BSES YAMUNA POWER LTD.

Tender Notification for

Expression of interest for Repairing of power transformer in BYPL for various rating

NIT NO CMC/BY/17-18/RB/AS/043

Due Date for Submission of Tender: 06.11.2017

(Till 15.00 PM)

BSES YAMUNA POWER LIMITED,
Shakti Kiran Building,Karkardooma, New Delhi-110032
Corporate Identification Number: U40109DL2001PLC111525
Telephone Number : +91 11 3999 7111
Fax Number: +91 11 3999 9765
Website: www.bsesdelhi.com

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SECTION – I: INSTRUCTIONS TO BIDDER

1.1 GENERAL

BSES Yamuna Power Limited invites (BYPL), Delhi is distributing electricity in East & Central Delhi, covering 14 divisions .Expression of interest is hereby invited from all the Bidders who are Interested to execute the job of repair of Power transformers of Rating (enclosed) as defined in technical specifications.

a) 16/20MVA 33/11KV

b) 16/20MVA 66/11KV

c) 25/35/50 MVA 66/33KV

The bidders will be required to repair the transformers and shall arrange all type of labor works and new materials required to execute the job of repair of the transformer.

The tender document can be obtained from address given below against submission of non-refundable demand draft of **Rs.1180/-** drawn in favour of BSES Yamuna Power Ltd, payable at Delhi:

Head of Department
Contracts & Material Deptt**.**
BSES Yamuna Power Limited
III Floor, 'A' Block
Shakti Kiran Building
Karkardooma
New Delhi-110032

The tender papers will be issued on all working days up to the date mentioned in clause 1.01. The tender documents & detail terms and conditions can also be downloaded from the website **www.bsesdelhi.com. (open tenders)** In case tender papers are downloaded from the above website, then the bidder has to enclose a separate demand draft covering the cost of bid documents. Bidders are requested to visit BSES Yamuna power website regularly for any modification /clarification of the bid documents.

1.2 BID submission

1.2.1 The Bidders are required to submit the bids in 1 original + 1 duplicate to the following address

Head of Department
Contracts & Material Deptt.
BSES Yamuna Power Limited
III Floor, 'A' Block
Shakti Kiran Building
Karkardooma
New Delhi-110032

1.2.2 Time schedule

The bidders should complete the following within the dates specified as under

1. Last date of sale of bids documents 5.11.2017
2. Last date of any queries , if any 5.11.2017
3. Last date of bid submission 6.11.2017

Purchaser shall reserve the the rights to following

a) Extend due date of submission

b) Modify tender document in part/whole.

c) Cancel the entire tender.

Bidders are requested to visit website regularly for any modification /clarification/corrigendum/addendum of the bids documents.

SECTION – II: COMMERCIAL TERMS AND CONDITION

1.3 Eligibility & Evaluation Criteria:-

The prospective bidder must qualify all of the following requirements to be eligible to participate in the bidding. Bidders who meet following requirements will be considered as successful bidder and BYPL management has a right to disqualify those bidders who do not meet these requirements.

Qualifying Criteria:-

(Tender No. CMC/BY/17-18/RB/AS/043)		
REPARING & SERVICING OF POWER TRANSFORMER of various make		**Doc attached(please tick)**
S. No.	**Qualification Criteria**	
1	Bidder must have experience of 5 years in Manufacturing and repairing of power transformers and should have supplied and repaired power transformer of similar & higher ratings to major utilities, PSU, State govt. companies, NTPC etc. Please attached last 5 years orders and performance certificate	
2	The bidders should have qualified technical & qualified QA personnel at various stages of manufacture & testing	
3	Bidder must provide proof of solvency from any nationalized/ scheduled commercial bank.	
4	Testing of power transformer should be in NABL accredited test Lab.	
5	Details of technical consultant or Technical collaboration , if any	
6	Firms who are debarred/blacklisted in other utilities in India will not be considered. An undertaking (self-certificate) that the bidders has not been blacklisted by any central/ state govt institution including electricity boards	
7	Approved vendor list for various raw material and bought out items	
8	Duly signed & stamped tender documents submitted with all annexures.	
9	Bidder shall furnish the following commercial & technical information along with the tender :	
a)	Latest Balance Sheet.	
b)	Details of constitution of the company (Proprietary / Limited. Along with the details)	
c)	Memorandum & Articles of Association of the Company.	
d)	Organization Chart of the Company.	
e)	Experience details with credentials.	
f)	Turnover certificate issued by C.A. for the last three Financial Years.	
	Documents to be submit and attached as per this format	

Evaluation criteria:-

BYPL will assess the capabilities /installed capacity and evaluation of the bids shall be carried out based on the documents submitted in support of the qualification criteria and the company profile.

BYPL reserve the right to accept / reject any or all tenders without assigning any reason thereof.

1.4

Technical clarification, if any, as regards this RFQ shall be sought in writing and sent by post/courier to following address	**Technical**	**Commercial**
Contact Person	Head (CES), BYPL Copy to :Head (C&M)	Head (C&M)
Address	CESDeptt**.** BSES Yamuna Power Limited III Floor, 'B' Block Shakti Kiran Building Karkardooma New Delhi-110032	Contracts & Material Deptt**.** BSES Yamuna Power Limited III Floor, 'A' Block Shakti Kiran Building Karkardooma New Delhi-110032

TECHNICAL SPECIFICATION

FOR REPAIRING AND SERVICING

OF POWER TRANSFORMER

Specification no – GN101-03-SP-32-00

Prepared by:	Checked by :	Approved by:	Rev	Date
Meenakshi	Devender Sharma	Devender Sharma	R0	05.08.2011

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General Specification

1.0.0 Codes & standards

Materials, equipment and methods used in the Repairing and Servicing of Power Transformer shall conform to the latest edition of following standards –

Indian Standards

IS : 335	Insulating oil
IS : 1271	Thermal evaluation and classification of electrical insulation
IS : 2099	Bushing for alternating voltage above 1000V
IS : 2705	Current transformers
IS : 3347	Dimensions for porcelain transformer bushing
IS : 3637	Gas operated relays
IS : 3639	Fitting and accessories for power transformers
IS : 4201	Application guide for CT's
IS : 6600	Guide for loading of oil immersed transformers
IS : 8478	Application guide for On load tap changer
IS : 8468	On load tap changer
IS 10028	Code of practice for selection, installation & maintenance of transformers
IS : 13947	LV switchgear & controlgear Part-1
IS : 2026	Power Transformers
IS : 5561	Electrical power connectors
IS : 6272	Specification for Industrial cooling fans
IS : 1866	Code of practice for electrical maintenance and supervision of mineral insulating oil in the equipment
IS : 3043	Code of practice for earthing
IS : 6792	Method for determination of electrical strength of insulating oils.
IS : 2099	Bushing for alternating voltages above 1000V
	Indian Electricity Rules
	Indian electricity act
	CBIP manual

2.0.0 Major Design Criteria & Parameters

2.1.0	Voltage variation on supply side	+ / - 10%
2.1.1	Frequency variation on supply side	+ / - 5%
2.1.2	Transient condition	-20% or +10% combined variation of voltage and frequency
2.1.3	Service condition	Refer annexure B

3.0 Terms and Conditions for Servicing of Power Transformer

3.1	General Terms and Conditions	i) The vendor shall have to lift the transformer from the substation after getting consent and written approval from owner. A complete list of material along with handing Over/Taking over Performa as per Annexure-D shall be handed over to the vendor. ii) Before lifting of transformers, the vendor to check and ensure that core coil assembly is fitted with the transformers. During Joint verification at vendors work if core/coil found missing the vendor shall repair the same on his cost and risk by giving credit of scrap of Copper/core approximate nearest/equal to quantity of the same make transformer core/coil. iii) Vendor has to give the inspection call before opening of the transformer at his works and the transformer shall be opened in presence of the representative of owner. The joint verification of the transformer shall be done and report for repairing/servicing shall be prepared as per formats attached as Annexure-E. Based on the above report, vendor has to take the approval of the work before proceeding with the repairing/servicing work.
3.2	On site inspection of Transformer	- Physical inspection of transformer at site/sub-station shall be checked for the present condition of the transformer and all components /accessories as a bench mark for preliminary assessment of extent of servicing/repair required and preparation of handing over/taking over document jointly with the Owner as per Annexure-D. - The owner shall carryout field test as per clause 8.0 and furnish Field Test Report of transformer along with brief history and last DGA report to vendor as a benchmark document.

3.3	Field check before lifting of transformer	Bidder shall carryout following checks on the transformer including accessories jointly with Owner's representative at site and record the observations in handing over/taking over document as per Annexure-D a) Check tank, radiators, Conservator and bushing for oil leaks. If oil level has fallen down below specified level (at site temp.), the cause of leakage should be determined. Check for leaks on all joints, valves, connections etc. shall be carried out. b) Check HV & LV bushing surface for damage, signs of chipping, dirt, oil films etc c) Check condition of relief vents. d) Check functioning of cooling arrangement. e) Check calibration of local & remote temperature indicators. f) Check operation of buchholz relay and magnetic oil level gauge. g) Check functioning of tap changer both local/remote as well as automatic/ manual control. Check motors and it's controls. h) Check that all control, alarm, power supply circuit are in order, switches are functioning and fuses in the circuit are well placed and of proper rating. i) Check the condition of Painting. j) Check the presence of nameplate, caution plate etc.
3.4	Transportation of transformer	Following shall be in scope of the vendor :- i) Lifting, dragging, loading and transportation of the transformer from the site to vendor's works and unloading, handing of transformer in vendor's works. ii) Transportation of new Oil (to be supplied by the owner as a free issue item in case of servicing) from owner's store to vendor works. iii) Complete transit insurance.

3.5	Servicing of Transformer at Vendor's work	i) Un-tanking the transformer at vendor's works in presence of owner's representative. During un-tanking, inspection and testing at vendor's works shall be carried out. This will help to assess exact quantum and nature of servicing/repair involved. Preparation of joint verification report highlighting condition of the transformer including it's core and winding and nature of replacement /repairing of components to be carried out. ii) Transportation of new Oil (to be supplied by the owner as a free issue item in case of servicing) from owner's store to vendor works. iii) Servicing of the transformer including repair/replacement of parts/accessories as per approval of the owner. iv) Repairing of core and change of winding is excluded from the scope of servicing of Transformer.
3.6		i) After servicing, the Power Transformer shall be deemed to be fully ready for charging and will be fitted with all necessary components and accessories, which are necessary for efficient performance and trouble free operation of transformer under various operating and atmospheric conditions. ii) Loading and transformation of the transformer after servicing from the vendor's works and finally unloading the transformer at sub-station site/store as per direction of the owner. iii) Dismantling of transformer before dispatch from site and Erection, Testing and commissioning of the refurbished transformer are excluded from the scope of the vendor. However, the vendor shall depute their representative during testing and commissioning of the transformer at site with no additional financial implication to the Owner.

3.7	Major checks during Un-tanking of the transformer	Transformer should be un-tanked in presence of owner for the following checks and Joint Verification Report shall be prepared.
3.8	Core and Coil	i) While un-tanking, looseness in laminations, core bolts, insulating block shall be checked. The top yoke shall be checked for any kind of weld and burnt marking. ii) If any bolt/nut is found loose that should be tightened. Moreover, if there is any slacking of windings, Tie-rod/Coil Clamping Screws shall also be tightened.
3.9	Condition of Coil	i) Visual inspection regarding the colour of the insulation paper. If it has oxidized fully and the colour has become black or the paper has become brittle, respective winding shall be replaced by new one and repairing shall be done as per clause 4.0 of this specification. ii) For the paper that appears in order, the small piece shall be checked for degree of polymerization for assessing the life of the paper. iii) The complete winding shall be given hot oil bath. Complete coil to be washed properly with clean oil under pressure to remove sludge and other accumulations, which prevent proper circulation of oil. iv) All spacers shall be checked properly for any deformation. If any spacer is found displaced, the same shall be put at the proper place by loosening the top bolt. If required the press board should be changed. v) The entire paper of the tie rod shall be removed and new paper wrapped. vi) Proper drying of all the replaced papers should be ensured while carrying out the job. vii) The connection between the windings and bushing shall be checked for healthiness and if required shall be attended.

		viii) The complete core coil shall be kept in the vacuum oven and shall be taken out only when it is completely dehydrated. The I.R. value should be more than 2000MΩ and Polarisation index ($PI=IR_{(10\ min)}/IR_{(1\ min)}$ factor shall be more than 1.5 respectively.
3.10	OLTC	i) Complete cleaning of the OLTC contacts and pitting, if any, shall be properly done. After cleaning contact resistance to be checked to ensure the proper cleaning of the contacts. ii) Papers of all the tapping leads is to be changed with the good quality crape papers , the test certificate and sources of the papers shall be scrutinized by the owner. iii) All lugs /crimping at the OLTC taps shall be checked and re-crimped if required. iv) Separation plate/Phase Barrier plate to be checked for any sort of mechanical damage and if found damaged shall be replaced after taking approval from the owner. v) Moving contacts of OLTC will be checked properly for wear and tear and if required the same shall be changed. vi) Insulation rods to be checked for its proper mechanical and insulating strength by applying high voltage across OLTC. vii) Complete wiring of OLTC both in remote and manual mode to be checked. viii) Vendor has to submit the list of the spares required for OLTC for the review of the owner. ix) If required, wiring of OLTC is to be carried out by reputed make FRLS cable and report for owner will verify the same. x) Manual operating handle, if not available, shall be provided.

		xi) Oil surge relay of OLTC to be checked for proper functioning and if required shall be changed.
3.11	TRANSFORMER TANK	i) For complete tank cleaning and removal of the sludge and carbon, hot oil cleaning shall be carried out. For flushing out the sludge, hot oil cleaning to continue till sludge is completely removed. ii) All carbon shall be removed. iii) Painting of the entire outer surface and inner surface of the tank and all other accessories shall be carried out.
3.12	RADIATORS	i) For complete cleaning and removal of the sludge and carbon from the radiator, hot oil cleaning shall be carried out. For flushing out the sludge from the radiator, hot oil cleaning to continue till sludge is completely removed. ii) Air pressure test as per relevant standard shall be carried out for the radiators. Damaged radiator fins shall be repaired/replaced. iii) Painting of the entire outer surface of the radiators shall be carried out.
3.13	CONSERVATOR AND AIR CELL	i) Conservator shall be cleaned by hot oil cleaning ii) Leakage in the air cell shall be checked. If required, the air cell shall be replaced with approval from the Owner. iii) Painting of the entire outer surface of the conservator shall be carried out.
3.14	BUSHING	i) All types of bushing shall be checked for hair crack and damages and it shall be replaced wherever required. In case bushing-having damage to any skirt, it should be replaced by new one. The bushings shall conform to the latest IS-3347. ii) Before using the old bushing it should be subjected to high voltage at 90% of the voltage and if the bushing does not withstand the test, it shall be replaced. iii) In case the bushing CT has been provided for WTI, the ratio and proper functioning is to be checked.

		iv) Tan Delta and capacitive leakage test shall be carried out for capacitive type bushings.
3.15	SUPPORT INSULATOR AND BUSBARS	i) Damaged support insulator shall be replaced with the porcelain glazed insulator of the creepage distance not less than 25 mm/ KV. The insulator shall be reputed make and subjected to the approval of the Owner. ii) If required, busbars shall be provided for connecting the two runs of 1CX1000 sq.mm., 11KV XLPE cable. iii) Provision for screen earthing of the cable shall be provided.
3.16	AXLES AND WHEELS	Proper functionality of flanged bi-directional wheels and axles shall be ensured.
3.17	SILICA GEL BREATHER	i) Breather shall be checked and it shall be ensured that the breather is leak proof and it breaths through the capillary only. Incase the breather is not serviceable, it shall be replaced. ii) If the old breather is retained, Silica gel and oil in sealing cup shall be changed.
3.18	WTI, OTI and Marshalling Box	i) WTI & OTI should be properly calibrated for indication of the correct temperature and initiating the alarm and trip contacts. In case, WTI and OTI are not serviceable, the same shall be replaced ii) Functioning of RTD's of oil and winding temperature indicators, if provided, shall be checked. iii) The Complete wiring, NO & NC contacts are to be checked and if required rewiring of the cubicle should be done. In case anything is found burnt/damaged, the same shall be repaired with the guarantee of one year. iv) All cabling as required is to be done by FRLS cable. All contactors shall be of approved vendor. v) All door and flange gasket neoprene or EPDM should be changed for proper environment protection. vi) Space heater and cubicle light shall be checked for proper operation.

3.19	REMOTE INDICATIONS AND RTCC PANEL	i) Remote WTI, OTI & TPI should be properly calibrated. In case, these are not serviceable, the same shall be replaced ii) Proper functioning of all alarm and annunciation in RTCC panel to be checked and corrected as required. iii) Cooler control and fan failure scheme shall be checked and necessary correction shall be made as required. iv) The Complete wiring and NO & NC contacts are to be checked and if required rewiring of the cubicle should be done. In case anything is found burnt/damaged the same shall be repaired with the guarantee of one year. v) All cabling as required is to be done by FRLS cable. All contactor shall be of approved make. vi) All door and flange gasket neoprene or EPDM should be changed for proper environment protection. vii) Space heater and cubicle light shall be checked for proper operation.
3.20	General Work	a) Accessories, which are not serviceable, shall be replaced. Before replacement joint verification report shall be prepared and approval shall be obtained from the Owner. b) All gaskets shall be changed by new ones. In addition, the vendor shall provide a complete set of spare gaskets for all joints. The gasket shall be type-B conforming to IS-4253 (Part-II)/1980 and any amendments thereof. c) All nuts & bolts shall be replaced by new ones. Steel bolts and nuts exposed to atmosphere shall be cadmium plated or zinc plated. On outdoor equipments all bolts, nuts and washers in contacts with non-ferrous parts, which may carry current, shall be phosphor-bronze, where transfer of current is through the bolts. d) All fuses shall be replaced by new ones.

		e) Checking for the functionality of all protective relaying i.e., Buchholz, OSR,PRV, PRD, MOG etc. for proper functioning. If required these shall be changed after taking approval from owner.
3.21	Painting	a) Tank and other metallic parts shall be thoroughly cleaned with caustic soda and there after with emery paper to remove oil, original old paint and rust (if any) to ensure good bond between metal and Paint. After above process, Tank internals shall be cleaned by Shot/Sand blasting method. b) One coat of high quality and heat resistant Epoxy based rust resisting primer as per IS:2074 with latest amendments. shall be applied on the complete outer surface of tank, conservator, radiator and other metal parts before applying the two coats of battleship grey shade 632 (IS : 5) polyurethane paint. All paints shall be oil and weather resistant type. The total paint thickness shall not be less than 80 micron with the glossy finish however vendor should take the approval of final paint shade from owner. c) The internal surfaces of transformer shall be painted by two coats of bright yellow heat resistant & oil resistant paint. Paint shall neither dissolve nor react in hot transformer oil. d) Each earthing point to be checked and it should be free from the paint

4.0 Terms and Conditions for Repairing of Power Transformer

	All the scope of work mentioned hereunder is included in the scope of repairing in addition to the work under clause 3.0 for servicing of transformer.	
4.1	Scope of work	Following additional scope of work is also included in the scope of work for repairing of transformer a) Repair/replacement of damaged core identified during Joint Verification Report and approved by the owner. b) Replacement of winding as per approval of the owner. Before re-installing the core and coil into the tank after repair, stage inspection shall be carried out in presence of Owner's representative and stage inspection report shall be prepared.
2	General terms and condition	a) The vendor shall have to lift the transformer from the substation after getting consent and written approval from owner. A complete list of material along with handing Over/Taking over Performa as per Annexure-I being handed over to the vendor shall be made. b) Before lifting of transformers, the vendor to check and ensure that core coil assembly is fitted with the transformers. During JVR if core/coil found missing the vendor will repair the same on his cost and risk by giving credit of scarp of Copper/core approximate nearest/equal to qty of the same make transformer core/coil. c) Vendor has to give the inspection call before opening of the transformer at his works and the transformer shall be opened in presence of the representative of owner. The joint verification of the transformer shall be done and report for repairing/servicing shall be prepared as per formats attached as Annexure-II. Standard quality plan for Joint Verification is attached as annexure-V. Based on the above report and the vendor has to take the approval of the work before proceeding with the repairing/servicing work.
		d) Vendor has to furnish the list of all the spares

		required for servicing of the transformer. All the accessories or parts being used for replacement shall be new and of approved make in line with the list attached as Annexure-IV. The vendor has to submit the test report of these components at the time of inspection. e) All the works as listed under clause no.5.0 for servicing and both of the clause no.5.0 & 6.0 for repairing, have to be completed before offering final inspection of the transformer. f) Before re-installing the core and coil into the tank, stage inspection shall be carried out in presence of Owner's representative. The joint stage inspection report shall be prepared as per formats attached as Annexure-III. Standard quality plan for Stage inspection is attached as annexure-VI . g) In case of transformer having no name plate the dimension of tank, radiator & conservator to be measured at the time of JVR and submitted for technical approval for quantity of oil. h) The Vendor may be allowed to dispose all detained material after approval of estimate for repair from the Owner. i) In case of replacement of winding, the Vendor shall retain the one coil of HT & LT for physical verification till the stage inspection and estimate approval. j) Any deviation with respect to the scope of work and specification should be clearly brought out by the vendor. In case of no deviation, it will be deemed that vendor has agreed on all the work as mentioned in the specification. k) Vendor shall offer inspection call to owner after completion of servicing work for which at least 1-week advance notice shall be given. Test will be performed in presence of owner's representative. Standard quality plan for final inspection is attached as Annexure-VII.

4.3	Core and Coil	i If core lamination is found to be damaged, the same shall be replaced and the weight of the damaged core shall be recorded in JVR. ii In case of rewinding the following shall be followed: iii The conductors shall be of electrolytic copper. Current density in winding should not be more than 2.5 A/sq mm. For any deviation prior approval of the owner is required. iv Temperature rise test shall be carried out after reassembly of the transformer. v All insulation materials shall be of quality appropriate to the insulation classes of respective transformer and shall conform to IS-2026/1977 and amendments thereof. a. After removing the top ring and core if sludge is found in between the windings, the HT windings shall be taken out and LT windings shall be cleaned properly with hot oil before putting it in the oven. b. All top rings to be changed by new ones. c. Binding between the winding layers to be checked and if loosened proper care shall be taken. d. If there is any slight deformation in the coil the same shall be corrected.
4.4	Transformer oil	Vendor shall replace transformer oil of approved make.

5.0.0 Fittings and Accessories on Power Transformer

5.1	Rating and Diagram Plate	Required (**in case of Repair only**)
5.2	Material	Anodized aluminum 16SWG
5.3	Background	SATIN SILVER
5.4	Letters, diagram & border	Black
5.5	Process	Etching
5.6	Name plate details	Following details shall be provided on rating & diagram plate as a minimum i) Type/kind of transformer with winding material. ii) Standard to which it is repaired. iii) Name of vendor who repaired the transformer. iv) Transformer new serial no. v) Month & year of repair. vi) Rated frequency. vii) Rated voltages in KV. viii) Number of phases. ix) Rated power in KVA x) Type of cooling. xi) Rated current in Ampere. xii) Vector group symbol. xiii) 1.2/50μ sec wave impulse voltage withstand level in kv. xiv) Power frequency withstand voltage in KV. xv) Impedance voltage at rated current & freq. In % at principal, minimum, maximum tap. xvi) Load loss at rated current. xvii) No-load loss at rated voltage & frequency. xviii) Auxiliary loss if applicable. xix) Continuous ambient temp. at which ratings apply. xx) Top oil and winding temp. rise at rated load and ambient temp. xxi) Winding connection diagram.

		xxii) Transport weight of transformer. xxiii) Weight of core and frame. xxiv) Weight of winding. xxv) Weight of core and winding. xxvi) Weight of tank & fitting. xxvii) Total weight. xxviii) Volume of oil. xxix) Weight of oil. xxx) NCT, WCT details. xxxi) Type of OLTC. xxxii) Tapping details. xxxiii) Name of Owner. xxxiv) PO no. and date. xxxv) Guarantee period.
	Instruction plate for OLTC	Required.
	Oil filling instruction	Required.
	Valve schedule instruction	Required.

6.0.0 Approved make of components

6.1	Core Lamination	Kawasaki, Japan Nippon, Japan British Steel, UK Duferco, Swizerland EBG, India Mitsubishi Corporation, Japan
6.2	Insulating Material(press board, kraft paper, press paper)	Sumitomo corporation, Japan Weidmann, Switzerland Raman Boards, Thandavapura Munkajo Paper, AB Sweden Senepathy Whiteley, Bangalore
6.3	Copper / Aluminium (rod)	Sterlite industries, Lonavala Birla Copper, Bharuch Hindustan Copper, New Delhi Bharat Alum. Co., New delhi

		National Alum. Co. , new delhi
6.4	Transformer Oil	Apar, Mumbai Savita Chemicals, Mumbai
6.5	Gasket	Nu-Cork products, Gurgaon Talbros, Faridabad Cortica Mfg. Chemical Gujarat Cork, Valaad Everest Electric
6.6	Condenser Bushing	Alstom BHEL, Bhopal CGL, Nashik ABB
6.7	Porcelain Bushing	CJI
6.8	Buchholz Relay	Proyog / ATVUS
6.9	Temperature Indicator	Precimeasure / / Perfect Controls/ Pradeep Sales
6.10	OLTC	CTR, Pune HHE, Chennai BHEL, Bhopal
6.11	MOG	Sukrut Udyog, Pune Atvus Industries, Kolkata Press N Forge, Mumbai
6.12	Pressure relief valve	Sukrut or equivalent
6.13	Oil Surge relay	Sukrut Udyog, Pune Atvus Industries, Kolkata
6.14	Repeater for WTI/OTI	Accord or equivalent
6.15	Temperature Scanner	Accord or equivalent
6.16	Neutral CT	Pragati / ECS / KAPPA/ Reputed equivalent
6.17	WCT	Pragati / ECS / KAPPA/ Reputed equivalent
6.18	Automatic Voltage Regulating Relay	Pradeep or equivalent
6.19	Under / Over Voltage relay	Easun Rayrolle or equivalent
6.20	Switch	L&T/ Siemens or equivalent
6.21	HRC Fuse links and base	Siemens/L&T/GE or equivalent
6.22	Meters	IMP/AE/Rishabh or equivalent

6.23	AC contactor & over load relay	L&T/Siemens/Schneider or equivalent
6.24	Terminals	Connectwell / elmex or equivalent
6.25	Push Button / Actuator	L&T / Siemens
6.26	Thermostat	Velco or equivalent
6.27	Heater	Velco or equivalent
6.28	Selector Switch	Siemens / Kaycee / Jainson
6.29	Tap position indicator	Accord or equivalent
6.30	Annunciator	Accord / Minilec / Equivalent
6.31	Digital tap change counter	Selectron or equivalent
6.32	LED indication lamp	MIMIC/Siemens/Binay/Equivalent

Note – Any other make of component to be approved by purchaser

7.0.0 Quality assurance

7.1	Vendor quality plan	To be submitted for purchaser approval.
7.2	Inspection point	To be mutually identified and agreed in quality plan.

8.0.0 Progress Reporting

8.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation programme. The vendor shall submit Time schedule for Servicing / repairing of Power Transformer within 5 Days of receipt of Transformer at there works.
8.2	Detailed Progress report	To be submitted to Purchaser once a month containing i) Progress on material procurement ii) Progress on servicing (As applicable) iii) Progress on assembly (As applicable) iv) Progress on internal stage inspection v) Reason for any delay in total programme vi) Details of test failures if any in manufacturing stages.(if applicable) vii) Progress on final box up Constraints / Forward path

9.0.0 Drawing, Data & manuals

9.1	To be submitted along with bid	Vendor has to submit: i) Detailed reference list of customers already using the serviced/repaired transformer during the last 5 years with particular emphasis on units of similar design and rating. ii) Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted iii) Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification iv) Details of facilities of the bidder where the transformer is intended to be repaired.
9.2	After award of contract, seller has to submit mentioned drawings for buyer's Approval (A) / Reference (R)	i) Programme for production and testing (A) ii) Calculations pertaining to winding and core in case of repair. (A) iii) Detailed dimensional drawing for all components, general arrangement drawing showing detailed component layout and detailed schematic and wiring drawings for all components (like marshalling box) which are replaced by vendor. iv) Terminal arrangement & cable box details etc (as applicable) (A) v) Rating and diagram plate in case of repair (A) vi) Transport / Shipping dimensions with weights, wheel base details, untanking height etc (As applicable) (R) vii) List of makes of all fittings and accessories (A) viii) Detailed installation and commissioning instructions (R) ix) Quality plan
9.3	Submittals required prior to dispatch	i) Inspection and test reports, carried out in manufacturer's works (R) ii) Test certificates of all bought out items iii) Operation and maintenance Instruction as well as trouble shooting charts/ manuals
9.4	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4
9.5	No of drgs. /Documents required at different stages	As per Annexure A Scope of Supply

10.0.0 Inspection during repair

10.1	Inspection and Testing during repair	
10.2	Core	i) Sample testing of core material for checking specific loss, bending properties, magnetization characteristics & thickness. ii) Check on the quality of varish if used on the stampings for a) measurement of thickness & hardness of varish on stampings. b) Solvent resistance test to check that varish does not react in hot oil. c) Check overall quality of varnish by sampling to ensure uniform hipping color, no bare spots, no burnt varish layer and no bubbles on varished surface. iii) Check on the amount of burrs. iv) Bow check on stampings. v) Check for the overlapping of stampings. Corners of the sheet are to be apart. vi) Visual & dimensional check during assembly stage. vii) Check on complete core for measurements of iron-loss and check for any hot spot by exciting the core so as to induce the designed value of flux density in the core. viii) Check for inter laminar insulation between core sectors before & after pressing. ix) Visual & dimensional checks for straightness & roundness of core, thickness of limbs & suitability of clamps. x) High voltage test (2KV for one min.) between core and clamps. xi) Certification of all the tests.
10.3	Insulating Materials	i) Sample check for physical properties of materials. ii) Check for dielectric strength. i) Visual and dimensional checks. ii) Certification of all tests.
10.4	Windings	i) Sample check on winding conductor for mechanical properties & electrical conductivity. ii) Visual & dimensional check on conductor for

		scratches, dept. mark etc. iii) Sample check on insulating paper for PE value, bursting strength, electric strength. iv) Check for reaction of hot oil on insulating paper. v) Check for bending of the insulating paper on the conductor. vi) Check to ensure that physical condition of all material taken for winding is satisfactory & free of dust. vii) Check for absence of short circuit between parallel strands. viii) Check for brazed joints wherever applicable. ix) Measurement of voltage ratio to be carried out when core/yoke is completely restocked and all connections are ready. x) Certification of all above results.
10.5	Oil	i) As per IS 335, which shall be free issue item to the vendor. Although vendor shall ensure that oil is filled under vacuum.

11.0.0 Testing of transformer

11.1	Routine tests	Tests shall be carried out in accordance with IS 2026 & IEC-76
11.2	Test before lifting of transformer by vendor for servicing/repair	i) Followings Tests shall be performed before handing over the transformer to the vendor for the servicing. Tests shall be carried out at site by owner and the test results along with brief history of the transformer shall be handed over to the vendor :- a) Measurement of insulation resistance & polarization index between HV & LV, HV &

		Earth, LV & Earth(In case the transformer has been kept out of service under DGA failure, no megger testing is necessary) b) Measurement of resistance at all taps. Vector Group and polarity test at principal tap. d) Measurement of Magnetising current at LT voltage at principal tap. e) Magnetic balance test at principal tap f) Single Phase Short Circuit test . g) Ratio test of HV WTI CT, LV WTI CT and neutral CT h) Turns Ratio test i) Test report of oil as per IS 1866-2000 i.e., colour / dirtyness, B.D.V. Resistivity, water content, surface tension, neutralization value, DDA, flashpoint, and Tan-Delta as far as available. j) DGA analysis of oil mainly for hydrogen, methane, ethane, ethylene, acetylene, CO and CO_2 content. Based on the above tests, if it is concluded that transformer is not faulty, the transformer will be given for servicing. If it is concluded that transformer is faulty, the transformer should be segregated for repairs.
11.3	Acceptance test after servicing / repair of Transformer	After servicing/repair all routine tests in accordance with IS: 2026 and IEC-76 shall be carried out on each transformer. The sequence of routine testing shall be as follows:- i) Measurements of insulation resistance and Polarisation Index. ii) Measurements of winding resistance corrected at 75°C and principal tap (HV and

		LV) and two extreme taps. iii) Vector Group, Ratio test and polarity test iv) Separate sources withstand voltage test (HV & LV) at 75% of original test voltage. v) Measurement of iron losses at 90%, 100% and 110% of rated voltage. vi) Induced voltage withstand test at 75% of original test voltage. vii) Load losses measurement corrected at 75°C at Principal tap and Impedance measurement at principal tap (HV and LV) of the transformer. viii) Regulation corrected at 75°C, unity p.f. and 100% load. ix) Efficiency corrected at 75°C and 100% load. x) Magnetic balance test. xi) Temperature rise test, only in case of rewinding. xii) Measurement of Zero phase sequence impedance xiii) Measurement of noise level xiv) Measurement of Vibration after transformer being fitted with radiator (in case of rewinding). xv) Test on on-load tap changer. xvi) All component parts and auxiliary equipment such as oil, bushings, tap changing gear, C.T.s, etc. shall be routine tested as per relevant Indian Standards. High voltage test shall be performed on auxiliary equipment and wiring after complete assembly. Performance testing of relays, WTI, OTI & MOG. xvii) Oil leakage test on transformer

		completed with all fittings (without radiator in case of servicing) & filled with oil at pressure equal to weight of oil + 0.7 atmospheric pressure on bottom valve for a period of 12 hours. xviii) Operation of OLTC and or RTCC shall be tested for two complete forward and two complete backward directions at full load current of the transformer.

12.0.0 Packing , Shipping, Handling and Storage

12.0	Packing	
12.1	Packing protection	Against corrosion, dampness, heavy rains, breakage and vibration
12.2	Packing for accessories and spares	Robust wooden non-returnable packing case with all the above protection and identification labels.
12.3	Packing identification label	In each packing case, following details are required: i) Individual serial number ii) Purchaser's name iii) PO number (along with SAP item code, if any) & date iv) Equipment Tag no. (if any) v) Destination vi) Manufacturer/Supplier's name vii) Address of manufacturer/supplier's / its agent viii) Description and quantity ix) Country of origin x) Month and year of manufacturing xi) Case measurements xii) Gross and net weights in kilograms xiii) All necessary slinging and stacking instructions.
12.4	Shipping	i) The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, overhead lines, free access etc. from the manufacturing plant to the project site; and furnish to the Purchaser confirmation that the proposed packages can be safely

		transported, as normal or oversize packages, upto the plant site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser. ii) The vendor shall be responsible for all transit damage due to improper packing.
12.5	Handling and Storage	Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

13.0.0 Deviations

Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification.

Annexure - A Scope of work

1.0 The scope of work shall include following

1.1 Scope shall include transportation, servicing, testing, replacement of accesseries and Repairing of Power transformer as per this specification.

Sr. No	Description	Scope of Work
1.0	Testing of transformer before handing over (at owners site)	NO
1.1	Testing of transformer at site after repair / servicing	NO
1.2	Supervising commissioning of transformer when put back in service	YES
1.3	Routine testing as per this specification	YES
1.4	Submission of Documentation as detailed below	YES

1.2 Supervision of testing & commissioning of transformer at site.

2.0 Submission of documents

Submission of drawings, calculations, catalogues, manuals, test reports shall be as follows

	Along with offer	For Approval after award of contract	Final after approval	Remarks
Drawings in case of repair	3 copies (Typical drgs)	4 copies	6 copies + 1 soft copy in CD	See Clause 5.0 for various drawings required
Calculations in case of repair	3 copies (Typical)	4 copies	6 copies + 1 soft copy in CD	See Clause 5.0 for details
Catalogues	1 copy		6 copies + 1 soft copy in CD	
Test Report	2 copies		6 copies + 1 soft copy in CD	Type test and sample routine test reports

3.0 Delivery schedule

3.1	Delivery period start date	-	From date of purchase order
3.2	Delivery period end date	-	As agreed with supplier
3.3	Material dispatch clearance	-	After inspection by purchaser and written dispatch clearances for purchaser

Annexure – B Service Conditions

1.0.0	Mumbai Atmospheric conditions	
a)	Average grade atmosphere :	Heavily polluted , salt Laden, dusty, humid with possibility of condensation
	Maximum altitude above sea level	1000 M
b)	Ambient Air temperature	Highest 45 deg C, Average 35 deg C
	Minimum ambient air temperature	20 deg C
c)	Relative Humidity	100 % Max
d)	Thermal Resistivity of Soil	150 Deg.C cm/W
e)	Seismic Zone	3 as per IS 1893
f)	Rainfall	3000 mm concentrated in four months

2.0.0	Delhi Atmospheric conditions	
a)	Average grade atmosphere :	Heavily polluted, dry
	Maximum altitude above sea level	1000 M
b)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
	Minimum ambient air temperature	0 Deg C
c)	Relative Humidity	100 % Max
d)	Thermal Resistivity of Soil	150 Deg.C cm/W
e)	Seismic Zone	4 as per IS 1893
f)	Rainfall	750 mm concentrated in four months
g)	Wind Pressure	195Kg/m2 up to 30M elevation as per IS 875-1975

Annexure – C Format for data of Temperature rise test

The vendor shall conduct and furnish temperature rise test on transformer after repair at its work in following format.

Time in Hrs.	Current in amp	Voltage in KV	Input in KW	Cooler A Temp. in DEG C			Top oil temp. in DEG C	Average ambient Temp. in DEG C	Top oil rise in DEG C
				Top	Bottom	Diff.			

Annexure - D Handing over/taking over of Power Transformer

HANDING OVER/TAKING OVER OF POWER TRANSFORMERS BEING SENT FOR REPAIR/SERVICING

PLACE:
DATE :

1.0	Name of the Vendor	
2.0	Address	
3.0	Phone / Fax No	
4.0	Name of Representative with Designation	

A	Transformer Details		
Name Plate details			
(English /Hindi/Marathi)			
1.0	Make		
2.0	Capacity		
3.0	Voltage Rating		
4.0	Serial Number		
5.0	Year of Manufacture		
6.0	Weight of Core & Winding		
7.0	Weight of Oil		
8.0	Quantity of Oil		
B.	List of accessories/Items handed over along with Main transformer		
Sr. No	Description	Handed over /Received	REMARKS Appearing Healthy – AH Missing – M No provision – NP Damaged - D
1.0	Main tank valves (butterfly valve, drain valve, filter valve etc)		
2.0	Conservator tank with oil level indicating glass tube		
3.0	MOG with Low oil level alarm		
4.0	Oil circulation valves of conservator (Top & Bottom)		
5.0	Air Cell		
6.0	Conservator oil drain valve		
7.0	Main silica gel breather assy.		
8.0	Main silica gel breather pipe		
9.0	Silicagel breather assembly for OLTC		

10.0	Pipe for silicagel breather assembly for OLTC		
11.0	Conservator mounting brackets /Frame		
12.0	Equalising pipe connecting conservator tank with main transformer tank		
13.0	Buchholz relay		
14.0	Oil surge relay for OLTC		
15.0	Air release cock of Buchholz relay		
16.0	Oil drain cock of Buchholz relay		
17.0	Valves on either side of buchholz relay		
18.0	Air release valve on top cover of the tank		
19.0	Explosion vent/PRV		
20.0	Connecting pipe between explosion vent & conservator		
21.0	Air release cock (brass) on top of explosion vent		
22.0	HV side turrets connecting pipe with equilising pipe		
23.0	HV Bushings		
23.1	Porcelain insulators		
23.2	Metal Parts (brass)		
23.3	Clamps		
24.0	LV Bushings		
24.1	Porcelain insulators		
24.2	Metal Parts (brass)		
24.3	Clamps		
25.0	11KV Copper Bus Bar		
25.1	NOS. and Size		
25.2	Weight		
26.0	11KV Lightning arrestor		
26.1	Quantity and present condition		
27.0	Blanking plates		
28.0	Main tank oil filtration valves		
28.1	Top		
28.2	Bottom		
28.3	Emergency oil drain valve (bottom)		
28.4	Oil sampling valves-top/middle/bottom		

29.0	Marshalling Box		
29.1	WTI		
29.2	OTI		
29.3	Transducer for OTI		
29.4	Transducer for WTI		
29.5	AC Main switch		
29.6	Strip Heater		
29.7	Lamp holder		
29.8	Lamp Switch		
29.9	Fans contactors		
29.10	Cable entry gland plate		
29.11	Condition of wiring		
29.12	Condition of door		
29.13	Door-lock Handle		
29.14	Door glass		
30.0	Radiator valves top & Bottom		
31.0	Number of radiators and condition		
32.0	Axle & Wheels assy.		
33.0	No. of cooling Fans / Make		
34.0	OLTC Details		
34.1	Make		
34.2	Type		
34.3	Serial number		
34.4	OLTC Operating handle		
34.5	Local /Remote Switch		
34.6	AC Mains ON/OFF switch		
34.7	Driving Motor		
34.8	Brakes		
34.9	Step by Step relays		
34.10	Direction sequence switch		
34.11	Control supply transformer		
34.12	Raise /Lower Switch		
34.13	Raise contactor		
34.14	Lower Contactor		
34.15	OLTC Operation Counter		
34.16	Driving mechanism door handle		
34.17	Driving mechanism door glass		
35.0	Selector switch oil single relay		
36.0	Selector switch conservator		
37.0	Equalising pipe connecting to conservator		

	and selector switch oil circulation valves		
38.0	Silica gel breather of selector switch conservator		
39.0	Selector switch chamber air release cock		
40.0	Selector switch chamber oil circulation valves		
41.0	Selector switch chamber oil level indicating glass		
42.0	Oil in selector switch		
43.0	General condition of OLTC driving mechanism		
43.1	Name Plate		
43.2	Caution plate		
43.3	Transformer oil		
43.4	Total quantity of oil handed over to vendor at site		
45.0	RTCC		
45.1	Tap position indicator		
45.2	Remote WTI		
45.3	Remote OTI		
45.4	Automatic voltage regulator		
45.5	Raise/Lower PB/switch		
45.6	Contactor		
45.7	Auto manual switch		
45.8	AC Main switch		
45.9	Strip Heater		
45.10	Lamp holder		
45.11	Lamp Switch		
45.12	Cable entry gland plate		
45.13	Condition of wiring		
45.14	Condition of door		
45.15	Door-lock Handle		
45.16	Indication/Alarm conditions		
45.17	Fan Failure Scheme		
45.18	Annunciator (FACIA)		
C.	List of Test report and past history handed over along with main transformer		
Sr. No	Description	Handed over/Received	Remarks Satisfactory – S Not satisfactory – NS
1.0	IR Values		
1.1	HV-LV+E		
1.2	LV-HV+E		
1.3	HV – LV		

1.4	Oil Temperature		
2.0	PI Values		
2.1	HV		
2.2	LV		
3.0	Transformer oil BDV at 2.5mm gap		
3.1	Main Tank		
3.2	Bottom		
3.3	Top		
4.0	OLTC		
5.0	DGA Report		
6.0	Oil Test report as per IS 1866-2000		
6.1	Colour / Dirtiness		
6.2	Water Content (ppm)		
6.3	Flash Point DEG C		
6.4	Pour point DEG C		
6.5	Neutralisation value (mg KOH/gm)		
6.6	Interfacial Tension (mN/m)		
6.7	Dielectric dissipation factor at 90DEG C (at 40HZ & 60HZ)		
6.8	Resistivity (90DEG C X 10^{12} (ohm-cm)		
6.9	Sediment and sludge		
7.0	Magnetisation currents at low voltage (principal tap)		
8.0	Magnetic balance		
9.0	Turn ratio test		
10.0	Winding resistance HV & LV		
11.0	Single phase short circuit		
12.0	Ratio of WTI CT (HV & LV) & neutral CT		
D.	Brief history of Transformer		
1.0	Load Condition		
2.0	NOS of Through faults		
3.0	NOS of Failures & abnormalities		
4.0	Repair carried in life time		
5.0	Date of dehydration		
6.0	Oil leakage & condition of gaskets		
7.0	Others (if any)		

NOTE: The transformer tank is handed over/Taken over with complete core and core assembly.

Signature & seal of
Handing over officer
(rep of Owner)

Signature & seal of
(Rep. Of the vendor)

Annexure E Joint Verification report of Power transformer
(For repairing / Servicing at vendors work)

Repairing agency details				
1.	Name of the company			
2.	Address			
3.	Phone / fax No			
4.	Name of representative & designation			
A	Transformer Details			
1.0	Name Plate details			
2.0	Make			
3.0	Capacity			
4.0	Voltage rating			
5.0	Serial number			
6.0	Year of manufacture			
7.0	Weight of Core & winding			
8.0	Weight of oil			
9.0	Quantity of oil			
B	Joint Verification report of Core, Coil assembly & oil			
Sr No	Description	Unit	QTY	Remarks Good Condition-GC Servicing required-SR Damaged to be replaced-TBR
1.0	Total weight of core & coil assembly (3 limbs)	Kg		
2.0	HV winding			
2.1	Weight per limb	Kg		
2.2	Inner diameter	Mm		
2.3	Outer diameter	Mm		
2.4	Total number of turns	No's		
2.5	Wire size of the conductor			
2.6	Cross sectional area of conductor	mm^2		
2.7	Number of parallel paths	No's		
2.8	Current density	A/mm2		
3.0	LV winding			
3.1	Weight per limb	Kg		
3.2	Inner diameter	Mm		
3.3	Outer diameter	Mm		
3.4	Total number of turns	No's		
3.5	Wire size of the conductor			
3.6	Cross sectional area of conductor	mm2		
3.7	Number of parallel paths	No's		
3.8	Current density	A/mm2		
4.0	Oil quantity as per name plate	Litre		
4.1	Oil quantity drained out from main tank at factory	Litre		
4.2	Oil quantity received at site	Litre		

NOTES

1. Before lifting of transformers, the vendor to check and ensure that core coil assembly is fitted with the transformers. During JVR if coil/core found missing the vendor will repair the same on his cost and risk by giving credit of scrap of copper/core approximate nearest/equal to quantity of the same make of transformer core/coil.
2. In case of rewinding the conductors shall be of electrolytic grade copper. Current density in winding should be around 2.5A/mm2. Under no circumstances, current density more than 2.6A/mm2 is acceptable.
3. If core lamination is found to be damaged the weight of the damaged core has to be provided and recorded in JVR.
4. The vendor may be allowed to dispose all detained material after approval of estimate for repair from the owner.
5. In case of replacement of winding, the vendor shall retain one coil of HT & LT for physical verification till stage inspection and estimate approval.

C	Joint Verification report of accessories		
Sr No	Description	Remarks as per handing over document Appearing healthy – AH Missing – M No provision – NP Damaged - D	Remarks of JVR Good condition – GC Servicing required – SR To be replaced – TBR Missing to be provided-TBD
1.0	Main tank valves (butterfly valve, drain valve, filter valve etc)		
2.0	Conservator tank with oil level indicating glass tube		
3.0	MOG with Low oil level alarm		
4.0	Oil circulation valves of conservator(Top & Bottom)		
5.0	Air Cell		
6.0	Conservator oil drain valve		
7.0	Main silica gel breather assy.		
8.0	Main silica gel breather pipe		
9.0	Silicagel breather assembly for OLTC		
10.0	Pipe for silicagel breather assembly for OLTC		
11.0	Conservator mounting brackets /Frame		
12.0	Equalising pipe connecting conservator tank with main transformer tank		
13.0	Buchholz relay		
14.0	Oil surge relay for OLTC		

15.0	Air release cock of Buchholz relay		
16.0	Oil drain cock of Buchholz relay		
17.0	Valves on either side of buchholz relay		
18.0	Air release valve on top cover of the tank		
19.0	Explosion vent/PRV		
20.0	Connecting pipe between explosion vent & conservator		
21.0	Air release cock (brass) on top of explosion vent		
22.0	HV side turrets connecting pipe with equilising pipe		
23.0	HV Bushings		
23.1	Porcelain insulators		
23.2	Metal Parts (brass)		
23.3	Clamps		
24.0	LV Bushings		
24.1	Porcelain insulators		
24.2	Metal Parts (brass)		
24.3	Clamps		
25.0	11KV Copper Bus Bar		
25.1	NOS. and Size		
25.2	Weight		
26.0	11KV Lightning arrestor		
26.1	Quantity and present condition		
27.0	Blanking plates		
28.0	Main tank oil filtration valves		
28.1	Top		
28.2	Bottom		
28.3	Emergency oil drain valve (bottom)		
28.4	Oil sampling valves-top/middle/bottom		
29.0	Marshalling Box		
29.1	WTI		
29.2	OTI		
29.3	Transducer for OTI		
29.4	Transducer for WTI		
29.5	AC Main switch		
29.6	Strip Heater		
29.7	Lamp holder		
29.8	Lamp Switch		
29.9	Fans contactors		
29.10	Cable entry gland plate		

29.11	Condition of wiring		
29.12	Condition of door		
29.13	Door-lock Handle		
29.14	Door glass		
30.0	Radiator valves top & Bottom		
31.0	Number of radiators and condition		
32.0	Axle & Wheels assy.		
33.0	No. of cooling Fans / Make		
34.0	OLTC Details		
34.1	Make		
34.2	Type		
34.3	Serial number		
34.4	OLTC Operating handle		
34.5	Local /Remote Switch		
34.6	AC Mains ON/OFF switch		
34.7	Driving Motor		
34.8	Brakes		
34.9	Step by Step relays		
34.10	Direction sequence switch		
34.11	Control supply transformer		
34.12	Raise /Lower Switch		
34.13	Raise contactor		
34.14	Lower Contactor		
34.15	OLTC Operation Counter		
34.16	Driving mechanism door handle		
34.17	Driving mechanism door glass		
35.0	Selector switch oil single relay		
36.0	Selector switch conservator		
37.0	Equalising pipe connecting to conservator and selector switch oil circulation valves		
38.0	Silica gel breather of selector switch conservator		
39.0	Selector switch chamber air release cock		
40.0	Selector switch chamber oil circulation valves		
41.0	Selector switch chamber oil level indicating glass		
42.0	Oil in selector switch		
43.0	General condition of OLTC driving mechanism		
43.1	Name Plate		
43.2	Caution plate		

43.3	Transformer oil		
43.4	Total quantity of oil handed over to vendor at site		
45.0	RTCC		
45.1	Tap position indicator		
45.2	Remote WTI		
45.3	Remote OTI		
45.4	Automatic voltage regulator		
45.5	Raise/Lower Pb/switch		
45.6	Contactor		
45.7	Auto manual switch		
45.8	AC Main switch		
45.9	Strip Heater		
45.10	Lamp holder		
45.11	Lamp Switch		
45.12	Cable entry gland plate		
45.13	Condition of wiring		
45.14	Condition of door		
45.15	Door-lock Handle		
45.16	Indication/Alarm conditions		
45.17	Fan Failure Scheme		
45.18	Annunciator (FACIA)		
46.0	Any other observations		

NOTE: Please attach copy of handing over/ taking over document.

Signature and seal of
Owners representative

Signature and seal of
Vendor's representative

Annexure F Stage Inspection Report for power transformer
(For repair / servicing at vendor's works)

Place
Date

Repairing agency details				
1.0	Name of the company			
2.0	Address			
3.0	Phone / fax No			
4.0	Name of representative & designation			
A	Transformer Details			
1.0	Name Plate details			
2.0	Make			
3.0	Capacity			
4.0	Voltage rating			
5.0	Serial number			
6.0	Year of manufacture			
7.0	Weight of Core & winding			
8.0	Weight of oil			
9.0	Quantity of oil			
B	Joint Verification report of Core, Coil assembly & oil			
Sr. No	Description	Unit	QTY	Remarks Good Condition-GC Servicing required-SR Damaged to be replaced-TBR
1.0	Total weight of core & coil assembly (3 limbs)	Kg		
2.0	HV winding			
2.1	Weight per limb	Kg		
2.2	Inner diameter	Mm		
2.3	Outer diameter	Mm		
2.4	Total number of turns	No's		
2.5	Wire size of the conductor			
2.6	Cross sectional area of conductor	mm^2		
2.7	Number of parallel paths	No's		
2.8	Current density	A/mm2		
3.0	LV winding			
3.1	Weight per limb	Kg		
3.2	Inner diameter	mm		
3.3	Outer diameter	mm		
3.4	Total number of turns	No's		
3.5	Wire size of the conductor			
3.6	Cross sectional area of conductor	mm2		
3.7	Number of parallel paths	No's		
3.8	Current density	A/mm2		

1. In case of rewinding the conductors shall be of electrolytic grade copper. Current density in winding should be around 2.5A/mm2. Under no circumstances, current density more than 2.6 is acceptable.
2. The vendor may be allowed to dispose all detained material after approval of estimate for repair from the owner.
3. In case of replacement of winding, the vendor shall retain one coil of HT & LT for physical verification till stage inspection and estimate approval.

Signature and seal of
Owners representative

Signature and seal of
Vendor's representative