2%</u>
		10.	<u>Crest value of third harmonic content in phase current at rated voltage with sinusoidal wave form</u>	<u>%</u>	<u>≤ 3% of the crest value of fundamental</u>
		11.	<u>Range of constant impedance</u>		<u>Up to 1.5 p.u voltage (However, complete saturation characteristics of the Reactors upto 2.5 p.u. Voltage shall be</u>

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Sl. No.	Name of the Document	Existing Provision			Revised Provision
				<u>furnished)</u>	
		12.	<u>Tolerance on current</u>	%	<u>0 to +5%</u>
		13.	<u>Ratio of zero sequence reactance to positive reactance (X0/X1)</u>		<u>Between 0.9 &amp; 1.0.</u>
		14.	<u>Temperature rise over 50 °C Ambient Temp. at 420 kV</u>		
		i)	<u>Top oil measured by thermometer</u>	°C	<u>40</u>
		ii)	<u>Average winding measured by resistance method</u>	°C	<u>45</u>
		15.	<u>Winding hot spot temperature rise over yearly weighted average temperature of 32 °C</u>	°C	<u>61</u>
		16.	<u>Max. tank surface temperature</u>	°C	<u>110</u>

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Sl. No.	Name of the Document	Existing Provision			Revised Provision	
		17.	<u>Max design ambient temperature</u>	<u>°C</u>	<u>50</u>	
		18.	<u>Windings</u>			
		i)	<u>Lightning Impulse withstand Voltage</u>			
			<u>Line end</u>	<u>kV<sub>p</sub></u>	<u>1300</u>	
			<u>Neutral</u>	<u>kV<sub>p</sub></u>	<u>550</u>	
		ii)	<u>Chopped Wave Lightning Impulse Withstand Voltage</u>			
			<u>Line end</u>	<u>kV<sub>p</sub></u>	<u>1430</u>	
		iii)	<u>Switching Impulse withstand Voltage at Line end</u>	<u>kV<sub>p</sub></u>	<u>1050</u>	
		iv)	<u>One Minute Power Frequency withstand Voltage</u>			
			<u>Neutral</u>	<u>kV<sub>rms</sub></u>	<u>230</u>	
		19.	<u>Tan-delta of windings</u>		<u>&lt; 0.005</u>	
		20.	<u>Neutral earthing</u>		<u>Solidly Earthed</u>	

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Sl. No.	Name of the Document	Existing Provision			Revised Provision
		21.	<u>Whether neutral brought out</u>		<u>Yes (through 145kV class bushing)</u>
		22.	<u>Bushing</u>		
		i)	<u>Rated voltage</u>		
			<u>Line bushing</u>	<u>kV</u>	<u>420</u>
			<u>Neutral bushing</u>	<u>kV</u>	<u>145</u>
		ii)	<u>Rated current</u>		
			<u>Line bushing</u>	<u>A</u>	<u>800</u>
			<u>Neutral bushing</u>	<u>A</u>	<u>800</u>
		iii)	<u>Lightning Impulse withstand Voltage</u>		
			<u>Line bushing</u>	<u>kV<sub>p</sub></u>	<u>1425</u>
			<u>Neutral bushing</u>	<u>kV<sub>p</sub></u>	<u>650</u>
		iv)	<u>Switching Impulse withstand Voltage of Line bushing</u>		<u>1050</u>
		v)	<u>1minute power frequency withstand of bushings (dry)</u>		
			<u>Line bushing</u>	<u>kV rms</u>	<u>695</u>

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Sl. No.	Name of the Document	Existing Provision			Revised Provision
			<u>Neutral bushing</u>	<u>kV rms</u>	<u>305</u>
		vi)	<u>Minimum creepage distance</u>		<u>(Specific Creepage Distance: of 25mm/kV corresponding to highest line to line voltage)</u>
			<u>Line bushing</u>	<u>mm</u>	<u>10500</u>
			<u>Neutral bushing</u>	<u>mm</u>	<u>3625</u>
		vii)	<u>Partial discharge of bushings at Ur (line end and neutral)</u>	<u>pC</u>	<u>&lt; 10</u>
		23.	<u>Maximum partial discharge level at <math>1.58U_r/\sqrt{3}</math></u>	<u>pC</u>	<u>100</u>
		24.	<u>Vibration and tank stress at rated voltage</u>		<u>Max <math>\leq 200</math>microns peak to peak</u> <u>Average <math>\leq 60</math>microns peak to peak</u> <u>Tank stress: <math>\leq 2.0</math>kg/sq.mm at any point of tank</u>
		25.	<u>Maximum noise</u>	<u>dB</u>	<u>80</u>

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Sl. No.	Name of the Document	Existing Provision				Revised Provision
			<u>pressure level at rated voltage &amp; frequency</u>			<p align="center"><b><u>Neutral Grounding Reactor (NGR) and Surge Arrester for 400kV Line Reactors (as applicable)</u></b></p> <p><b><u>The neutral of the line reactors (wherever provided) shall be grounded through adequately rated Neutral Grounding Reactors (NGR) to facilitate single phase auto-reclosure, provided that the NGR shall be provided with bypass arrangement through a breaker so that the line reactor can be used as Bus reactor as and when required. The neutral of bus reactor shall be solidly grounded.</u></b></p>
26.	<b><u>Maximum Permissible Losses of Reactor at rated current and frequency and at 75°C</u></b>		<b><u>Total loss</u></b>	<b><u>I<sup>2</sup>R Loss</u></b>		
i)	<b><u>125MVAr 420kV</u></b>	<b><u>kW</u></b>	<b><u>160</u></b>	<b><u>90</u></b>		
ii)	<b><u>50MVAr 420 kV</u></b>	<b><u>kW</u></b>	<b><u>85</u></b>	<b><u>45</u></b>		
27.	<b><u>Insulating oil</u></b>		<b><u>Unused inhibited or uninhibited transformer oil conforming to IEC-60296:2012</u></b>			
<p><b><u>The neutral of shunt reactor shall be insulated to 550 kVp for lightning impulse. The neutral of the line reactors (wherever provided) shall be grounded through adequately rated Neutral Grounding Reactors (NGR) to facilitate single phase auto-reclosure, provided that the NGR shall be provided with bypass arrangement through a breaker so that the line reactor can be used as Bus reactor as and</u></b></p>						

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Sl. No.	Name of the Document	Existing Provision	Revised Provision
		<p><u>when required. The neutral of bus reactor shall be solidly grounded.</u></p> <p><u>Neutral Grounding Reactor (NGR) and Surge Arrester for 400kV Line Reactors</u></p> <p><u>NGR can be oil filled or air core type. Oil filled NGR shall be rated for continuous current of 10A and short time current of 60A r.m.s for 10 seconds while air core NGR shall be rated for continuous current of 20A and short time current of 240A r.m.s for 60 seconds. However, the air core NGR shall be designed for a short time current of 600 Amp r.m.s to ensure mechanical robustness. It shall be solidly connected between neutral of shunt reactor and earth. The air core NGR shall be mounted on support structure (nonmagnetic material) high above ground level (2.55 meter) to allow free and safe access at ground level for personnel.</u></p> <p>The surge arresters <b>(rated voltage 120kV)</b> shall be provided &amp; physically located between the neutral of shunt reactor (brought out at 145kV class bushing) and neutral grounding reactor. The surge arresters shall be of heavy duty station class gapless Metal oxide (ZnO) type conforming in general to IEC-60099-4. Arresters shall be hermetically sealed units, of self-supporting construction, suitable for mounting on structures.</p>	<p><u>NGR shall be oil filled or a dry type air core for outdoor application. NGR shall conform to CEA's "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV and above)" available on CEA website. Technical parameters of NGR shall be as specified in Annexure-A of above mentioned documents.</u></p> <p>The surge arresters <b>(rated voltage of arrester in coordination with ohmic value of NGR shall be decided by the TSP)</b> shall be provided &amp; physically located between the neutral of shunt reactor (brought out at 145kV class bushing) and neutral grounding reactor. The surge arresters shall be of heavy duty station class gapless Metal oxide (ZnO) type conforming in general to IEC-60099-4. Arresters shall be hermetically sealed units, of self-supporting construction, suitable for mounting on structures.</p>
11.	SPECIFIC TECHNICAL REQUIREME	<p><b>2.3 Circuit Breakers (AIS)</b></p> <p>The circuit breakers and accessories shall conform <u>to</u> IEC:</p>	<p><b>2.3 Circuit Breakers (AIS)</b></p> <p>The circuit breakers and accessories shall conform <u>with</u> IEC: 62271-</p>

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Sl. No.	Name of the Document	Existing Provision	Revised Provision
	NTS FOR SUBSTATION	62271-100, IEC: 62271-1 and shall be of SF6 Type. The circuit breakers shall be of class C2-M2 (as per IEC) with regard to restriking probability during capacitive current breaking and mechanical endurance. The rated break time shall not exceed 40 ms for 400kV circuit breakers and 60 ms for 220kV circuit breakers. <b>400kV and 220kV</b> 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 be provided with pre insertion closing resistor of about 400 ohms maximum with 8 ms minimum insertion time or Controlled Switching Device. 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 controlled switching device shall be provided in 400kV Circuit breaker of switchable line reactor <b>bay</b> and in Main & Tie <b>bay</b> circuit breakers of line with non-switchable line reactors, Bus reactors and Transformers.	100, IEC: 62271-1 and shall be of SF6 Type. The circuit breakers shall be of class C2-M2 (as per IEC) with regard to restriking probability during capacitive current breaking and mechanical endurance. The rated break time shall not exceed 40 ms for 400kV circuit breakers and 60 ms for 220kV circuit breakers. 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 be provided with pre insertion closing resistor of about 400 ohms maximum with 8 ms minimum insertion time or Controlled Switching Device. 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 controlled switching device shall be provided in 400kV Circuit breaker of switchable line reactor and in Main & Tie circuit breakers of line with non-switchable line reactors <b>and</b> Bus reactors.
12.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.4 Isolators (AIS)</b></p> <p>The isolators shall comply <b>to</b> IEC 62271-102 in general. 400 kV and 220kV Isolators shall be double break type. All Isolators and earth switches shall be motor operated. Earth switches shall be provided at various locations to facilitate maintenance. Isolator rated for 400kV and 220kV shall be of extended mechanical endurance class-M2 and suitable for bus transfer current switching duty. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. 400kV and 220kV earth switch for line isolator shall be suitable for induced current switching duty as defined for Class- B.</p>	<p><b>2.4 Isolators (AIS)</b></p> <p>The isolators shall comply <b>with</b> IEC 62271-102 in general. 400 kV and 220kV Isolators shall be double break type. All Isolators and earth switches shall be motor operated. Earth switches shall be provided at various locations to facilitate maintenance. Isolator rated for 400kV and 220kV shall be of extended mechanical endurance class-M2 and suitable for bus transfer current switching duty. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. 400kV and 220kV earth switch for line isolator shall be suitable for induced current switching duty as defined for Class-B.</p>

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Sl. No.	Name of the Document	Existing Provision	Revised Provision
13.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.5 Current Transformers (AIS)</b></p> <p>Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps only. Generally, Current Transformers (CT) for 400kV shall have six cores (four for protection and two for metering). 220kV Current Transformers shall have five cores (four for protection and one for metering). 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. The rated burden of cores shall be closer to the maximum burden requirement of metering &amp; protection system (not more than 20 VA for metering core) for better sensitivity and accuracy. The instrument security factor shall be less than 5.</p>	<p><b>2.5 Current Transformers (AIS)</b></p> <p>Current Transformers shall comply with IEC 61869 in general. All ratios shall be obtained by secondary taps only. Generally, Current Transformers (CT) for 400kV shall have six cores (four for protection and two for metering). 220kV Current Transformers shall have five cores (four for protection and one for metering). 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. The rated burden of cores shall be closer to the maximum burden requirement of metering &amp; protection system (not more than 20 VA for metering core) for better sensitivity and accuracy. The instrument security factor shall be less than <u>5 for CTs upto 400kV voltage class.</u></p>
14.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.6 Capacitor Voltage Transformers (AIS)</b></p> <p>Capacitive Voltage transformers shall comply <u>to</u> IEC 61869 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 it 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. The rated burden of cores shall be closer to the maximum burden requirement of metering &amp; protection system (not more than 50VA for metering core) for better sensitivity and accuracy.</p>	<p><b>2.6 Capacitor Voltage Transformers (AIS)</b></p> <p>Capacitive Voltage transformers shall comply <u>with</u> IEC 61869 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 it 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. The rated burden of cores shall be closer to the maximum burden requirement of metering &amp; protection system (not more than 50VA for metering core) for better sensitivity and accuracy.</p>

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Sl. No.	Name of the Document	Existing Provision	Revised Provision
15.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.7 Surge Arresters(AIS)</b></p> <p><u>336kV &amp; 216kV Station class, heavy duty gapless type Surge arresters conforming to IEC 60099-4 in general shall be provided for 420kV &amp; 245kV systems respectively. The rated voltage of Surge arrester and other characteristics are chosen in accordance with system requirements.</u> Surge arresters shall be provided near line entrances, transformers &amp; Reactor so as to achieve proper insulation coordination. Surge Arresters shall be provided with porcelain/ polymer housing fitted with pressure relief devices. A leakage current monitor with surge counter shall be provided with each surge arrester.</p>	<p><b>2.7 Surge Arresters(AIS)</b></p> <p><u>336kV Station High (SH type) class gapless type Surge arresters &amp; 216kV Station Medium (SM type) class gapless type Surge arresters conforming to IEC 60099-4 in general shall be provided for 420kV &amp; 245kV systems respectively. Other characteristics of Surge arrester shall be chosen in accordance with system requirements.</u> Surge arresters shall be provided near line entrances, transformers &amp; Reactor so as to achieve proper insulation coordination. Surge Arresters shall be provided with porcelain/ polymer housing fitted with pressure relief devices. A leakage current monitor with surge counter shall be provided with each surge arrester.</p>
16.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>2.8 Protection Relaying &amp; Control System</b></p> <p>.....</p> <p><b>b) Auto Transformer Protection</b></p> <p>These shall have the following protections:</p> <p>.....</p> <p>iii) Numerical Back-up Over -current and earth fault protection on HV &amp; <b>MV</b> side</p> <p>iv) Numerical Over fluxing protection on HV &amp; <b>MV</b> side</p> <p>.....</p>	<p><b>2.8 Protection Relaying &amp; Control System</b></p> <p>.....</p> <p><b>b) Auto Transformer Protection</b></p> <p>These shall have the following protections:</p> <p>.....</p> <p>iii) Numerical Back-up Over -current and earth fault protection on HV &amp; <b>IV</b> side</p> <p>iv) Numerical Over fluxing protection on HV &amp; <b>IV</b> side</p> <p>.....</p>

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Sl. No.	Name of the Document	Existing Provision	Revised Provision
17.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>3.1 AC &amp; DC power supplies</b></p> <p>For catering the requirements of three phase &amp; single phase AC supply and DC supply for various substation equipment, the following arrangement is envisaged:-</p> <p>.....</p> <p>iv) At new Substation, one no. of DG set (<b><u>minimum 500 kVA for substations with highest voltage rating as 765kV and minimum 250kVA for substations with highest voltage rating as 400kV</u></b>) shall be provided for emergency applications.</p> <p>v) .....</p> <p><b><u>vi) For substation extensions, existing facilities shall be augmented as required.</u></b></p>	<p><b>3.1 AC &amp; DC power supplies</b></p> <p>For catering the requirements of three phase &amp; single phase AC supply and DC supply for various substation equipment, the following arrangement is envisaged. <b><u>However, for substation extension / augmentation, existing facilities shall be augmented as required:-</u></b></p> <p>.....</p> <p>iv) At new Substation, one no. of DG set <b><u>of adequate capacity</u></b> (minimum 250kVA for substations with highest voltage rating as 400kV) shall be provided for emergency applications <b><u>considering future bays.</u></b></p> <p>v) .....</p> <p>vi) Deleted.</p>
18.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>3.7 Visual monitoring system for watch and ward of substation premises:</b></p> <p>.....</p> <p>All camera recordings shall have Camera ID &amp; location/area of recording as well as date/time stamp. The equipment should generally conform to Electromagnetic compatibility requirement for outdoor equipment in EHV substation.</p>	<p><b>3.7 Visual monitoring system for watch and ward of substation premises</b></p> <p>.....</p> <p>All camera recordings shall have Camera ID &amp; location/area of recording as well as date/time stamp. The equipment should generally conform to Electromagnetic compatibility requirement for outdoor equipment in EHV substation.</p>

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			<u>At existing substations, the visual monitoring system if available shall be augmented as per existing or better specifications as required.</u>
19.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION	<p><b>4.0 General Facilities</b></p> <p>a.....</p> <p>e. In 400kV switchyard, if spare bay of half diameter is identified as future, all the equipment for Tie &amp; Future bay shall be designed considering the current rating of line bay i.e. 3150A.</p>	<p><b>4.0 General Facilities</b></p> <p>a.....</p> <p>e. In 400kV switchyard, if spare bay of half diameter is identified as future, all the equipment for Tie &amp; Future bay shall be designed considering the current rating of line bay i.e. 3150A.</p> <p><u>f. Boundary wall shall be brick masonry wall with RCC frame or Stone masonry wall or Precast RCC wall under present scope along the property line of complete substation area including future switchyard area to prevent encroachment and unauthorized access. Minimum height of the boundary wall shall be of 1.8 m from finished ground level (FGL) as per CEA Measures Relating to Safety and Electric Supply Regulations.</u></p>
20.	SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION	<p>SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION</p> <p>In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall conform to the following requirements.</p>	<p>SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION</p> <p>In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall conform to the following requirements. <u>The protections for transmission line and the line compensating equipment shall have hundred percent back up communication channels i.e. two channels for tele- protection in addition to one channel for</u></p>

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Sl. No.	Name of the Document	Existing Provision	Revised Provision
		<p>LILO of both circuits of Parli(PG) – Pune(GIS) 400kV D/c line at Kallam PS</p> <p>.....</p> <p>Establishment of 2x500MVA, 400/220kV s/s near Kallam PS</p> <p>.....</p> <p>viii) The maintenance of all the communication equipments including <b><u>FODP and approach cable, PMUs, RTU/SAS &amp; repeater stations</u></b> shall be the responsibility of TSP.</p> <p><b><u>PLCC</u></b></p> <p>PLCC &amp; PABX: .....☐</p> <p>.....</p> <p>- All other associated equipment like cabling, coupling device and HF cable shall also be provided by the TSP. The wave trap and CVT required for PLCC at remote end shall be provided by respective bay owner.</p>	<p><b><u>speech plus data for each direction.</u></b></p> <p>LILO of both circuits of Parli(PG) – Pune(GIS) 400kV D/c line at Kallam PS</p> <p>.....</p> <p>Establishment of 2x500MVA, 400/220kV s/s near Kallam PS</p> <p>.....</p> <p>viii) The maintenance of all the communication equipments including <b><u>FOTE, FODP, approach cable, PMUs,DCPS along with Battery Bank</u></b> shall be the responsibility of TSP.</p> <p><b><u>PLCC</u></b></p> <p>PLCC &amp; PABX: .....☐</p> <p>.....</p> <p>- All other associated equipment like cabling, coupling device and HF cable shall also be provided by the TSP. The wave trap and CVT required for PLCC at remote end shall be provided by respective bay owner.</p> <p>- <b><u>2 sets of 48 V battery banks for PLCC and</u></b></p>

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			<b><u>communication equipment shall be provided at each new substation with at least 10 hour battery backup and extended backup, if required.</u></b>