



Bharat Heavy Electricals Limited, Bhopal
Transformer Engineering Department

Tender Enquiry No. E02141603

Dated: 01.12.2021

To,

Subject: TENDER ENQUIRY for “CONDUCTING DYNAMIC SHORT CIRCUIT TEST ON 1 No., 144 MVA, 400/11.5-11.5 KV, 3-PH STATION TRANSFORMER”.

Dear Sir,

We are manufacturing 144 MVA, 400/11.5-11.5 KV, 3-phase, Station Transformer for M/s PVUNL in which Dynamic short circuit test is to be conducted.

We invite your quotation for “Conducting Dynamic Short Circuit Test” on the above-mentioned transformer at your test lab.

A. SCOPE OF WORK

1. The scope of test is as per attached Annexure -A
2. Technical specification is as per attached Annexure-B

B. GENERAL TERMS & CONDITIONS OF ENQUIRY

1. Offer shall be sent through courier having 2 different envelopes put in 1 outer envelope as mentioned below:
 - **First Part** – It must contain only the technical offer and commercial terms and **conditions (but without price i.e. unpriced offer)**. If price is indicated in this part, then offer is liable to be rejected.
 - **Second Part** – It must contain the actual price and price breakup (i.e. price bid), **Total Price must be indicated in figures and words both and in case any ambiguity between the figures and words, words shall prevail.**
 - **Both these parts shall be duly signed by authorized representative of the bidder.**
2. BHEL expects that the bidder must respond to the enquiry. Regret letter, for not participating in the tender will be submitted where the bidder is unable to submit offer. Repeated lack of response on the part of vendor may lead to his deletion from BHEL's approved vendor list.



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3. Pricing Terms

Prices once quoted shall remain firm within the validity or any extension thereof for placement of order, till complete execution of the order, without any escalation / increase for any reason, whatsoever, unless specifically provided for in the Enquiry & PO.

4. Terms of Payment

Payment shall be released by BHEL normally within 90 days by electronic-pay mode on submission of invoice for the work after completion of work.

5. Taxes and Duties

All taxes/bank charges as per statutory requirement in the country of bidder shall be borne by the bidder. Income tax as applicable shall be deducted during final settlement of bill. TDS will be deducted from contractors Bill both under Income Tax Act and GST Act.

Necessary tax deduction at source from supplier's bill will be made as per statutory requirements. Tax if applicable shall be paid extra. Any new tax introduced in future shall be considered as applicable. Any loss of tax credit to BHEL due to the reason attributable to the contractor will be recovered from them along with interest

- a) Wherever bidders are required to supply services at project site Party has to submit GST registration no. of the State in which project site is located along with copy of registration certificate at the time of submission of Bid. In case the same is not available at the time of submission of bid, the contractor has to give an undertaking that the same will be arranged before award of work order
- b) HSN Code/SAC, rate of tax under GST and applicable GST (IGSTCGST/SGST/UTGST) and GSTIN shall be clearly mentioned by the Bidder.
- c) GST portion of the invoice shall be released only upon: -
 - (i) All invoices raised by contractors/vendors must be GST compliant Tax invoices as per GST invoice rules.
 - (ii) Contractor declaring such invoice in his GSTR-1 or any modified return as notified by Government.
 - (iii) Receipt of goods/services and Tax Invoice by BHEL.
 - (iv) Confirmation of payment of GST thereon by contractor on GSTN portal.
 - (v) Alternatively, Contractor has to submit BG of appropriate value which shall be valid at least one month after the confirmation of date of payment of GST by contractor on GSTN portal and receipt of Tax invoice and receipt of services, whichever is later. Contractor has to give an undertaking in this regard.
 - (vi) Contractor has to give an undertaking to BHEL that they have declared invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.
- d) Payment to Contractor for GST portion will be released only after completion of above activity and on availment of ITC by BHEL
- e) In case GST credit is delayed/denied to BHEL due to non/delayed receipt of services/goods and/or tax invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from the contractor along with interest levied/ leviable on BHEL



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- f) Tax Deduction at source (TDS) as per extant provisions of the Income Tax Act and GST Act shall be deducted from supplier/contractor bill.
- 6. The offer shall be evaluated on the basis of total delivered cost of entire package to BHEL (including all the activities starting from sending transformer from BHEL works & receiving back transformer to BHEL works & completion of all activities related to Short Circuit at BHEL works till certification) which shall include foreign currency conversion rate on the date of technical bid opening.

The total delivered cost means 'total cost to BHEL' including to and fro freight, Customs Duty, GST / Other taxes as applicable). Exchange rate (TT selling rate of State Bank of India) applicable on the date of Part-I bid opening shall be considered for evaluation of foreign bids. If the relevant day happens to be a bank holiday in India, then the FOREX rate as on the previous bank working day shall be taken for evaluation.

- 7. In case of any deviation, the same may be clearly mentioned in the offer and checklist to be filled in by the bidder.

8. Variation of orders

No variation to the Engineering Order is permitted unless authorized in writing and signed by or on behalf of purchase executive, BHEL Bhopal.

9. Secrecy Clause

Bidder should not divulge any technical document/ information of BHEL to any third party without prior written permission of BHEL. Further no publications/ patent to be taken from above work without prior written permission of BHEL.

10. Arbitration:

Any disputes arising out at any stage of execution of the work to be mutually discussed and settled. Any Arbitration shall be conducted in accordance with the provisions of the Indian Arbitration and Reconciliation Act, 1996 with latest amendments.

The arbitration proceedings shall be held in Bhopal.

11. Right of rejection/Non-placement of PO:

BHEL reserves the right to accept the offers in part or in full, cancel the Tender Enquiry or short close the contract without assigning any reason.

12. THE BHEL CONCILIATION SCHEME:

The Parties agree that if at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract or the Memorandum of Understanding (delete whichever is inapplicable), which the Parties are unable to settle mutually), arise inter se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.



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Notes:

- (i) No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
- (ii) Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS.

13. OVERWRITING IN THE PRICE BID

Bid should be free from correction, overwriting, using corrective fluid etc. Any interlineation, cutting erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for the rejection.

14. DISCREPANCY IN WORDS & FIGURES - QUOTED IN THE PRICE BID

- (a) If, in the price structure quoted for the required goods! services! works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.
- (b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and
- (c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject of (a) and (b) above.
- (d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

15. EVALUATION IN CASE OF MORE THAN ONE L-1 BIDDER

In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.

In case more than one bidder happens to occupy the L1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss / draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s)

Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.

16. RISK AND COST

If the work is not executed or partly executed within the agreed execution period, BHEL reserves the right to cancel the order and get the executed from alternate source(s) at the Risk and Cost of Contractor. In such an even, it shall be obligatory on the part of contractor to make good any loss suffered by BHEL.



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17. FORCE MAJEURE

“Notwithstanding anything contained in the contract, neither BHEL nor the Contractor shall be held responsible for total or partial non-execution of any of the contractual obligations, should the obligation become unreasonably onerous or impossible due to occurrence of a 'Force Majeure' which directly affects the obligations to be performed by the BHEL or the contractor; Such events include war, military operations of any nature, blockages, revolutions, insurrections, riots, civil commotions, insurgency, sabotage, acts of public enemy, fires, explosion, epidemics, quarantine restrictions, floods, earthquake, or acts of God, restrictions by Govt. authorities; over which the BHEL or the contractor has no control.

The party claiming to be affected by force majeure shall notify the other party in writing without delay, within two weeks from the occurrence of such situation and on the cessation thereof. Extension of time sought by the contractor along with supporting evidence and so granted by BHEL for the work affected, if any, shall not be construed as waiver in respect of remaining execution. Rescheduling of execution on account of force majeure conditions, if so agreed by BHEL, will not entail the contractor to claim any increase in the price on whatsoever account.

Notwithstanding above provisions, BHEL shall reserve the right to cancel the Contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements. If deemed necessary, BHEL may takeover partly processed work at a mutually agreed price”

C. ADDRESS FOR SENDING OFFERS

1. Offer may be sent in sealed envelope to following address OR on e-mail:
mmtender.bpl@bhel.in:

In Charge,
Works Contract (GREEN BOX),
MM Tender Room
BHEL Administrative Building, GF
BHEL Piplani, Bhopal (India) 462022

**Before tender due date 27th Dec. 2021 (Monday) & time 11am, clearly super scribing the
Tender Enquiry No. & Subject on the top of envelope/e-mail.**

2. **The quotation thus received shall be opened on the same day i.e. 27th Dec. 2021 at 2 pm.**

Thanking you.

Dy. Manager (TRE)
BHEL, BHOPAL, INDIA



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CHECKLIST FOR SCOPE OF WORK (Annexure-A)

Note: Bidder shall fill in the following details and no column should be left blank

1	Name & address of the bidder Fax / Email address		
2	Name & designation of the official of the tenderer to whom all the references shall be made.		
3	Bidder's proposal No. & date		
		YES	NO
4	Sl. No. 4.1		
	Sl. No. 4.2		
	Sl. No. 4.3		
	Sl. No. 4.4		
	Sl. No. 4.5		
	Sl. No. 4.6		
	Sl. No. 4.7		
	Sl. No. 4.8		
	Sl. No. 4.9		
	Sl. No. 4.10		
	Sl. No. 4.11		
5	Sl. No. 5.0		
6	Sl. No. 6.0		
7	Sl. No. 7.0		
8	Sl. No. 8.0		
9	Sl. No. 9.0		
10	Sl. No. 10.0		
11	Sl. No. 11.0		
12	Sl. No. 12.0		
13	Sl. No. 13.0		
14	Sl. No. 14.0		
15	Sl. No. 15.0		



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CHECKLIST FOR GENERAL TERMS & CONDITIONS OF ENQUIRY

Note: Bidder shall fill in the following details and no column should be left blank

1	Name & address of the bidder Fax / Email address		
2	Name & designation of the official of the tenderer to whom all the references shall be made		
3	Bidder's proposal No. & date		
		YES	NO
4	Sl. No. 3		
5	Sl. No. 4		
6	Sl. No. 5		
7	Sl. No. 6		
8	Sl. No. 7		
9	Sl. No. 8		
10	Sl. No. 9		
11	Sl. No. 10		
12	Sl. No. 11		
13	Sl. No. 12		
14	Sl. No. 13		
15	Sl. No. 14		
16	Sl. No. 15		
17	Sl. No. 16		
18	Sl. No. 17		

PRICE BID FORMAT

Tender Enquiry No.: E02141603

Rating of Transformer: 144 MVA, 400/11.5-11.5 KV, 3-PH STATION
TRANSFORMER

Name of Test: Dynamic Short Circuit test

S. No.	Description	Charges
1	SC Test Charges	
2	Inspection Charges	
3	Other charges if any	

ANNEXURE TO INDENT CUM ENQUIRY: - **E02141603**

DTD.: -

DESCRIPTION OF EQUIPMENT: **SHORT CIRCUIT TEST ON 144/72/72 MVA, 400/11.5/11.5 kV, 3-PHASE
STATION TRANSFORMER**

WORK ORDER NO. : **67048-A-512-01**

CUSTOMER : **M/s PVUNL**

SPECIFICATION OF SHORT CIRCUIT TESTING OF TRANSFORMER

1.	This specification calls for short circuit testing of power transformer as per IEC 60076-5 having technical particulars as per Annexure-B (2 sheets) & with following condition:
1.1	Single phase method with supply from HV with both LV terminal (LV1 & LV2) pre shorted
1.2	Total number of test shots shall be 9, in which three shots shall be applied at maximum tap position, on one of the outer limb, three shots at principal tap position on the middle limb and three shots at minimum tap position, on the other outer limb.
1.3	Duration of each shot shall be 0.25 seconds.
1.4	The values of the HV peak short-circuit current shall be calculated based on tested impedance values at maximum, minimum & principal tapping & HV system impedance corresponding to 63 kA system fault level. The calculated peak value of current shall be based on X/R ratio of transformer and is 2.69 times the symmetrical current as per IEC 60076-5. The tolerance on the current shall be as per IEC 60076-5. Final value of short-circuit currents will be furnished after routine testing at works prior to S.C test.
1.5	Also note that after each shot, a demagnetizing shot is to be applied to demagnetize the core.
2.	Transformers shall be assembled to our OGA Drg. no. 34600001190 enclosed herewith. However, radiators & associated fittings shall not be assembled during this test.
3.	Bidder to submit complete procedure for testing along with the offer including values of currents.
4.	<p>Scope of work: Bidder to cover the following in their scope of work & if necessary in collaboration with other agencies for part of work normally not performed by them.</p>
4.1	Unloading of transformer at nearest sea-port (if applicable).
4.2	Transportation up to test laboratory.
4.3	Transportation up to test bed.
4.4	Arranging crane, crane operator etc. for mounting bushings, turrets, pipework, conservator & other fittings. Charges for the same are to be quoted by bidder on per hour or per day basis specifying constraints, limitations if any. Number of working hours considered in a day with time applicable. Additional charges (if any) for providing above facilities after normal working hours & on weekly off days to be clearly spelt out. This facility shall also be required after Short Circuit testing for dismantling the fittings.

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
TRANSFORMER ENGINEERING DEPARTMENT

FORM NO: TRE-2003A

Sht 2 of 3 sheets

ANNEXURE TO INDENT-CUM-ENQUIRY - E02141603

WORK ORDER NO. : 67048-A-512-01

4.5	Arranging of processed oil as per IEC 60296 suitable for filling in Transformer tank. The oil should specifically comply the following requirements in addition to IEC: BDV \geq 70 kV, ppm \leq 5, Tan delta at 90°C: 0.002 (max.) Total oil quantity required shall be as per Annexure-B. The offer should also include charges for disposal/ processing in case oil parameter exceeds the limit of IEC: 60296 after completion of test.
4.6	Arranging vacuum pump, oil filtration plant etc. for processing of transformer. The processing of transformer shall include the following activities:
4.6.1	Vacuum pulling & holding vacuum for 72 hours approx.
4.6.2	Oil filling under vacuum at the rate of 3500-4500 LPH.
4.6.3	Oil circulation for 45 hours approx. (Approx. 3 complete circulation of oil) The above process shall be continuous without any break & therefore may include weekly-off days depending on the day the process is started. Bidder to furnish the charges of complete processing on lump sum basis. Bidder is also required to quote charges for additional working hours on per hour basis if the above process could not be completed in the mentioned duration due to oil parameters after circulation not meeting the desired parameters.
4.6.4	Draining of oil after completion of test.
4.7	Performance of Short Circuit Test including all activities (as listed below). Separate charges for each activity to be quoted. (If breakup cost is not given, and if repetition of these tests are required then it shall be considered that the cost of same has been built-in the Short Circuit test charges)
4.7.1	Measurement of capacitance and tan δ of windings and HV & HVN bushing.
4.7.2	DGA before and after short circuit test.
4.7.3	Measurement of turn ratio at all taps (HV/LV1 & HV/LV2) and LV1/LV2 before & after S.C. test.
4.7.4	Measurement of winding resistance of HV winding at max, min & rated taps & full winding of LV1 & LV2 before & after S.C. test.
4.7.5	Measurement of insulation resistance between HV/LV+E, LV/HV+E & HV+LV/E
4.7.6	Measurement of Magnetizing current at low voltage.
4.7.8	Measurement of oil parameters e.g. BDV, PPM, Resistivity & Tan Delta (shall be conducted 3 times).
4.7.9	SFRA Test before & after S.C. test.
4.7.10	Transportation unto nearest seaport & loading on ship. (If applicable)
4.7.11	Inspector charges for carrying out inspection at works.
4.8	Submission of test report in 2 copies, which shall include all the tests (S.C. test, low voltage test, inspection report etc. along with calibration certificate of testing equipment). After successful completion of test & inspection of the transformer at our works, test certificate declaring the successful passing of S.C. test to be furnished.

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
TRANSFORMER ENGINEERING DEPARTMENT

FORM NO: TRE-2003A

Sht 3 of 3 sheets

ANNEXURE TO INDENT-CUM-ENQUIRY - **E02141603**

WORK ORDER NO. : **67048-A-512-01**

4.9	Time sheet for each activity on hour/per day basis shall be prepared & duly signed by lab or its collaborator & BHEL. This shall be furnished along with invoice at the time of final settlement of bills.
5.0	Short circuit test shall be continued till the following conditions are met – (i) Variation of Short Circuit reactance is within 2% after each shot & (ii) Current and Voltage wave shapes are sustained for entire test cycle of 0.25 second.
6.0	Any other observations during Short Circuit testing i.e. PRD, wave shape, DGA etc. shall be dealt with as per the provisions laid down in IEC 60076-5 without interrupting the test schedule.
7.0	Termination of Short Circuit test to be mutually agreed between Testing laboratory and BHEL.
8.0	All the test and measuring instruments employed in the Short Circuit Testing should have been calibrated and calibration certificates made available to BHEL or its end customer whenever required.
9.0	Bidder may also quote the other miscellaneous charges required for satisfactory completion of testing e.g. assembly hall, photograph, N2 cylinder & custom clearance.
10.0	The bidder to confirm that in case of unforeseen circumstances like accident, transportation delay etc. the scheduled test dates may have to be cancelled/deferred.
11.0	Bidder should allow test witness by purchaser's representatives.
12.0	Bidder to furnish complete techno-commercial offer and a specific point wise response to each of the clauses of this indent. Any offer not responding to any of the clauses may be ignored without any explanation.
13.0	Our staff will be at test laboratory for assembly, dismantling, witnessing of test etc. of the transformer. Suitable office accommodation to be provided for them during their stay.

ANNEXURE 'B'

TECHNICAL PARAMETERS

<u>SL. NO.</u>	<u>ITEM</u>	<u>DETAILS</u>
1.	Type of cooling	ONAN/ONAF (60/100%)
2.	Continuous rating (MVA)	
	(a) HV	86.4/144
	(b) LV1	43.2/72
	(c) LV2	43.2/72
3.	Rated Voltage (KV)	
	(a) HV at principal tap	400
	(b) LV1	11.5
	(c) LV2	11.5
4.	Rated frequency (Hz)	50
5.	No. of Phases	3
6.	Connections	
	(a) HV	STAR
	(b) LV1	STAR
	(c) LV2	STAR
7.	Connection symbol	YNyn0yn0
8.	Line current at rated no load voltage and on principal tap (Amps).	
	(a) HV	207.85
	(b) LV1	3614.71
	(c) LV2	3614.71
9.	Terminal arrangement:	
	(a) HV side	OIL-AIR BUSHINGS
	(b) LV side	OIL-AIR BUSHINGS
	(c) Neutral	OIL-AIR BUSHING
10.	Test voltage for HV/LV1/LV2 windings	
	(a) Lightning impulse withstand test voltage (kVp)	
	HV	1425 (FW), 1570 (CW)
	LV1/LV2	75(FW), 82.5 (CW)
	LVN	75
	HVN	95
	(b) Switching Impulse (kVp) HV	1175
	(c) Power frequency withstand test voltage HV/LV(1-min.)	630/28 kVrms
	(d) Separate source on HV/LV (KV rms)	38/28

11. Type of Tap changer ON LOAD

12. Tap Changer on winding HV winding

13. Tapping's on **HV winding** for regulations:
 (a) Step voltage & steps $\pm 8 \times 1.25\%$
 (b) Plus and minus range of variation $+10\% \text{ to } -10\%$

14. Positive sequence impedance on 144 MVA base at rated current and frequency at 75°C winding temperature :

	Normal Tap (Tap 9)		Maximum Tap (Tap 1)		Minimum Tap (Tap 17)	
	Guaranteed	Calculated	Guaranteed	Calculated	Guaranteed	Calculated
HV-LV1 <i>OR</i> HV-LV2	$34.2\% \pm 7.5\%$ Tol.	$34.14\% \pm 2\%$ Tol.	$34.2\% \pm 10\%$ Tol.	$35.32\% \pm 2\%$ Tol.	$34.2\% \pm 10\%$ Tol.	$33.82\% \pm 2\%$ Tol.
HV- (LV1+LV2)	--	$17.97\% \pm 2\%$ Tol.	--	$18.59\% \pm 2\%$ Tol.	--	$17.80\% \pm 2\%$ Tol.
LV1-LV2	$66.0\% \pm 10\%$ Tol.	$64.64\% \pm 2\%$ Tol.	--	--	--	--

15. Apparent fault level (MVA)
 HV (63 kA for 3 sec) ($U_m = 420 \text{ kV}$) 45830.1

16. Category III

17. Approximate mass with oil without cooling system(kg) 197500

18. Approximate volume of oil to be filled during testing (L) 60650

19. Approximate mass without oil without cooling system(kg) 144700

20. Un-tanking weight (kg) 20000

21. Approximate shipping dimensions (L x W x H) (mm) 8000 x 4000 x 4500 mm

22. Approximate height with bushings (From rail level) (mm) 9970

Outline General Arrangement (OGA) drawing no.34600001190, Rev. 04 is attached.



