Content

1. Scope

The scope covers design, manufacturing, testing at manufactures works and supply of 33 kV and 11 KV outdoor Lightning Arresters complete with all required accessories as per relevant IS and IEC standard. The LAs shall be suitable for protection of Power Transformer or 33 kV / 11 kV Lines and switchyard of TPNODL sub-transmission system against lightning strokes & switching surges.

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2. Geographic and Climatic Conditions where Lightning Arrestors to be installed

a. Maximum altitude above sea level 100 m
b. Maximum ambient air temperature 50°C
c. Maximum daily average ambient air temperature 35°C
d. Minimum ambient air temperature 0°C
e. Maximum relative humidity 95%
f. Average number of thunderstorm days per annum 70
g. Average number of rainy days per annum 120
h. Average annual rainfall 150 cm
i. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3 g
j. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15 g (g being acceleration due to gravity)
k. Wind velocity: Maximum 160 to 200 km/hr.
l. In some of coastal area relative humidity will be higher, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas.

3. Specific Requirements

The Lightning Arrestors (LA's) shall be suitable for outdoor operation under the climatic conditions as specified in item 2 above in this Tender specification.

a. Lightning Arrestors shall be hermetically sealed type and of self-supporting construction. LA's shall be suitable for mounting on concrete or steel structures. LA's shall be capable of withstanding the internal pressure developed during various discharges.
b. All metal parts of LA shall be of non-rusting and non-corroding type metal. Bolts, Screws and pins shall be provided with lock washers, keys or equivalent locking facilities. All ferrous parts exposed to atmosphere shall be hot dip galvanized (min thickness 120 microns)

c. The Polymer insulator housing shall be of 'Shatter proof' high quality Silicon Composite material. The Silicon sheds shall exhibit hydrophobic property. The insulator housing shall be of a single piece construction without any joints or coupling. It should be void free and should have high resistance to acid corrosion. The base polymer shall be 100% Silicon Rubber prior to the addition of reinforcing fillers. The core of the Silicon composite insulator should be manufactured from Electric Corrosion Resistant (ECR) grade fiber glass reinforced plastic (FRP).

d. The sealing plate of HV chamber where Zn O blocks are kept is to be sealed by Silicon paste to prevent rusting and gasket failure.

e. Each LA shall be provided with non-rusting and non-corroding name plate bearing identification as per the applicable standards

f. Arresters shall be completely molded units with ***absolutely no air volume inside***, ***Surge arresters shall be of cage type construction with no gas volume to ensure that the arrester does not explode during the short circuit test condition.***

g. *Arresters of tubular construction i.e. arresters assembled in hollow core insulators with enclosed gas volume are* ***not acceptable***

h. There should be direct contact between polymer housing and MOV blocks to have better thermal heat dissipation.

3.1 Technical Parameters of 11 kV LA including Data Sheet

No.	Description	TPNODL Requirement	Data given by Bidder

1	Name of the Manufacturer	To be furnished by bidder	
2	Place of the manufacture	To be furnished by bidder	
3	Standards applicable	IS 51086 Part 4, IEC 60099 Part 4	
4	Arrestor Voltage Rating	9 kV rms	
5	Discharge Class	**Station Low (SL)** as per IEC60099-4	
6	Type of Construction	Gapless Polymeric	
7	Connection	Phase to Earth	
8	Maximum Continuous Operating voltage	8 kV	
9	Nominal Discharge Current	10 kAp	
10	Energy Discharge capacity (kJ/kV)	> 4.5 at Ur (minimum)	
11	Reference current	5 mA peak	
12	Rated Frequency	50 Hz	
13	Application / Installation	Outdoor	
14	System voltage & Design Ambient Temperature		
	a) Nominal Voltage	11 Kv	
	b) Highest Voltage	12 kV	
	c) Design Ambient Temperature	50°C	
15	Type of System Earthing	Solidly Grounded	
16	Thermal stability	As per IEC 60099-4	
17	Withstand test voltages value of LA to be protected		
	a) One Minute Power frequency	28 kV	
	b) Lightning Impulse	75 kV	
18	Nominal Discharge	10 kA Heavy duty	

	Current, 8 x 20 µs wave		
19	Long duration current impulse withstands		
	a) Peak current and virtual duration of peak (A/ µs)	To be furnished by bidder	
	b) High current impulse (kA peak)	To be furnished by bidder	
20	Max. Continuous leakage current at M.C.O.V (kV)	To be furnished by bidder	
	a) Resistive current (mA)	To be furnished by bidder	
	b) Capacitive current (mA)	To be furnished by bidder	
21	Residual voltage corresponding to:		
	a) Lightning Impulse (kV)	To be furnished by bidder	
	b) Switching Current Impulse (kV)	To be furnished by bidder	
	c) Max Steep Current Impulse (kV)	To be furnished by bidder	
	d) Min Steep Current Impulse (kV)	To be furnished by bidder	
22	Nominal Creepage Distance (mm)	31 mm / kV	
23	Max PD at 1.05 x MCOV	< 10 pc	
24	Lightning Impulse Residual voltage at		
	a) 0.5 X NDC (kV Peak)	To be furnished by bidder	
	b) 1.0 X NDC (kV Peak)	To be furnished by bidder	
	c) 2.0 X NDC (kV Peak)	To be furnished by bidder	
25	Residual voltage and corresponding value of Discharge	To be furnished by bidder	

	current, if in the range of 0.01 to 0.25 times the NDC (kV Peak)		
26	Maximum value of Temporary over voltages and their durations (kV Peak)		
	a) 1 Sec	To be furnished by bidder	
	b) 10 Sec	To be furnished by bidder	
	c) 100 Sec	To be furnished by bidder	
27	Recommended clearance		
	a) Phase to Phase (mm)	To be furnished by bidder	
	b) Phase to Earth (mm)	To be furnished by bidder	
	c) Additional Requirements		
28	Type of mounting	Vertical / Pedestal Mounting	
29	Total height of the arrestors	To be Furnished by bidder	
30	Total weight of the arrestors	To be Furnished by bidder	
31	GA drawings	Required	
32	Temperature rise	As per IEC 60099-4	

3.2 Technical Parameters of 33 kV LA including Data Sheet

No.	Description	TPNODL Requirement	Data given by Bidder
1	Name of the Manufacturer	To be furnished by bidder	
2	Place of the manufacture	To be furnished by bidder	

3	Standards applicable	IS 51086 Part 4, IEC 60099 Part 4	
4	Arrestor Voltage Rating	30 kV rms	
5	Discharge Class	**Station Low (SL), Class-2**	
6	Type of Construction	Gapless Polymeric	
7	Connection	Phase to Earth	
8	Maximum Continuous Operating voltage	25 kV	
9	Nominal Discharge Current	10 kA	
10	Energy Discharge capacity (kJ/kV)	> 4.5 at Ur (minimum)	
11	Reference current	5 mA peak	
12	Rated Frequency	50 Hz	
13	Application	Outdoor	
14	System voltage & Design Ambient Temperature		
	a) Nominal Voltage	33 kV	
	b) Highest Voltage	36 kV	
	c) Design Ambient Temperature	50°C	
15	Type of System Earthing	Solidly Grounded	
16	Thermal stability	As per IEC 60099-4	
17	Withstand test voltages value of LA to be protected		
	a) One Minute Power frequency	70 kV	
	b) Lightning Impulse	170 kV	
18	Nominal Discharge Current, 8 x 20 µs	10 kA Heavy duty	
19	Long duration current impulse withstands		

	a) Peak current and virtual duration of peak (A / µs)	To be furnished by bidder	
	b) High current impulse (kA peak)	To be furnished by bidder	
20	Max. Continuous leakage current at MCOV (kV)	To be furnished by bidder	
	a) Resistive current (mA)	To be furnished by bidder	
	b) Capacitive current (mA)	To be furnished by bidder	
21	Residual voltage corresponding to:		
	a) Lightning Impulse (kV)	To be furnished by bidder	
	b) Switching Current Impulse (kV)	To be furnished by bidder	
	c) Max Steep Current Impulse (kV)	To be furnished by bidder	
	d) Min Steep Current Impulse (kV)	To be furnished by bidder	
22	Nominal Creepage Distance (mm)	31 mm / kV	
23	Max PD at 1.05 x MCOV	< 10 pc	
24	Lightning Impulse Residual voltage at		
	a) 0.5 X NDC (kV Peak)	To be furnished by bidder	
	b) 1.0 X NDC (kV Peak)	To be furnished by bidder	
	c) 2.0 X NDC (kV Peak)	To be furnished by bidder	
25	Residual voltage and corresponding value of Discharge current, if in the range of 0.01 to 0.25 times the NDC (kV Peak)	To be furnished by bidder	

26	Maximum value of Temporary over voltages and their durations (kV Peak)		
	a) 1 Sec	To be furnished by bidder	
	b) 10 Sec	To be furnished by bidder	
	c) 100 Sec	To be furnished by bidder	
27	Recommended clearance		
	a) Phase to Phase (mm)	To be furnished by bidder	
	b) Phase to Earth (mm)	To be furnished by bidder	
	c) Additional Requirements		
28	Type of mounting	Vertical / Pedestal Mounting	
29	Total height of the arrestors	To be Furnished by bidder	
30	Total weight of the arrestors	To be Furnished by bidder	
31	GA drawings	Required	
32	Temperature rise	As per IEC 60099-4	

4. Codes and Standards

Lightning Arrestors shall conform to following IS / IEC standards

Sr. No.	Brief Title	Ref. No. of Standard
1.0	Lightning Arrestors	IS 51086 Part 4, IEC 60099 Part 4
2.0	Polymeric Insulators	IEC 62217, 60815, 61462, 61109
3.0	Connectors	IS 5561
4.0	Hot Dip Galvanizing	IS 2619, IS 2633
5.0	High voltage test techniques	IEC 60060 - 1 & 2, 60270

6.0	Environmental testing	IEC 60068 – 2
7.0	Insulation Co-ordination	IEC 60071-1 & 2

5. General Requirements

a. 33 kV & 11 kV LA shall be of Zinc Oxide (Zn O) gapless, Polymeric Insulator type as per relevant IS and IEC standards.

b. The supplier shall supply all the necessary components and accessories for the satisfactory performance including Base insulator and necessary terminal clamps.

c. Submission of technical documents related to design, installation, testing, operation & maintenance of the equipment for TPNODL review & approval.

d. Acceptance of minimum quality requirements defined in TPNODL Standard Quality Plan.

e. Demonstration / testing of the LA's at Bidder's works as per the approved MQP before dispatch to site (FAT).

f. Bidder should submit all the Type Test reports conducted as per attached SQP. The Type tests should have been carried out within the last five years from the date of bid submission

5.1 Type Test

a. The LA's shall be type tested as per latest IS 51086 Part 4, IEC 60099 Part 4 from NABL /International accredited laboratory and certification of the same to be submitted along with bid document.

b. The type tests must have been conducted recently. The type test conducted on the LA's before 5 years from the date of opening of bids will not be accepted.

c. In case of any change in design /type of LA already type tested and the one offered against this specification, TPNODL reserves the right to demand repetition of type tests without any extra cost.

d. TPNODL will randomly select 2 no's of 33 kV LA's and 2 no's of 11 kV LA's from the lots inspected by TPNODL representative during FAT, which shall be type tested as per IEC standard. TPNODL representative will witness the type test of these LA's at type test location. The cost of type test

will be borne by TPNODL. In case of failure of LA's of any voltage during type test, the corresponding lot of LA will not be accepted by TPNODL. The supplier shall manufacture fresh lot of LA's, sample of which will be again type tested as above for acceptance. The cost of this second type test will be borne by Supplier.

5.2 Factory Acceptance Tests

a. All factory acceptance tests, as stipulated in relevant standards, shall be carried out by the manufacturer in presence of TPNODL representative
b. Manufacturer shall give 15 days' advance intimation to TPNODL for witnessing the factory acceptance tests at OEM factory.
c. After placing PO, manufacturer shall submit GTP, Quality Assurance Plan (QAP) along with drawings of the LA's to TPNODL for approval. The manufacturing shall be initiated only after approval of Quality Assurance Plan and drawings by TPNODL.

5.3 Rating Plates

The rating plate shall be detailed as per IS: 51086 Part 4 including serial number, year of manufacturing and TPNODL order number with date.

5.4 Performance Guarantee

The LA's to be supplied shall be guaranteed for satisfactory performance for a period of 66 months from the date of receipt of complete LA's or 60 months from the date of satisfactory commissioning of LA's whichever is earlier.

The LA's found defective/failed within the above guarantee period shall be replaced by the supplier free of cost within one month of receipt of intimation of failure. In case of non-compliance to this, TPNODL shall recover an equivalent amount plus 15 % supervision charges from any of the invoice of the supplier or through bank guarantee.

5.5 Drawings

1. The bidder shall furnish two sets of relevant descriptive and illustrative published literature /pamphlets and the following drawings for preliminary study:

a. GA drawings showing outside dimensions, shipping dimensions, weights and such other prominent details.

b. Foundation drilling plan and loading data for foundation design.

c. Type test reports of LA's along with a separate list showing all the tests carried out with date & place of test.

d. Test reports, literatures and pamphlets of bought out items and raw materials.

2. The successful bidder shall, within 6 weeks of placement of order, submit two sets of final versions of all the above said drawings in A-3 size, bill of material, packing list & all type test reports, QAP for TPNODL approval. TPNODL shall communicate the comments /approval on the drawings to the supplier within 15 days from date of receipt of drawings from supplier. The supplier shall, if necessary, modify the drawings and resubmit two copies of the modified drawings for TPNODL approval within two weeks from the date of TPNODL comments.

3. The manufacturing of the circuit LA's shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the TPNODL.

4. Approval of drawings by the TPNODL shall not relieve the supplier of any of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revisions of applicable standards, rules and codes of practices.

5.6 Packing and Forwarding

The LA's shall be packed in suitable case to withstand handling impact during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the LA's during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper lifting arrangement such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost within two weeks from the date of intimation.

Each consignment shall be accompanied by a detailed packing list containing the following information:

a. Name of the consignee

b. Details of consignment

c. Destination

d. Total weight of consignment
e. Sign showing upper /lower side of the crate
f. Handling and unpacking instructions
g. Bill of materials indicating contents of each package and spare materials
The supplier shall ensure that the packing list and bill of materials are approved by the Purchaser before dispatch.

5.7 Technical Pre-qualification Requirement (PQR)

11 kV and 33 kV LA		
Technical Pre-qualification Requirement		
Parameter	**TPNODL Requirement**	**Documents to be submitted by Bidder to ascertain meeting of Pre-qualification requirement**
Infrastructure	Bidder must be an OEM of 11 kV & 33 kV LA's with manufacturing facility / assembly in India.	Bidder shall submit Self-undertaking in this regard. TPNODL reserves the right to inspect the manufacturing facility as a proof of compliance to this parameter.
Supply and Experience	Bidder shall have supplied 200 or more nos. of 11 kV & 33 kV Lightning arrestors together in last three years. Out of this, 100 nos. of 11 kV / 33 kV Lightning arrestors together shall be in satisfactory service for last two years. Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.	Supply List & Performance Certificates from the utilities / clients Bidder shall submit Self-undertaking in this regard. TPNODL reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.

Type Test	The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design. The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test can be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC). In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, then type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before dispatch of the equipment / material.	Type Test Report. Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening must be considered (if applicable) Undertaking that type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before dispatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, (if applicable)
Commercial Capability		Copy of audited Balance Sheet and P&L Account to be submitted in this regard.

Signature of Bidder:

Name of the Company:

Date:

Office Seal
