

Rehabilitation of Penstock in Kameng HEP  
using combination of CFRP and GFRP



**Pre Bid Meeting Queries**

**Name of Work**

**NIB No.** NEEPCO/PEN/IND/001

**BIDDERS QUERIES**

S. No.	Location	Queries	Responses
1	Part 3 Clause 6(iii)	What are the details for the 4/5 pre-bid meeting?	The meeting proposed for 4/5 is rescheduled and fresh date shall be informed shortly.
2	Part 3 Clause 6(iii)	Based upon the pre-bid meetings taking place on 4/2 and 4/5, and a site visit taking place subsequent to this, will the deadline for questions be extended so that follow-up questions can be asked as more details are understood about the project?	All queries including design issues, if any shall be raised till the 2nd Pre-bid meeting. Replies on queries including clarification on technical issues shall be provided immediately after second pre bid meeting. No queries will be entertained after that, therefore prospective bidders are requested to conclude site visit immediately.
3	Part 1 Clause 14 & Part 3 Clause 8 (III)	Based upon logistics for site visit timing, will the bid due date be extended?	Bid stipulations shall prevail.
4	Part 5 Section 6	Please clarify the basis for the 100-day schedule for the project scope and specifically what is included in the 3 days allotted for material procurement. It would be helpful to understand if the schedule included in the bid documents is for construction or preliminary in nature and for consideration in our bid preparation?	100 - day duration has been worked out on the basis of Front End Engineering design for the Project. The durations of sub-activities provided in the construction schedule are tentative and for guidance purpose only. Bidders are required to prepare and submit their own schedule for the Project keeping 100 days project execution period unaltered.
5	Part 5 section 1	We understand that the repair should consider the new steel penstock hosting the CFRP, and the liner should be designed to take internal pressure at the longitudinal welded joints. Our preliminary analysis indicates very high forces from pressure alone that cannot be reliably transferred from steel to CFRP by bond alone. Should the complete circumferential repair be performed along the length of the penstock, or just in the areas where penstock has defective longitudinal welds?	The composite lining has to withstand stress arising due to the discontinuities in all the longitudinal and circumferential joints keeping in view the uncertainties in the long term stability of the defective joints which would be subjected to cyclic load and consequent crack propagation.

6	Part 5 section 2.4	We understand there is hydraulic thrust from closure of the Main Inlet Valve (MIV) located in downstream end of Penstock, and there is also hydraulic thrust at all elbows along the length of the penstock. The drawings show concrete thrust blocks around some elbows, and soil/rock bearing at others. Is there thrust restraint analysis for the elbows along the length of the penstock showing thrust blocks or pipe to soil friction are used to resist the thrust? Is there pipe installation and soil data including pipe to soil friction to calculate the length of thrust and temperature restraint needed? Should all circumferential welds be considered for repair?	The reply is furnished below : 1. Hydraulic thrust of 1850MT comes into play on closure of the Main Inlet Valve (MIV) located in downstream end of Penstock. The MIV transfers the thrust to the connected Penstock which in turn transfers the same to concrete through a reducer piece located near downstream end. A sketch is enclosed for reference. The bidder is expected to examine the mentioned provision vis-à-vis hydraulic thrust 2. Thrust blocks/anchor blocks have been designed and provided in all vertical and horizontal bends duly considering all forces including hydro dynamic and temperature acting on the pipes laid on surface. In underground portion, hydraulic load coming on the pipe is disipated to rock through back-fill concrete. For repair of Circumferential Joints refer reply at Sl. No. 5 above.
7	Part 5 section 2.4	Please confirm that CFRP repair should be designed for internal pressure, temperature and thrust, and that soil load is taken by the steel pipe; there are no holes and significant gaps (> 5 mm 1/4 in.) in the steel wall.	<i>Except the section just U/s of MIV, the liners are to be designed as per the Cl. No. 2.4.2 Of the Part-5 of the Bid Document. The composite lining has to be checked for the hydrostatic thrust transferred from MIV to upstream liner in closed condition duly considering the clarification furnished above at Sl. No. 6. Presently, in empty condition no gap &gt; 5 mm may be envisaged. However, development of gap in the defective/damaged longitudinal &amp; circumferential joints in steel ferrules under design internal load (&gt;5mm) may be checked.</i>
8	Part 5 Section 2	Please provide all data available for penstocks regarding soil boring, original pipe construction/installation, pipe specifications and grouting data.	In underground portion, tunnel excavation was initially done with bigger diamter. The tunnel was adequately supported by steel girder and backfill concrete. This support system was designed to take vertical load of rock/soil. Steel penstock/pipe was later installed inside the excavated and supported tunnel and the annular gap between tunnel and penstock/pipe was filled up with concrete.
9	Part 5 Section 2	Please provide all data available for penstocks related to thrust blocks including drawings.	Civil drawings are enclosed herewith.
8	Part 1 Clause 14	Will multiple addenda be issued addressing questions as they are submitted and can be answered? Based upon the level of detail required in the requested "complimentary design with FEM", it is going to take significant time to complete the design documents for inclusion in the bid package. Given that design is the single most important aspect of the bid submission, as identified in the bid scoring scale, It would be helpful if answers to questions were issued prior to April 7th, as indicated in bid documents.	Yes.

9	Corrigendum II	What is the location and time for the pre-bid meeting on April 2nd?	On 2nd April at Centre for Underground Infrastructure Research & Education (CUIRE), The University of Texas at Arlington (UTA) from 10:30 AM to 1:30 PM (CUTC / GMT-5 hrs) & Video Conference Room, North Eastern Electric Power Corporation Ltd., Lower New Colony, Shillong, Meghalaya, India from 9.00 PM to 12.00 PM (Indian Standard Time)
10	Part 4B Clause 19	Part 4B of the documents – Special Conditions refers to: a. Clause 19 of NEEPCO’s General Conditions of the Contract – are the NEEPCO General Conditions of the Contract provided in the bid documents? b. LD clause – Section 8 – Execution cites the “LD Clause” – was information on liquidated damages included in the bid documents?	(a) Clause No.1 of Part-4(B) may be read as - <b>"A contractor to which a contract is awarded by NEEPCO under this solicitation is required to carry the insurance specified in the contract. For more details, please refer to Clause 19 of General Conditions of the Contract."</b> (b) Clause No. 8 (c) of Part-4(B) may be read as - <b>"Delivery period should be guaranteed. The Contract can be cancelled unilaterally by the NEEPCO in case items are not received within the contracted delivery period. Extension of contracted delivery period will be at the sole discretion of the Buyer, with applicability of Clause 25 (COMPENSATION FOR DELAY) of General Conditions of the Contract.."</b>
11	Part 5 Section 2.2	Part 5 – Technical Specification, Section 2.2 – General Requirements: Item 2.2.1 states that “Materials for the FRP composite system must be suitable qualified, in compliance with industry standards, and supplied by a reputable manufacturer approved by the Owner.” For pipeline upgrades using CFRP/GFRP, industry standards and best practices include provision by the manufacturer of the following information with their bid, please indicate if these will be required: a. An International Code Council (ICC) Evaluation Service Report for FRP materials to be utilized on pipeline upgrades to validate long term durability properties. There is no inclusion of long term durability testing requirements in the specification, which is a critical factor in completing a 50-year service life design. b. Full-scale pipe testing – there is no requirement within the specification to provide validation of the FRP’s system applicability for pipeline repairs through full-scale testing on a 48-inch diameter or larger pipeline.	a. Without reference to ICC, the 10,000-hour test is required.  b. Full scale hydro test is desirable subject to time allowed in the bid. Bidders may examine the requirement for the same and furnish their view in the pre-bid meeting.
12	Part 5 Section 2.4.2	Part 5 - Technical Specification, Section 2.4.2 – Design Requirements: a. Please confirm if the circumferential CFRP design Hoop design should be stand-alone, i.e., designed to take the entire internal and external pressure and soil load, and if it should also be designed to span over a gap or hole of a certain size. b. Is there a negative pressure that should be considered for design of CFRP?	a. It is not necessarily a standalone design as there is a new steel penstock hosting the CFRP. The liner should be designed however, to take internal pressure at the joints without any specific gap size specified.  b. Negative pressure may not be considered

		<p>c. Please confirm if the CFRP in the longitudinal direction should be designed to take the thrust from hydraulic pressure and temperature, especially considering that many defects are in the circumferential welds.</p> <p>d. Are there results of hydraulic thrust analysis available or is designer expected to perform thrust restraint analysis?</p>	<p>c&amp; d. Hydraulic thrust of 1850MT comes into play on closure of the Main Inlet Valve (MIV) located in downstream end of Penstock. The MIV transfers the thrust to the connected Penstock which in turn transfers the same to concrete through a reducer piece located near downstream end. A sketch is enclosed for reference. The bidder is expected to examine the mentioned provision vis-à-vis hydraulic thrust.</p> <p>Maximum temperature shall be 35°C and temperature variation shall be 25°C.</p>
13	Part 5 Section 2.4.2	So that all of the background information on the project is available to review with respect to constructability, design and all project aspects, will the Feasibility Report completed on the repair of the penstock be provided to bidders?	The content of feasibility study is incorporated into the bid documents
14	Part 5 Section 6	Do the bid documents cite an anticipated start date for the project, or projected date for issuance of a Notice to Proceed, and if not, are these dates, or estimated dates, known at this time?	Tentative start date of the project is 1 <sup>st</sup> week of May 2019.
15	Part 3 Clause 10 & Annexure 5	Tiger procurement system is not working. Requesting removal of e-tendering portal for bids. Requesting a longer period of time for the delivery of hard copies.	Bidders are advised to provide details of problem being faced for redressal.
16	Part 5 Section 3	Frequency of QA testing. Number of samples?	Bid Stipulation shall prevail. Refer Clause No. 3.5.6 (Part-5) ** (3 samples every 50,000 SF to test for D3039 (tensile strength) and D7616 (lap shear). Normally the contractor makes the samples and gives it to the owner and the owner pays for and gets the test done independently from the contractor's input.
17	Part 5 Section 1	Is the scope limited to Penstock 2 or will there be work in Penstock 1? If so, quantities are needed to include in the bid.	In the present Bill of Quantity, no item for Penstock-1 has been considered. However, the bidder may be required to take up some work in Penstock-1 in exigency. The work in Penstock-1 shall be considered as appropriate extra item and analysed and paid accordingly.
18	Part 5 Section 6	We think 100 days for completion is unrealistic. We propose extending it to 200 working days	Bid Stipulation shall prevail.
19	Part 3 Clause 11(iv)	Taxes/duties will be included in the bid or not?	Shall be addressed and necessary corrigendum shall be issued.
20	General	Income tax in India for US employees?	Bid stipulation shall prevail.
21	Part 3 Clause 2	Will bidders be allowed to bid with exceptions to the requirements?	Bid stipulation shall prevail.
22	Part 3 Clause 23.3	Requesting removal of "bid splitting"? It will affect cost/unit pricing.	Bid stipulation shall prevail.
23	Part 3 Clause 12	Please confirm that the currency for the entirety of the project can be in US \$	Bid conditions (Cl.12 , Part-3 ) shall prevail
24	General	Housing, food, water supply, sanitation included for how many people?	All employees to be engaged by the contractor at site.
25	Part 4A Clause 29	If the scope changes post award, unit pricing should be renegotiated.	Bid stipulation shall prevail.

26	Part 4A Clause 70	Termination should compensate for the work completed as of the date of termination plus any incurred cost on the project.	Bid stipulation (Cl. 22, 23 of Part-4(A) ) shall prevail.
27	Part 4a Clause 64	Safety officer should be required for all bidders.	In Cl. 64(ii), the Appendix-III may be read as Appendix-II. In Appendix-II, Cl. 02.15 shall be read as "To ensure effective enforcement of rules and regulations relating to Safety precautions, contractor shall appoint a qualified and experienced safety officer at site and all safety arrangements made by the Contractor shall be opened to inspection by the Engineer-in-Charge or his representative."
28	Part 4a Clause 19	Please provide details on the storage facilities for materials. Will they be climate controlled?	Closed space storage with CGI sheet roof and wall of adequate size is available at site. However, it is not climate controlled.
29	General	Will you be providing an approximate number of protrusions.	Bidders are strongly advised to visit site for adequate understanding.
30	Part 4A Clause 66	Who does QA testing and how it will be compensated?	PIA shall do the testing and cost of all testing shall be embedded in contract price except the Hydrostatic test which shall be paid separately as a B.O.Q item.
31	Part 1 Clause 6.3 (ii)	In case of liquid asset the confirmation of the same shall be provided by our chartered accountants as per the provisions made in the balance sheet.	Bid Stipulations shall prevail.
32	Part 3 Clause 27	Retention money should be included in CPG which is generally done in other places. 50% of CPG amount withheld as retention is released after work completion.	Bid Stipulations shall prevail.
33	Part 3 Clause 32	There should be availability of 3- phase power from NEEPCO (from normal electricity or generators) for 24 hrs including providing electricity inside Penstock.	Clause No. 32 of Part-3 of Bid Documents shall prevail.
34	Part 4A Clause 25	There should be limit for compensation of delay which is generally 5%.	Bid Stipulations shall prevail.
35	Part 4A Clause 61	It is again for confirmation that GST is payable extra.	Bid Stipulations shall prevail.
36	Part 4A Clause 71	Mobilization Advance should be interest free.	Bid Stipulations shall prevail.
37	Part 4A	75% of secured advances to be given against materials which is missing in the tender documents.	Bid Stipulations shall prevail.
38	Part 5 Section 3.3.2.3 & 3.3.2.5	All kind of injections and stoppage of leakages shall be in NEEPCO - Scope. All welding, cutting and refixing of plates including fabrication works if required shall be in NEEPCO Scope.	Following activities have been taken up in Penstock-2 before start of restoration work with CFRP lining: a) Grotting with micro-fine/OPC to arrest seepage of ground water into Penstock through holes/cracks b) Injection of Polyurethane (PU) to arrest remaining seepage after cement grouting  c) Filling up of offsets with welds Therefore, no noticeable seepage should exist at the time of handing over of site to PIA which shall be jointly ensured by Corporation and PIA. All other activities for surface preparation shall be within the scope of work. Sealing of minor seepage, if any, is detected at the time of execution shall be in the scope of work.
39	Part 5 Section 1	It is informed that all Penstocks are buried 1000mm minimum as against partly above ground as informed in the tender documents.	Relevant drawings ( Concrete encasement details ) are enclosed.

40	General	Net connectivity shall be provided by NEEPCO at site and other places over there since there is network problem, mobiles and internet doesn't work.	Internet facility available at site shall be extended to PIA for use.
41	Part 5	Is there a summary of defects identified for Penstock 1? (similar to Penstock-2 as provided in the Section 13 of Form 5 – Technical Specifications). Before has over are these defects in the welds going to be rectified.	Summary of defects in zone-8 of Penstock-1 is enclosed.
42	Part 5 section 2.4.1	Section 2.4.1 states that “the penstock could be pressurized up to maximum +4MPa when the leakage starts against the design pressure of 6.9MPa”. Further, the Section 2.4.1 summarizes potential defects as elaborated in the Section 13. (However, this is only for Penstock-2). Would NEEPCO accept a solution which provides extra number of layers (depending on the pressure requirements and defect type) for the defect areas only where for all other areas the wrapping is based on a nominal number of layers to cater for pressure difference between design pressure of 6.9MPa and 4MPa pressure which leakage start?	PI Refer reply furnished above at Sl. NO. 5.
43	Part 5	What’s the current volumetric flow rate of the pipe and expected flow rate of the pipe (assuming current flow rate is lower than the expected flow rate)?	Maximum flow rate shall be 80 cubic meter per second.
44	General	What’s the expected change or variation in temperature?	Maximum temperature shall be 35 <sup>o</sup> C and temperature variation shall be 25 <sup>o</sup> C.
45	Part 5 Section 2	How have the minimum CFRP strength specifications for the CFRP laminate properties been derived? It is common knowledge that FRP laminate strengths / modulus of the same areal weight of fabric once infused with epoxy may vary by +/- 7 to 10% from another manufacturer’s stated laminate properties. As this is a Design and Build Tender, this +/- 7% to 10% tolerance in FRP Laminate properties (tensile strength and modulus) should be allowed as in the end any design will finally compensate for the slight variance in Laminate Properties strengths by either adding more or fewer layers to accommodate for the variation.	Bid stipulation shall prevail.
46	Part 5 Section 3.3	Please confirm if sandblasting is allowed to prepare the internal surface of the Pipe as the current pipe is coated with tar. This is critical as any residual tar will severely effect bonding and long term performance of the FRP system.	Clause Nos. 3.3.2 .6 & 3.3.2.7 of Part-5 of Bid Documents shall prevail.
47	Part 5	What is the PH of the water that will be flowing through the penstock as NEEPCO have faced problems of high sulfuric acid content in other reservoirs in the region. If this is expected as well at this site, the final selection of top coat is crucial to the proper operation and long-term viability of any FRP system.	Acidic condition with low PH value is not envisaged.
48	Part 5 section 2.7.4	Clause 2.7.4 specifies adding silica fume to thicken the epoxy. Note that the industry standard to thicken epoxy in “Fumed Silica” and not “Silica Fume”. They are different materials with different end uses and have immense cost implications and performance.	Fumed Silica is correct.
49	Part 5 section 2.7.2	In section 2.7.2 regarding the resin system that is used to saturate the FRP fabric a clause needs to me added to state that “The resin system used for FRP saturation shall not be diluted with solids or fillers to minimize the actual pure epoxy content” as adding solid fillers to the saturating epoxy does not allow for proper impregnation of the fibres.	Bid stipulation shall prevail.

50	Part 5 Section 2	What is the reason for such a stringent specification for the Glass Fabric and its laminate properties when it is to be used only as a di-electric barrier?	Bid stipulation shall prevail.
51	Part 5 Section 2 Table 6	In Table 6: Epoxy Resin Properties, kindly clarify what "Glass Transition" means. Is this the glass transition temperature of the epoxy resin system?	That is correct.
52	General	Will more detailed drawings of the Existing Penstock be provided, including all elevations and section details?	Drawings are available at at <a href="http://www.indstt.com/NEEPCO/Civil_Drawings.rar">http://www.indstt.com/NEEPCO/Civil_Drawings.rar</a> or further details please contact us at <a href="mailto:indstt@indstt.com">indstt@indstt.com</a> .
53	General	There must be some preliminary design analysis and basis to come out with the current Tender Requirements. Will NEEPCO share that preliminary design report with all bidders?	The content of preliminary design analysis and basis is incorporated into the bid documents
54	Part 5, Section 3, Cl. No. 3.3.4.14	Whether UV exposure criteria is required for the job.	UV exposure criteria may be considered dropped from Tech. Specification.
55	General	What will be the schedule of approval of design and drawings	Hydro Test activity should proceed concurrently with design activity and necessary submission. Approval of design shall be accorded immediately on successful completion of Hydro Test carried out for validation of design.

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Summary of Pre-rectification UT of L-Joints and C-Joints of Zone-8 of Penstock-1										
Zone	Total number of Joints	Total length (m)	Total UT done		Defects identified				% age of defects to be repaired	
			No. of Joints	Length (m)	No. of Joints	Length (m)	Brief description of defects	Offset in mm with length of offset	In terms of no. of Joints	In terms of length
L-Joints										
P1-Z8	53		53	130.6	20	39.5	LOF+CRACK, LOP+CRACK	0	37.74	30.25
C-Joints										
P1-Z8	53		53	624.66	52	428.74	LOF+CRACK, LOP+CRACK	0	98.11	68.64