

Technical Specification and Scope of Work :

This is a proposal for carrying out mechanical design, manufacturing & Experimental tests on a small scale Hydro Turbine model (Francis turbine, medium head - 250 m , Specific speed - 120 m-Kw) .

We would be supplying the complete hydraulic profile /passage information to the successful bidder. The pre-supplied Hydraulic profile would contain information about spiral casing neat-line dimensions, stay vanes profile & location , stay ring dimensions, Guide vane profile & location & Draft tube profile for the particular Hydro-Turbine. The above profile drawings would be given in both hard-copy and soft-copy formats including solid surface models in iges file format. As regards the runner, the 3-D solid model will not be given ,only meridional passage drawing giving salient inlet, outlet dimensions would be supplied.

We expect that the bidder would develop manufacturing drawings of a small scale working model based on the above passage drawings in accordance with the provisions of IEC 60193. Further, various components of working model have to be manufactured as per provisions of IEC 60193. The components would include Spiral casing, stay ring along with stay vanes, guide vanes, mechanism to drive the guide vanes, topcover, pivot ring, labyrinth rings, Draft tube, pen-stock/inlet pipes, adapting parts & other allied components for supporting & assembly of the above model components in the Test-stand. All necessary hardware (bolts, nuts, screws, seals etc) for assembly and installation of model turbine in bidder's test stand would also be manufactured/procured.

The Francis model runner made of stainless steel for the above project will be manufactured and supplied by BHEL. Immediately on receipt of LOI, bidder shall intimate the discharge diameter of runner to be manufactured. Also the assembly details of runner in the Test-stand shall be provided by the bidder. **The runner would be manufactured by BHEL and sent to the bidder at a mutually acceptable date against submission of bank guarantee of equivalent amount.** Further, there will be a finish machining allowance for final fitting and assembly of runner (viz. on shaft bore, labyrinth diameter etc). These will be finished by the bidder to achieve desired accuracy of fitting and assembly.

The various model components should be manufactured as per the present International Standards in terms of surface finish, accuracy etc(profiled components manufactured by CNC) and the model assembly also as per International norms (Guide Vane end clearance - 0.05 mm on each side & Labyrinth seal(radial) clearance 0.15 mm for a dia 350 mm model.

Detailed inspection of various components shall be carried out in accordance with IEC 60193 and inspection report generated.

The above model would be then assembled and erected on bidders' Test-stand and various Experimental model tests performed after calibration of instrumentation as listed below :

The tests shall comprise of the following:-

- i) Turbine performance (efficiency) tests at a number of points covering the entire working range of turbine. Typically, the range should be from 65% to 130% of optimum speed factor and 40% to 130% of optimum discharge factor.
- ii) Pressure and velocity (magnitude & direction) at the beginning and end of different water passage components (like spiral casing, stay vanes, guide vanes & runner to evaluate individual component losses. Further meridional velocity and absolute circumferential velocity components at the exit of runner will also be measured. These measurements will be carried out for optimum efficiency points of at least six guide vane openings. The above quantities would be measured using appropriate probes and allied instrumentation. The bidder will indicate in brief the methodology for measuring these quantities.
- iii) Cavitation tests with photo documentation for at least fifteen operating points scattered in the range as specified in 1.

- iv) Pressure pulsation (fluctuation) tests at locations as defined in IEC in spiral casing and draft tube at 50% load, full load and 20% overload .
- v) Hydraulic thrust (Axial & radial) test.
- vi) Wicket gate torque (both aligned & misaligned) test on three guide vanes.
- vii) Air admission test for the whole sigma range of operation.
- viii) To determine best location of the Winter Kennedy taps and to determine the exponential co-efficient for the flow calculation on proto type.
- ix) Runaway speed tests to determine the maximum run-away speed in the entire operating range of turbine as above.

Arrangement for above measurements in terms of adequate provision in model components, probes, instrumentation etc will be made by the bidder.

Bidder shall inform the schedule of testing at least six-weeks in advance. BHEL may depute its personnel to witness the dimensional inspection, assembly calibration and the various tests. The decision to witness the tests would be taken at a later date. Expenditure on account of BHEL personnel (travel, lodging, boarding) will be borne by BHEL.

Deliverables :

1. The bidder shall submit Test-stand layout including runner fitting and assembly details. The bidder shall also briefly lay out the methodology, including probes and instrumentation for carrying out the experimental tests as detailed above immediately after receipt of LOI.
- 2 a) A complete model test report (1 hard-copy and one softcopy) consisting of all measurements made above (raw data, standard curves, graphs photographs etc) should be submitted. The report shall also include standard Universal curve(hill chart) for the entire range for which measurements have been carried out. The universal curve shall show unit speed versus unit discharge containing constant efficiency lines with constant GV opening lines, best efficiency point, constant sigma lines, constant pressure pulsation line, cavitation limits and other quantities as per standard practice clearly marked on it.
- b) A full inspection report of model component dimensions should be part of the model test report.
- c) The report should also contain information about instrumentation used, their range and accuracies, uncertainty & repeatability of various parameters, total uncertainty of various quantities including efficiency. The report should also contain calibration records and certificates.
3. After the successful completion of tests, the bidder shall pack the model components (spiral casing, stay ring assembly, guide-apparatus assembly, draft tube assembly & labyrinths) in proper sea-worthy packaging and transport it to the nearest port. Runner supplied by BHEL should also be packed in a separate package and transported with the above items at bidders cost.

General Instructions for the bidders

1. Tender documents can be downloaded from Web site- www.bhel.com or www.bhelbhopal.com.

3.0 INSTRUCTIONS AND GUIDELINES TO BIDDERS**3.1 INTRODUCTION :**

Bharat Heavy Electricals Limited (BHEL) is an ISO-9001:2000 certified premier Engineering and Manufacturing organization with majority share-holding by Government of India. BHEL is catering to the core infrastructure sectors of Indian economy viz. Power Generation and Transmission, Industry, Transportation and Renewable energy. BHEL has been in this business for almost five decades now. In India BHEL has 14 manufacturing units, 4 Power Sector Regions, 8 Service centres and 15 Regional offices besides host of Project sites spread all over India and abroad. BHEL supplied equipment account for more than 65% of the total installed Generating capacity in India and contribute approx. 73% of the total power generation in the country.

More details about the entire range of BHEL's products and operations can be had by visiting our web site www.bhel.com or www.bhelbhopal.com.

Hydro Turbines are a major product of manufacturing unit located in Bhopal, Madhya Pradesh in Central India. BHEL, Bhopal has a wide and rich experience of supplying various types of hydro turbines and hydro generators for more than 150 projects. In around 50 years of operation BHEL has supplied & commissioned Hydro Turbine sets of around 18000 MW. BHEL also has an in-house NABL-certified Hydro turbines and Pumps Model Testing Laboratory conforming to the relevant International standards.

3.2 TENDERER TO INFORM HIMSELF FULLY:

3.2.1 The bidder shall closely peruse all the clauses, specifications, requirements etc., indicated in the tender documents, before quoting. Should the bidder have any doubt about the meaning of any portion of the tender specifications or find discrepancies or omissions in the specifications or if the tender documents are found to be incomplete or require clarifications on any of the technical aspects, scope of work etc., he shall at once contact the official inviting the tender, before submission of the tender.

3.2.2 Bidders are advised to study all the tender documents carefully. Any submission of tender by the Bidder shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. The specifications and terms and conditions shall be deemed to have been accepted unless otherwise specifically commented upon by the bidder in his offer.

3.3 PROCEDURE FOR SUBMISSION & OPENING OF BIDS

3.3.1 Bids are invited in TWO parts, as described below, on or before the due date & time indicated in the Tender Notice.

PART-I: TECHNO-COMMERCIAL BID

This part shall consist of the following:

- a. Technical Specifications including all items of Table-1 & Table -2, Annexure-3 duly filled. The bidder should offer only as per the Complete Scope of Technical Specification. BHEL reserves the right to accept or reject the technical offer. Price bids of only techno-commercially successful bidders will be opened.

PART-II : PRICE BID

Price bid of only techno-commercially qualified bidders shall be opened.

Price bid containing PRICES only in English Language in both Words and Figures.

Price-Bid should be submitted in Table-3 , Annexure -4 duly filled.

Price Bid should not contain any technical details and/or Commercial Terms & Conditions as the same are supposed to be contained in PART-I only so that the same can be evaluated before opening of Price Bid(s). In case of disparity between prices in words & figures, the price in words will be considered.

3.4 MARKING ON ENVELOPE

Part-I & Part-II offers shall be submitted in TWO sealed envelopes super-scribed as follows:

PART-I:1. TENDER ENQUIRY NO. AND DESCRIPTION

2. DUE DATE OF OPENING
3. "TECHNO-COMMERCIAL BID".

PART II: 1. TENDER ENQUIRY NO AND DESCRIPTION

2. "PRICE BID".

Un-sealed envelopes or envelopes not super-scribed as above may not be accepted/considered. Sealed Part-II envelope can be kept inside Part-I envelope also.

3.5 BID SUBMISSION

- 3.5.1 Bids shall be addressed to the official inviting Bids by name and designation and sent at the following address:

Tender Room,
Ground Floor,
Administrative Building,
BHEL, Piplani, Bhopal- 462022.
Contact Phone No – 91-755-2506533, Fax – 91-755-4201937,

- 3.5.2 Bids can be submitted by post / International Courier / personally and shall be posted with due allowance for any postal delay. Bids received after the Due Date and Time of opening are liable to be rejected.

3.6 BID OPENING

- 3.6.1 PART-I (Techno-Commercial Bid) is to be opened on the due date and time as specified in the Tender Notice, in the presence of bidders who may like to attend. Part-II (Price Bid) shall be opened subsequently.

- 3.6.2 Date and time of Price Bid (Part-II) opening shall be intimated to the technically and commercially acceptable bidders only.

- 3.6.3 Unsolicited bids shall not be entertained. Unsolicited revised Price Bids also, shall not be entertained at any stage of the tendering process.

3.7 VALIDITY OF OFFER

Offer shall be kept valid for at least three months from the due date of Tender, for BHEL's acceptance.

3.8 DEVIATIONS

Bids shall be submitted strictly in accordance with the Technical specification (annexure- 1) of the Tender Enquiry. However, deviations if any should be clearly brought-out separately.

3.9 LANGUAGE & CORRECTIONS

3.9.1 The bidder shall quote the rates in English language and international numerals only. The metric system of units shall be used, for the purpose of tender.

3.9.2 Bidder shall fill the tender documents issued by BHEL in ink or in typed formats. Each page of the bid shall be signed by the bidder.

3.9.3 All entries shall be filled in neat and legible handwriting. No over-writings erasures and corrections are permitted and may render such bids liable for rejection.

3.9.4 However, if any cancellations, corrections and insertions are in the bid, the bidder shall duly attest the same.

3.9.5 Normal language of communication(written as well as verbal) including Final report would be in English.

3.10 REJECTION OF BID AND OTHER CONDITIONS

BHEL reserves to itself, full rights for the following without assigning any reasons, whatsoever:

- a) To reject any or all the bids.

3.11 TENDER EVALUATION

3.11.1 Value should be indicated both in words as well as in figures. If there is a difference between price quoted in words and figures the price in words will be considered or if there is any other price discrepancy, lower value(s) will be considered for evaluation & ordering.

4.0 COMMERCIAL TERMS AND CONDITIONS FOR BIDDERS

4.1 DELIVERY

Delivery period shall be around 9 months or duration proposed / agreed at the time of Order placement. The details of deliverable are explained in Annexure 1. The runner supplied by BHEL should be sent back to BHEL in good condition after completion of testing along with other components being transported back.

4.2 RATES

4.2.1 Lump-sum value of the entire scope (annexure -I) is to be quoted in both Figures and Words in Part-II (price-Bid- Annexure 4, table 3). Further the above total value is to be split into the following four sub-parts :

1. Cost for manufacturing of water-passage components (which are to be transported back to BHEL).
2. Cost of manufacturing/procurement of adapting elements for assembly and installation in bidders' test-stand.
3. Cost of Testing including assembly, pre-test, witness test(if any), inspection, report.
4. Cost of packaging and forwarding.

All applicable taxes as per Indian Government laws shall be payable extra as per actuals. {Incase of International bidders the tax liabilities as per the native Country's law shall be paid by

the Bidder himself. The Price quoted shall be inclusive of all tax liabilities of the native country of the Bidder}.

4.2.2 Rates shall remain FIRM without any variation till completion of the Contract.

4.2.3 In case of International Bidders the Exchange rate on the date of opening of Techno-Commercial bid (Part-I) shall be taken for evaluation.

4.2.4 In case of Income Tax deduction, BHEL will issue TDS (Tax Deducted at Source) which can be claimed by the bidder in their native Country and payment to the Bidder will be net of Income Tax. Pl. confirm acceptance of this condition. In case of non-acceptance of this, the same will be loaded on your price for evaluation.

4.3 PAYMENT TERMS

The progressive payment would be made by LC in four stages after successful completion of each stage against **submission of Bank Guaranties of equivalent amounts. Bank Guaranties shall be valid for a period till the dispatch of components to BHEL.**

Stage (1) - (10% of total value) Successful completion & submission of mechanical designing / drawings of the small scale working model to be installed on Vendors Test stand based on water-passage drawings provided by BHEL. This should also include runner assembly drawing along with its assembly details on Test stand and details of provision of tappings for various measurements to be carried out during testing.

Stage (2) - (40% of the total value) Successful completion of manufacturing of all model components on the basis of a completion Certificate/ photographs & inspection sheets produced by the Vendor.

Stage(3) - (40% of the total value) Successful completion of calibration of instrumentation, detailed model tests, inspection of model components.

Stage (4) - (10% of the total value) Dispatch of model components to BHEL and acceptance of model test report.

The payment will be made within a maximum of 30 days of presenting the invoice. There would be no intermediate stage payments other than mentioned above. Further, payment would be made only after full completion of the stage scope in a sequential manner.

4.4 PENALTY FOR DELAY

If the completion of project (stage-3 in clause 4.3 above) is delayed from the agreed/ proposed schedule, a penalty of 0.5% (of total value) per week would be imposed subjected to a maximum of 10% , if the delay is not on account of BHEL or Force-Majeure conditions.

4.5 CONFIDENTIALITY

Bidder shall, at all times, undertake to maintain complete confidentiality of all data, information, drawings & documents, etc. belonging to BHEL and also of the procedures, reports, input documents, manuals, results and any other company documents discussed and/or finalized during the course of execution of the order/contract.

4.6 ACCEPTANCE OF ORDER

Letter of acceptance of the Purchase order is to be submitted within two weeks of receipt of Purchase Order.

TECHNO-COMMERCIAL BID - Part -1

Qualifying Criteria :

- a. The bidder should have a well-equipped Hydro turbine model testing Laboratory with latest instrumentation and facilities. The Hydro turbine model testing process would be as per IEC 60193. The total uncertainty in measuring turbine efficiency should be within 0.25%. For manufacturing of model components, the bidder should have his own facility or tie-up with a reputed firm having the facility.
- b. The bidder should have an expertise and experience (at least 5 years) in model testing of Hydro turbines and should have conducted at least 2 contractual witness-tests(details to be submitted) of Hydro turbine models in the last three years.
- c. The bidder should have tested at least two Francis turbine models out of which at least one is a contractual witness test in the head range of 200m or above and unit output of 25 MW or more (for prototype) in the last 5 years.
- d. The bidder should not be a business partner/ business associate to any of the major Hydro Turbine Manufacturers having any business interest in India and should be ready to accept of a Secrecy clause of maintaining strict Confidentiality of the data / information related to this project.

TABLE - 1

S.No.		Criteria	Description		
1	i	Brief details of the Hydro turbine model testing set-up including views of Test-stand layout including details about instrumentation and facilities (clause a above).			
	ii	Total uncertainty in measuring turbine efficiency	Pl. specify the value		
	iii	Details of model manufacturing facilities			
2 a		Details of Experience in testing of Hydro Turbine models including number of years and names of Projects for which testing (development /contractual witness tests have been completed (clause b).			
2 b		Details of contractual witness tests in last three years	1	2	3
	i	Name of the Project & location			
	ii	Type of turbine			
	iii	Turbine output x Number of Units			
	iv	Operating head range			
	v	Rated speed			
	vi	Date of model testing completion			
	vii	Name /contact details of Customer			
3.		Details of Medium/High head Francis for a Project which is successfully operating			
	i	Name of the Project			
	ii	Location			
	iii	Turbine output x Number of Units			
	iv	Operating head range			
	v	Rated speed			

	vi	Date of model testing completion	
	vii	Name /contact details of Customer	
4.		Statement detailing the Status of bidder with respect to any association with major hydro turbine manufactures	
5.		Acceptance of Secrecy/Confidentiality clause (Clause No. 4.5 of Annexure -2)	YES /NO

TABLE -2

S.No.	Description	Remarks / Comments	Deviations (if any)
1.	Acceptance of complete Technical scope of work as per Annexure -1	Yes / No	
2.	Acceptance of deliverables as per Annexure - 1	Yes / No	
3.	Acceptance of Payment terms and conditions (clause 4.3 of Annexure -2)	Yes / No Comments if any	
4.	Acceptance of commercial terms & conditions (clause 4.2 of Annexure -2)	Yes / No Comments if any	
5.	Validity of quoted price -(acceptance of clause 3.7 of Annexure -2)	Yes /No Comments if any	
6.	Proposed Delivery schedule (Also refer clause No. 4.1 of Annexure -2)		
7.	Acceptance of clause 4.2.4 (pl. refer Annexure 2)	Yes / No	

Deviation in any of the seven items in Table -2 above must be clearly brought out as Deviations and should be a part of Techno-Commercial bid Part-I .

BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect at any point of time, the offer shall be rejected.

Price Bid - Part -2

TABLE -3

S.No.	Description	Value (Both in Figure and Words)
1.	a. Cost for manufacturing of water-passage components (which are to be transported back to BHEL). b. Cost of manufacturing/procurement of adapting elements, allied hardware for assembly and installation in bidders' test-stand. c. Cost of Testing including assembly& installation, calibration, pre-test, witness test(if any), inspection & report. d. Cost of packaging and forwarding (FOB Price).	----- ----- ----- -----
2.	Lump Sum value of Entire Technical Specifications, scope and Deliverables as per Annexure -1 (sum of a,b,c,d) as above.	-----