BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
ENGINEERING MANAGEMENT

	01	Name	MS	DKM	RS
Type of Document	**TECHNICAL SPECIFICATION**	Sign	-SD-	-SD-	-SD-
Title	**624kV, 216kV & 198 kV Lightning Arrestor**	Date			
		Group	**TBEM**		

Customer	**TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED.**
Consultant	**Fichtner Consulting Engineers (India) Pvt Ltd. (For North Chennai-III)** **DESEIN CONSULTING ENGINEERS, NEW DELHI (For Uppur-I & II)**
Projects	**1X800 MW TANGEDCO NORTH CHENNAI TPP STAGE-III-BTG** **2X800MW UPPUR STPP (STAGE-I, UNIT#1&2)**

CONTENTS

Note: Offers without checklist will not be considered

01	**02.04.18**	**MS**	**DKM**	**RS**	216kV, Class-III & 198kV, Class-IV ratings revised in line with customer confirmation.
Rev No.	Date	Altered	Checked	Approved	

Distribution						

SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES.

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of 624kV, 216kV & 198kV Surge Arresters **(polymer/porcelain insulator is acceptable)** complete with all accessories like surge counter, insulating base, terminal connector , connecting lead and fixing hardware etc.

In case of any conflict between the technical details mentioned in this section and the remaining sections of this document, then Section-1 shall prevail and is to be considered as binding requirement.

1.1 The equipment is required for the following project.

A. North Chennai-III

Name of Owner :	:	**TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED.**
Name of Consultant	:	**Fichtner Consulting Engineers (India) Pvt Ltd.**
Name of Project	:	**1X800 MW TANGEDCO NORTH CHENNAI TPP STAGE-III-BTG**

B. Uppur -I & II

Name of Owner :	:	**TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED.**
Name of Consultant	:	**DESEIN CONSULTING ENGINEERS, NEW DELHI.**
Name of Project	:	**2X800MW UPPUR STPP (STAGE-I,UNIT#1&2) IN RAMANATHAPURAM DISTRICT, TAMILNADU.**

Refer Section - 3 for Project Details and General Specifications.

2.1 SPECIFIC TECHNICAL REQUIREMENTS

800 kV class arrester shall be capable of discharging energy equivalent to class 5 of IEC for an 800 kV system on two successive operation followed immediately by 50 Hz energisation with a sequential voltage profile as specified below:

1000 kVp for 3 peaks

910 kVp for 0.1 Sec

885 kVp for 1 seconds

866 kVp for 10 seconds

2.2 Technical parameters

Sl. No	Parameter	Data		
a)		North Chennai-III/ Uppur	Uppur	North Chennai-III
b)	System Voltage (kV)	765kV	230kV	230kV
a)	Highest System Voltage (kV)	800kV	245kV	245kV
b)	Rated arrester voltage (kV)	624	198	216
c)	Nominal discharge Current (kA)	20kA		10kA
	Discharge current at which insulation co-ordination will be done.	20kA		10kA
d)	Rated Voltage (Ur) (kV)	624	230	230
e)	Continuous operating voltage at 50 deg.C (kV)	490	245	245
f)	Max. Switching surge residual voltage (kVp) -at 1kA -at 2KA	 1180 1220	 280	 -
g)	Lighting impulse (8/20 wave) 5kA 10kA 20kA	 - - 1480	 - 310 330	 -
h)	Long duration discharge class	5	4	3
i)	Current for pressure relief test (kA)	50	40	40
j)	High current short duration test value (4/10 micro second wave) (kAp)	125	100	100
k)	Low current long duration test value	As per IEC		
l)	Prospective symmetrical fault current for 0.2 Sec. (kA)	50	40	40
m)	Cantilever strength of Polymer/Porcelain insulator (Min) (kg)	500	500	500
n)	Creepage distance (mm/kV)	31		
o)	Mounting Structure	Lattice		

3.0 TECHNICAL QUALIFYING REQUIREMENTS:

765kV Surge Arrestors:

765kV Surge Arrestors being offered should be from Manufacturer who has manufactured and supplied at least fifteen (15) nos. of single phase Surge Arrestors suitable for Air Insulated Substation/ Switchyard of 715kV or above class which should have been in successful operation for minimum two (2) years prior to 20.05.2016 for Uppur-I & II and 29.01.2016 for North Chennai-III.

230kV Surge Arrestors:
230kV Surge Arrestors being offered should be from Manufacturer who has manufactured and supplied at least fifteen (15) nos. of single phase Surge Arrestors suitable for Air Insulated Substation/ Switchyard of 220kV or above class which should have been in successful operation for minimum two (2) years prior to 20.05.2016 for Uppur-I & II and 29.01.2016 for North Chennai-III.

1.3 QUANTITIES AND ACCESSORIES REQUIRED

S. N.	DETAILS	Unit	QUANTITY		
			North Chennai Stage-III	Uppur-I & II	TOTAL
1	**624 kV**, Discharge current-**20 kA**, Class-V, Creepage-31mm/kV Surge Arrestor complete with all accessories like corona ring, terminal pad, surge counter, insulating base, fixing hardware etc.	Nos.	3	6	9
2	Rigid through type Terminal Connector for 624kV Surge Arrestor suitable for Quad Bull AAAC conductor with Horizontal approach	Nos.	3	6	9
3	**198 kV**, Discharge current-**20 kA**, Class-IV, Creepage-31mm/kV Surge Arrestor complete with all accessories like corona ring, terminal pad, surge counter, insulating base, fixing hardware etc.	Nos.	0	3	3
4	**216 kV**, Discharge current-**10 kA**, Class-III, Creepage-31mm/kV Surge Arrestor complete with all accessories like corona ring, terminal pad, surge counter, insulating base, fixing hardware etc.	Nos.	3	0	3
5	Rigid through type Terminal Connector for 198/216kV Surge Arrestor suitable for Twin Bull AAAC/ Twin ACSR Moose conductor with Horizontal approach	Nos.	3	3	6
6	Insulated connecting cable between Surge Arrestor & Surge Monitor along with Lugs (Single Length)	Mtr	51*	87*	138

Note-1- *Insulated connecting Cable between Lightning Arresters and Surge monitor shall be supplied in single length for all required surge arresters including main and spare items (i.e. Considering individual length of 12m for 624kV & 5m for 216kV /198kV SA). Please note that connecting lead, lugs and accessories shall be provided with each Lightning Arrester.
Note -2- Total quantity may vary up to ±25% at contract stage.
Note-3- Bidder to comply all tests as per clause no. 5 of section 2B of Technical Specification.
Note-4 - Refer Section 2B for details of terminal connector.
Note-5 - Prices of all accessories shall be included in equipment price.

7.0 TYPE TESTS:

i. All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this

specification and carried out within last five years from the zero date (20.05.2016 for Uppur-I & II and 29.01.2016 for North Chennai-III). These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

ii. However if the contractor is not able to submit report of the type test(s) conducted within last five (5) years from the zero date, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of TANGEDCO representative and submit the reports for approval.

iii. All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

iv. The type test reports once approved for any projects shall be treated as reference. For subsequent projects of TANGEDCO, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design change". Minor changes if any shall be highlighted on the endorsement sheet.

8.0 DEVIATIONS:

The bidder shall list all the deviation from the specification separately. Offers without specific deviation will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.

SECTION-2

Lightning Arrestor

2.2.24 LIGHTNING ARRESTER

The lightning arrestors (surge arrestors) shall be utilized to protect the power transformers supplied under this package.

2.2.24.1 General Reqirements

Each Lightning Arrester shall be furnished complete with the accessories as listed below:

a. Insulating Base with anchoring bolts, nuts etc. for fixing the equipment on to structure. The structure design shall be comply with civil technical specification under Volume II,Section 2, Part 2.4.

b. Surge counter with integral leakage current monitor.

c. By-pass shunt with connection provision.

d. Ground terminals.

e. Grading ring, if necessary.

f. Arrester disconnector.

g. Other standard accessories which are not specifically mentioned but are usually provided with Lightning Arrester of such type and rating for efficient and trouble-free operation of electrical systems.

2.2.24.2 Codes and Standards

a. All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable IEC/IS except where modified and/or supplemented by this specification.

b. Equipment and materials conforming to any other standard which ensures equal or better quality maybe accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

c. The electrical installation shall meet the requirements of Indian Electricity Rulesas amended upto date and relevant IS Codes of Practice. In addition, other rules or regulations applicable to the work shall be followed. In case of any discrepancy, the more restrictive rule shall be binding.

d. Applicable standard for the lightning arrestor are as follows:

i. Lightning arrester for alternating current system: Metal oxide lightning arrestors without gaps : IS 3070

ii. Metal oxide surge arresters without gap : IEC 60099-4

iii. Selection and application recommendation: IEC 60099-5

2.2.24.3 Design Criteria

The equipment will be used in 765kV and 230kV substations.

a. The equipment will be installed outdoor in a hot, humid and tropical atmosphere with heavy pollution.

b. All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

c. The maximum temperature in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.

d. The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

e. There shall be no radio interference when the equipment is operated at maximum service voltage.

f. The safety clearances of all live parts of the equipment shall be as per relevant standards.

g. Arresters shall be designed with sufficient cantilever strength to meet with stress due to wind pressure and short circuit forces arising from rated short time current.

h. The lightning arrester shall be installed as close to the equipment as possible and also on the line entrance.

Insulation coordination

a. The contractor shall carry out the insulation coordination studies and design calculations for deciding the exact locate, energy capability, voltage levels of the LAs. The locations shown in the single line diagram is indicative only. If contractor feels that at some more locations the Lightning arrester are required same should be included in the offer.

b. The contractor shall perform all necessary studies for insulation co ordination and the report shall detail the characteristics of Lightning arrester. The report shall also demonstrate that selected insulators comply with the requirements of the specification.

2.2.24.4 Specific Requirements

1. Type and Rating

a. Lightning arrester shall be station class, heavy duty, metal oxide (ZnO) type, gapless type without any series or shunt gaps.

b. The arrester shall have adequate thermal discharge capacity for severe switching surges, long duration surges and multiple strokes.

c. Lightning arresters shall be capable of discharging over voltages occurring due to switching of unloaded transformers.

2. Constructional Features

a. The arrester shall be single pole, hermetically sealed, of robust construction with excellent electrical, thermal and mechanical characteristics even after repeated operation.

b. Insulator shall be wet process porcelain, brown glazed and free from imperfections. All metal parts and hardware shall be hot dip galvanised.

c. Creepage distance shall correspond to heavily polluted atmosphere.

d. Grading ring, if required, shall be provided to maintain voltage gradient within permissible limit.

e. The arrester shall be fitted with pressure relief devices and diverting ports suitable for preventing shattering of porcelain housing providing path for the flow of rated currents in the event of arresters failure.

3. Accessories

a. Lightning arrester shall be furnished complete with insulating base, arrester disconnector, surge counter leakage current monitor and anchoring hardware for mounting on steel structure.

b. The surge counter shall be suitably enclosed for outdoor duty and be mounted at a convenient height for reading. Counter terminals shall be such as to permit

connections with minimum possible bends. No auxiliary power supply or battery shall be required for operation of counter.

c. A leakage current detector shall be furnished with the counter as an integral part along with connecting cables. This is for monitoring the leakage to indicate any possible breakdown. Readings of milli ammeter and counter shall be visible through inspection glass panel.

d. A suitably sized by-pass copper shunt along with necessary terminals shall be furnished for bypassing the discharge counter if required.

e. Grading ring/corona ring as applicable for the particular voltage class of arrester shall be provided.

f. Insulated copper conductor of adequate size and length shall be used for connecting discharge counter terminal and lightning arrestor earth terminal.

4. Terminals

a. All connection terminals shall be of corrosion resistant material and complete connection hardware.

b. All ground terminals shall have provision of connection to G.I. flat of approved size.

2.2.24.5 Tests

1. Routine Tests

During manufacture and on completion, the lighting arresters in complete shall be subjected to the Routine Tests as laid down in latest revision of IEC/IS including functional (operational) tests on the surge counter.

2. Type Tests

Type tests to be carried out on one(1) complete lightning arrester of each voltage class according to latest revision of IS 3070 (Part-3).
In addition Radio Interference Voltage Test (as per IS:8263) shall also be carried out for 765KV Arrester

3. Test Witness

Tests shall be performed in presence of Owner's representative if so desired by the Owner. The Contractor shall give at least fifteen (15) days' advance notice of the date when the tests are to be carried out.

4. **Test Certificates**

Certified reports of all the tests carried out at the works shall be furnished in requisite no. of copies for approval of the Owner. The equipment shall be despatched from works only after receipt of Owner's written approval of the test reports.

Type test certificate of any associated equipment, if so desired by the Owner, shall be furnished. Otherwise, the equipment shall have to be type tested, free of charge, to prove the design.

The test report shall furnish complete identification of the equipment such as serial no., rating, equipment designation and date of test.

2.2.24.6 **Drawings, Data & Manuals**

Bidder shall furnish the following:

a. Metalizing coating of thickness of reduced resistance between adjacent discs along with procedure for checking the same.

b. Details energy calculations to prove thermal capability test for uniform distribution of current on individual disc.

c. The value of resistive current for each complete arrestor in factory test report and further suggest the value at which arrestor to be taken out of service.

d. Drawings, Data and Manuals shall be submitted with the bid and in quantities and procedures as specified in Conditions of Contract and/or elsewhere in this specification for approval and subsequent distribution after the issue of Letter of Award.

1. **To be submitted with the Bid**

a. Typical general arrangement drawing showing constructional features and disposition of various accessories.

b. Technical leaflets.

c. Type test certificate on similar equipment.

2. **To be submitted for Approval and Distribution**

a. Dimensioned general arrangement drawing showing disposition of various accessories and safety clearances.

b. Transport/Shipping dimensions with weight.

c. Foundation plan and loading.

d. Assembly drawing for erection at site with part numbers and schedule of materials.

e. Characteristic curves for insulation coordination.

f. Test Certificates

g. Any other relevant drawing or data necessary for satisfactory installation, operation and maintenance.

h. Instruction manuals on the equipment and its various accessories.

i. The manual shall clearly indicate method of installation, check-ups and tests to be carried out before commissioning of the equipment.

1.00.00 SURGE ARRESTORS

1.01.00 CODES AND STANDARDS

IEC 60099, IS 3070

1.02.00 TYPE

Heavy duty station class and Gapless type without any series or shunt gaps

1.03.00 RATING

For 765 & 230 kV Class Surge Arrestor

Rated arrester voltage	624 kV & 198 kV
Nominal discharge current	20KA of 8/20 microsec. Wave
Discharge current at which insulation coordination is done	20 KA of 8/20 microsec. Wave

1.04.00 OPERATIONAL REQUIREMENTS

1.04.01 Shall protect power transformerswith insulation levels specified in this specification.

1.04.02 The reference current shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage. Values and calculations shall be furnished with offer.

1.05.00 DISCHARGE CAPABILITIES

1.05.01 Shall be fully stabilized thermally to give a life expectancy of one hundred (100) years under site conditions and take care of effect of direct solar radiation.

1.05.02 Shall be capable of discharging over-voltages occurring due to switching of unloaded transformers.

1.06.00 DESIGN AND CONSTRUCTIONAL FEATURES

1.06.01 **Construction**

i. Shall be hermetically sealed single phase unit.
ii. The non linear blocks shall be sintered metal oxide material
iii. Shall be robust with excellent mechanical and electrical properties.
iv Shall be capable of withstanding meteorological and short circuit forces under site conditions.
v. Each SA shall be complete with insulating base for mounting on structure.
vi Grading / corona rings and intermediate ring of hot dip galvanised steel shall be provided on each arrestor unit.

1.06.02 **Pressure relief device**

i. Shall have pressure relief devices and arc diverting ports suitable for preventing shattering of porcelain housing and to provide path for flow of rated currents in the event of SA failure
ii Shall not fail due to porcelain contamination.
iii. Seals shall be effectively maintained even when SA discharges rated lightning current.

1.06.03 **Porcelain**

i. Porcelain shall be so coordinated that external flashover will not occur due to application of any impulse or switching surge voltage up to maximum design value for SA. The cantilever strength of the insulator shall be minimum 500kg.
ii. The end fittings shall be non-magnetic and of corrosion proof material.

1.06.04 **The Contractor shall furnish the following:**

i. The heat treatment cycle details with necessary quality checks used for individual blocks along with insulation layer formed across each block.
ii. Metalizing coating thickness for reduced resistance between adjacent discs along with procedure for checking the same.
iii. Details of thermal stability test for uniform distribution of current on individual disc.
iv. Detailed energy calculations to prove thermal capability of Discs.
v. The value of resistive current for each complete arrestor in factory test report and further suggest the values at which arrestor to be taken out of service.

1.06.05 **Discharge counters**

i. Self contained discharge counters, suitably enclosed for outdoor use (IP-55 degree of protection) and requiring no auxiliary or battery supply shall be fitted with each SA along with necessary connection to SA and earth.
ii. Suitable leakage current meters shall also be supplied in the same enclosure. The reading of milli -ammeter and counter shall be visible through an inspection glass panel to a man standing on ground. A pressure relief vent/suitable provision shall be made to prevent pressure build up.
iii. The discharge counter shall be insulated from structure for measurement of resistive current.

1.07.00 MAINTENANCE EQUIPMENT (NIL)

The Contractor shall also supply micro-processor based portable maintenance equipment for monitoring resistive current of SA which is of proven design & make for the intended purpose. The Contractor shall demonstrate the operation of the equipment at site.

1.08.00 TECHNICAL PARTICULARS

1.08.01 **Lightning Arrester:**

SL. NO	ITEM	UNIT		REQUIRED	
				765 kV	230 kV
i)	Applicable standards	IEC	:	60099-1/4/5	
ii)	SURGE ARRESTERS		:		
iii)	(GI and Outdoor Type)	kV	:		
iv)	Type		:	MO	MO
v)	Rated voltage (Ur)	kV	:	624	230
vi)	Maximum continuous operating voltage	kV	:	490	245
vii)	Discharge class		:	5	4

viii)	Maximum residual voltages at Switching impulse 2 kA 1kA	 kV kV	 : :	 1220 1180	 280
ix)	Lighting impulse (8\20 wave) 5 KA 10kA 20 kA	 kv kV kV	 : : : :	 - - 1480	 310 330
xii)	Short circuit strength (0.2 s)	kA	:		
xiii)	Insulator housing		:		
xiv)	Material		:	Silicon rubber	Silicon rubber
xv)	Creepage distance at rated voltage	mm/kV	:	31	31

1.09.00 TESTS

1.09.01 Following tests shall be carried out for lightning arrester

i) Routine Tests

a) Measurement of reference voltage
b) Residual voltage test of arrester unit
c) Partial discharge test
d) Current distribution test
e) Leakage check
f) Verticality check on completely assembled surge arresters

ii) Acceptance Tests

a) Measurement of power frequency reference voltage of the arrester units
b) Lightning impulse residual voltage on arrester units
c) Partial discharge test
d) Thermal stability test on three sections
e) Watt loss test
f) Aging & energy capability test on blocks

1.09.02 **Site Tests**

The following tests shall be carried out before and during erection, testing and commissioning:-

i) Leakage current measurement
ii) Resistance of earth connection
iii) Earth continuity
iv) IR measurement of stacks

SECTION-3

Chapter 2

Project Information

CHAPTER 2
PROJECT INFORMATION

1.1 GENERAL

TANGEDCO has planned to establish 1X800MW Coal Based Super Critical North Chennai Thermal Power Project Stage III in the premises of existing NCTPS at Ennore & Puzhudhivakkam Village, Ponneri Taluk, Thiruvallur District, Tamil Nadu, India. This project will be executed in two package mode i.e, BTG with related Civil Works and BOP with related Civil Works.

1.2 LOCATION

The proposed site for main power plant is located near Ennore port (approx 5 km) and also 35 km from Chennai City.

The nearest Railway station is at Athipattu Pudunagar (approx 5 km)

All weather road from Pattamandri on the Thiruvotriyur-Ponneri highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

1.3 PROJECT INFORMATION

1.1	Project Title	:	1 x 800 MW North Chennai Coal Based Super Critical Thermal Power Project Stage III.
1.2	Plant capacity	:	800 MW
1.3	Type of project	:	Brown field
1.4	Owner	:	Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)
1.5	Plant site location	:	In the premises of North Chennai Thermal Power Station (NCTPS)
1.6	Location co-ordinates	:	80° 19' E to 80° 20' E Longitude 13° 13' N to 13° 18' N Latitude
1.7	Nearest Village	:	Ennore & Puzhudhivakkam Village
1.8	Nearest Town & City	:	Chennai (35 Km)
1.9	State Capital	:	Chennai (35 Km)

1.10	Nearest Railway Station	:	Athipattu Pudunagar (~ 5 Km) on Chennai – Vijayawada Line
1.11	Nearest Airport	:	Chennai (~ 60 Km)
1.12	Nearest Seaport	:	Ennore (~ 3 Km)
1.13	Nearest Road access	:	All weather road from Pattamandri on the Thiruvottiyur – Ponneri highway
2.0	**Meteorological Condition**		
2.1	Climate	:	Tropical, very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind
2.2	Site Elevation	:	(+) 10.0 Meter above Mean Sea Level
2.3	Ambient Temperature		
a.	Annual Maximum Mean Temperature	:	45 ºC
b.	Annual Minimum Mean Temperature	:	15 ºC
c.	Design ambient temperature	:	30 ºC
2.4	Relative Humidity		
a.	Maximum	:	90 %
b.	Minimum	:	36 %
c.	Design	:	75 %
2.5	Annual Rainfall		
	Maximum	:	2540 mm
	Average	:	1600 mm
	Minimum	:	1175 mm
2.6	Basic Design Wind Pressure	:	As per IS: 875 (Latest Edition)

2.7	Wind Speed	:	11.8 kmph (Avg), 50 m/s (max)
2.7	Seismic zone	:	Zone: III as defined in IS:1893-2002
2.8	Design ambient temperature for Electrical equipment	:	50 °C

1.4 ACCESS TO SITE

Site is well connected to all weather road from Pattamandri on the Thiruvotriyur – Ponneri highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

SPECIFICATION
FOR
BTG EPC CONTRACT

VOLUME II – GENERAL & SCHEDULES

CHAPTER 1

PROJECT SYNOPSIS

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1600 MW (2 units of 800 MW each) Coal Based Thermal Power Station. The Project Site is located in Uppur, Valamavoor and Thiruppalaikudi villages of Thiruvadanai Taluk, Ramanathapuram District.

1.2 Location

The proposed site for main power plant is located at Uppur in Ramnathpuram District of Tamil Nadu.

The nearest Railway station is Thiruppalaikudi Railway Station, 3Kms from site

ECR Connecting Ramanathapuram and Pattukottai is the nearest road access.

The nearest airport is at Madurai at a distance of 140 km.

The nearest port is Tuticorin located at a distance of 130 km.

1.3 Type of Plant

The proposed 2 x 800 MW Super-Critical Power Project consists of coal fired steam generator connected to a reheat type steam turbine generator along with all the required auxiliaries. Circulating cooling water system is envisaged for condenser cooling.

The description and salient technical data of the Steam Generator, Steam Turbine Generator, Auxiliary systems, Electrical, Control & Instrumentation, Civil etc. are explained elsewhere in the specification:

1.4 PROJECT INFORMATION

1.1	Owner	:	Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)	
1.2	Project Title	:	2 x 800 MW Uppur Thermal Power Project	
1.3	Owner's Engineer	:	Desein Private Limited; New Delhi	
1.4	Project Site Location	:	Place	Uppur
			State	Tamil Nadu
			Country	India
1.5	Nearest Railway Station	:	Ramanathapuram at 28 KM away	
1.6	Nearest City	:	Ramanathapuram	
1.7	Nearest Highway	:	ECR Connecting Ramanathapuram and Pattukottai	
1.8	Nearest Airport	:	Domestic air port at Madurai (140 KM)	
1.9	Nearest Sea Port	:	Tuticorin Port (130 KM)	
1.10	Site Elevation	:	+ 4.5 m	
1.11	CLIMATOLOGICAL DATA	:		
i.)	HIGHEST TEMPERATURE RECORDED	:	37.8°C	
ii.)	MINIMUM TEMPERATURE RECORDED	:	22.3°C	
iii.)	DRY BULB TEMPERATURE (DBT) FOR DESIGN PURPOSE	:	30 ± 10°C 50°C (for electrical equipment)	
iv.)	RELATIVE HUMIDITY FOR DESIGN PURPOSE	:	75 ± 15%	
v.)	ANNUAL RAINFALL	:	827 mm (avg.)	
1.12	Source of Water (Distance from site)	:	Sea	
1.13	Primary Fuel & Source	:	Imported Coal (Indonesia and S. Africa)	
1.14	Startup Fuel & Source	:	HFO/ L.D.O. (Domestic)	
1.15	Earthquake Data	:	Zone III as defined in IS: 1893-2002	

1.5 Access to Site

Site is well connected and located along ECR Connecting Ramanathapuram and Pattukottai. Site is well connected by rail also.

SECTION-4

GUARANTEED TECHNICAL PARTICULARS

6.00.00	**Lightning Arrester**		
	i. Make		
	ii. Type		
	iii. Reference standard		

6.01.00	L.A. Rating		
	a. Rated voltage	(kV)	
	b. Nominal discharge current KA		
	c. Discharge class		
6.02.00	Insulation level		
	a. One (1) minute power frequency test voltage		
	Dry	(kV)	
	Wet	(kV)	
	b. Impulse withstand test voltage (1.2x50 micro second(kV) wave)		
6.03.00	Spark Over Voltage		
	a. Minimum 50 Hz	kV peak	
	b. Maximum 1.2 / 50 micro sec.	kV peak	
	c. Maximum front-of-wave	kV peak	
	d. Maximum switching	kV peak	
6.04.00	Maximum Residual Voltage at 8 /20 micro-sec. current wave		
	a. 10 KA	kV peak	
	b. 20 KA	kV peak	
	c. 40 KA	kV peak	
	d. 100 KA	kV peak	
6.05.00	Impulse current withstand		

	a. High current 4/10Micro sec.	kV peak	
	b. Long duration current for		
	i) 1000 Micro sec	kV peak	
	ii) 2000 Micro sc	kV peak	
6.06.00	Porcelain creepage distance	kV/mm	
6.07.00	No. of section per pole No.		
6.08.00	Approx. dimension (LxBxH) mm		
6.09.00	Approx. weight	Kg	
6.10.00	Catalogue furnished	Yes/No	
6.11.00	Characteristic curve furnished		

SECTION - 5

QUALITY PLAN

Supplier shall follow valid approved Quality Plan of TANGEDCO.

(INFORMATION TO BE FURNISHED WITH OFFER)

BIDDERS ARE INSTRUCTED TO

WRITE **'YES'** UNDER CLOUMN '2', IF THE INFORMATION / SCHEDULE IS FURNISHED / ENCLOSED WITH THE OFFER, **OR**

WRITE **'NO'** UNDER CLOUMN '2', IF THE INFORMATION / SCHEDULE IS NOT FURNISHED / ENCLOSED WITH THE OFFER, **OR**

WRITE **'NOT APPLICABLE (NA)'** UNDER CLOUMN '2', IF THE INFORMATION / QUERY / SCHEDULE IS NOT RELEVANT TO THEM, **AND**

RETURN THIS CHECKLIST (624kV LA) AS THE PART OF THE OFFER DULY SIGNED BY THEM.

	Parameters	1	2	3
S.No.		Specified Requirement	Confirmation Yes	Comments, if Any
1.	Type	Gapless , Zinc Oxide		
2.	Installation	Outdoor		
3.	Nominal System Voltage	765kV		
4.	Highest system Voltage	800kV		
5.	Rated Arrestor Voltage(KV)	**624kV**		
6.	Type of Insulator housing	Polymer/Porcelain		
7.	Standard applicable for Surge arrestor	IEC:60099-4		
8.	Nominal discharge current	**20kA** of 8/20 microsecond wave		
9.	Continuous Operating Voltage at 50 deg C	490kV (rms)		
10.	Max. Residual Voltage at 20kA nominal discharge current	1480kVp		
11.	Max. Residual Voltage at steep front wave at 10kA	1480kVp		
12.	Rated frequency (Hz)	50		
13.	High current short duration test value(4/10 micro second wave)	125kAp		
14.	Current for Pressure relief test	50kA rms		
15.	Long duration discharge class	**Class 5**		
16.	Cantilever strength of Polymer Insulator (min)	500kG		
17.	Min. creepage distance	31 mm/kV		
18.	Length of connecting lead between Surge arrestor to counter	12 meter		
19.	Potential free contact in surge counter	Provided		
20.	Accessories & Earthing Connection leads between the bottom of the Arrester & Surge counter	included		
21.	Hardware required for inter-unit connection and to connect the Lightening arrester to structure	Yes		
22.	Corona ring (If applicable)	Yes		

	Parameters	1	2	3
S.No.		Specified Requirement	Confirmation Yes	Comments, if Any
23.	Terminal connectors suitable for Quad Bull AAC Conductor	Yes		
24.	Type test Reports as per clause 7 of section-1 of Technical specification	Enclosed		
25.	Compliance of all tests as per as per point no. 1 & 4 of 2.2.24.5 of Section-2	YES		
26.	Type test Reports	Enclosed		
27.	Type test charges (if not acceptable to customer)	Free		
28.	GA drawing, GTP & VI characteristics graphs	Enclosed		
29.	Technical requirement as per clause 3.0 of section-1	Enclosed		
30.	A legally enforceable undertaking by the manufacturer shall be furnished during contract execution for guarantee quality, timely supply and performance of the 765 KV Surge arrester.	Confirmation		

Date:
Place:
Phone:
Fax:
E-mail:
Mobile:
Website:

(Signature of the authorized representative of Bidder / Firm / Company)
Name:
Designation:
Company Seal:

RETURN THIS CHECKLIST (216kV LA) AS THE PART OF THE OFFER DULY SIGNED BY THEM.

	Parameters	1	2	3
S.No.		Specified Requirement	Confirmation Yes	Comments, if Any
1.	Type	Gapless , Zinc Oxide		
2.	Installation	Outdoor		
3.	Nominal System Voltage	230kV		
4.	Highest system Voltage	245kV		
5.	Rated Arrestor Voltage(KV)	**216kV**		
6.	Type of Insulator housing	Polymer/Porcelain		
7.	Standard applicable for Surge arrestor	IEC:60099-4		
8.	Nominal discharge current	**10kA** of 8/20 microsecond wave		
9.	Continuous Operating Voltage at 50 deg C	245kV (rms)		
10.	Max. Residual Voltage at 20kA nominal discharge current	330kVp		
11.	Max. Residual Voltage at steep front wave at 10kA	310kVp		
12.	Rated frequency (Hz)	50		
13.	High current short duration test value(4/10 micro second wave)	100kAp		
14.	Current for Pressure relief test	40kA rms		
15.	Long duration discharge class	**Class 3**		
16.	Cantilever strength of Polymer Insulator (min)	500kG		
17.	Min. creepage distance	31 mm/kV		
18.	Length of connecting lead between Surge arrestor to counter	5 meter		
19.	Potential free contact in surge counter	Provided		
20.	Accessories & Earthing Connection leads between the bottom of the Arrester & Surge counter	included		
21.	Hardware required for inter-unit connection and to connect the Lightening arrester to structure	Yes		
22.	Corona ring (If applicable)	Yes		
23.	Terminal connectors suitable for Twin Bull AAC/ Twin Moose ACSR Conductor	Yes		
24.	Type test Reports as per clause 7 of section-1 of Technical specification	Enclosed		
25.	Compliance of all tests as per as per point no. 1 & 4 of 2.2.24.5 of Section-2	YES		
26.	Type test Reports	Enclosed		
27.	Type test charges (if not acceptable to	Free		

	Parameters	1	2	3
S.No.		Specified Requirement	Confirmation Yes	Comments, if Any
	customer)			
28.	GA drawing, GTP & VI characteristics graphs	Enclosed		
29.	Technical requirement as per clause 3.0 of section-1	Enclosed		
30.	A legally enforceable undertaking by the manufacturer shall be furnished during contract execution for guarantee quality, timely supply and performance of the 765 KV Surge arrester.	Confirmation		

Date:
Place:
Phone:
Fax:
E-mail:
Mobile:
Website:

(Signature of the authorized representative of Bidder / Firm / Company)
Name:
Designation:
Company Seal:

RETURN THIS CHECKLIST (198kV LA) AS THE PART OF THE OFFER DULY SIGNED BY THEM.

	Parameters	1	2	3
S.No.		Specified Requirement	Confirmation Yes	Comments, if Any
1.	Type	Gapless , Zinc Oxide		
2.	Installation	Outdoor		
3.	Nominal System Voltage	230kV		
4.	Highest system Voltage	245kV		
5.	Rated Arrestor Voltage(KV)	**198kV**		
6.	Type of Insulator housing	Polymer/Porcelain		
7.	Standard applicable for Surge arrestor	IEC:60099-4		
8.	Nominal discharge current	**20kA** of 8/20 microsecond wave		
9.	Continuous Operating Voltage at 50 deg C	245kV (rms)		
10.	Max. Residual Voltage at 20kA nominal discharge current	330kVp		
11.	Max. Residual Voltage at steep front wave at 10kA	310kVp		
12.	Rated frequency (Hz)	50		
13.	High current short duration test value(4/10 micro second wave)	100kAp		
14.	Current for Pressure relief test	40kA rms		
15.	Long duration discharge class	**Class 4**		
16.	Cantilever strength of Polymer Insulator (min)	500kG		
17.	Min. creepage distance	31 mm/kV		
18.	Length of connecting lead between Surge arrestor to counter	5 meter		
19.	Potential free contact in surge counter	Provided		
20.	Accessories & Earthing Connection leads between the bottom of the Arrester & Surge counter	included		
21.	Hardware required for inter-unit connection and to connect the Lightening arrester to structure	Yes		
22.	Corona ring (If applicable)	Yes		
23.	Terminal connectors suitable for Twin Bull AAC/ Twin Moose ACSR Conductor	Yes		
24.	Type test Reports as per clause 7 of section-1 of Technical specification	Enclosed		
25.	Compliance of all tests as per as per point no. 1 & 4 of 2.2.24.5 of Section-2	YES		
26.	Type test Reports	Enclosed		
27.	Type test charges (if not acceptable to	Free		

	Parameters	1	2	3
S.No.		Specified Requirement	Confirmation Yes	Comments, if Any
	customer)			
28.	GA drawing, GTP & VI characteristics graphs	Enclosed		
29.	Technical requirement as per clause 3.0 of section-1	Enclosed		
30.	A legally enforceable undertaking by the manufacturer shall be furnished during contract execution for guarantee quality, timely supply and performance of the 765 KV Surge arrester.	Confirmation		

Date:
Place:

Phone:
Fax:
E-mail:
Mobile:
Website: .

(Signature of the authorized representative of Bidder / Firm / Company)
Name:
Designation:
Company Seal: