Clarifications Dated 20-09-2019 to pre-bid queries on stipulations of Bid Documents

NIB No. 330 Dated 14-08-2019

Name of work : Rehabilitation of Penstock-II (Partly Underground and partly Over ground) of Kameng Hydro Electric Project (600 MW) located at Kimi, Arunachal Pradesh, India using a combination of Glass Fiber Reinforced Polymer (GFRP) and Carbon Fiber Reinforced Polymer (CFRP).

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Sl. No.	Bid Document	Clause No.	Clause Details	Requests/ Queries	Reply/ Clarification
1.	Part-1 Short & Detail NIB	13e	Tender Timeline	We Request the tender be extended to Oct. 30 since it is a design and build and responsibility ultimately lies with the bidder many items require clarification from techno commercial stand point as well as design standpoint. Rushing this tender through will be a disservice to all.	The date for submission of bids and opening of Techno-Commercial bids have been extended till 30-09-2019 (14:00 Hours) and 01-10-2019 (14:00 Hours) respectively. (**Refer Corrigendum No. 4 Dated 18-09-2019)**
2.	-do-	13d	-do-	We request the pre bid meeting be held in Delhi to facilitate international travellers.	The Pre-bid meeting was held at 06-09-2019 at NEEPCO Office, New Delhi. (**Refer Corrigendum No. 3 Dated 03-09-2019)**
3.	-do-	6.4	Joint-Venture/ Consortium Bidders	We request client that any of JV/consortium having technical qualification as per clause no. 6.5.(i). Bidders Associating Sub Contractors and Other partner should be authorised experienced applicator in India for more than 15 years shall be considered as qualified. And JV association with sub-contractor shall have required technical experience as per clause no. 6.2.(a), (b) & (c) shall be considered.	Bid stipulations shall prevail.
4.	-do-	6.2.(b)	Technical Qualifying Requirement	Application of 10,000 Sq.mt of FRP area being installed in any one or cumulative projects where FRP has been installed for rehabilitation of pressurised encased/buried pipe (from OEM supplier itself or through their authorised installer/applicator anywhere worldwide in man entry pipe 0.90m.	Stipulation modified vide **Corrigendum No. 5 Dated 20-09-2019.**
5.	Part- 6 tender Forms and Data Sheets	Form No. H	Proforma of Joint Deed	In case of foreign sub-contractor kindly advise what should be the procedure to execute Joint Deed Undertaking, since they do not have place of office in India and accordingly unable to purchase stamp paper in its name in India	1. During bid stage, Joint Deed Undertaking (JDU) shall be submitted on a plain paper. 2. In the event of award to such bidder, the JDU shall be executed on Non-Judicial stamp paper of

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>requisite value purchased by the Indian entity. Accordingly, the bidder shall submit along with their Techno-Commercial bid an undertaking to submit the said JDU on stamp paper at award stage.</td></tr>
<tr><td>6.</td><td>Part- 5 Technical Specifications</td><td>3</td><td>Design Methods and Requirements</td><td>Table 1 in Part- 5: technical Specification provide total 13 Zones of the Penstock (Zone 1A – Zone12). Please provide the thickness of the existing pipe section in each zone.</td><td>
<u>Table-1: Zone Wise Thickness & Grade of Steel Liner</u>
<table>
<tr><th>ZONE</th><th>Penstock Stretch</th><th>Penstock Dia. (m)</th><th>Grade of Steel</th><th>Pipe Thickness (mm)</th></tr>
<tr><td>Z1A</td><td>BH to AB 1</td><td>3.75</td><td rowspan="6">SUMITEN-540/ASTM 537 CL-II</td><td>25</td></tr>
<tr><td>P1-Z1</td><td>AB 1 TO 2</td><td>3.75</td><td>30</td></tr>
<tr><td>P1-Z2</td><td>AB 2 TO 3</td><td>3.75</td><td>36</td></tr>
<tr><td>P1-Z3</td><td>AB 3 TO 4</td><td>3.75</td><td>36 & 40</td></tr>
<tr><td>P1-Z4</td><td>AB-4 to AB 5</td><td>3.75</td><td>40</td></tr>
<tr><td>P1-Z4</td><td>AB 5 TO 6</td><td>3.75</td><td rowspan="7">SUMITEN-780/ASTM 517 Gr-F</td><td>32</td></tr>
<tr><td>P1-Z5</td><td>AB 6 TO 7</td><td>3.75</td><td>32</td></tr>
<tr><td>P1-Z6</td><td>AB 7 TO 8</td><td>3.75</td><td>36</td></tr>
<tr><td>P1-Z7</td><td>AB 8 TO 9</td><td>3.75</td><td>38</td></tr>
<tr><td>P1-Z8</td><td>AB 9 TO BP-10 (VS -2)</td><td>3.75</td><td>36</td></tr>
<tr><td>P1-Z9</td><td>FACE - 10</td><td>3.75</td><td>36</td></tr>
<tr><td>P1-Z10</td><td>VS - 4</td><td>3.75</td><td>40</td></tr>
<tr><td>P1-Z11</td><td>FACE - 12</td><td>3.75</td><td>40</td></tr>
</table>
</td></tr>
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<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>
<table>
<tr><td>P1-Z12 B1</td><td>FACE 14</td><td>2.65</td><td rowspan="2"></td><td>32 & 40</td></tr>
<tr><td>P1-Z12 B2</td><td>FACE 15</td><td>2.65</td><td>32 & 40</td></tr>
</table>
The aforesaid details are also incorporated in Drawing No. OMML/393/S-04, R-6 & OMML/393/S-05, R-5 (Copies enclosed).</td></tr>
<tr><td>7.</td><td>-do-</td><td>3</td><td>Design Methods and Requirements</td><td>All material details of the existing penstock steel are missing in the tender. What is the Steel Grade, Steel Yield Strength and Modulus of Elasticity of the existing penstock steel in each zone.</td><td>Reply above may be referred. All the mechanical properties such as YP, UTS & Modulus of elasticity is to be taken as per steel grade indicated in the enclosed drawing. It may be clarified that the steel Grade SUMITEN-540 is equivalent to ASTM 517 Cl-2 and SUMITEN-780 is equivalent to ASTM-517, Gr-F.</td></tr>
<tr><td>8.</td><td>-do-</td><td>-do-</td><td>-do-</td><td>What is the Grade, Yield Strength and Modulus of Elasticity of the weld.</td><td>The mechanical properties of weld may be considered identical to steel material used in the respective section.</td></tr>
<tr><td>9.</td><td>-do-</td><td>-do-</td><td>-do-</td><td>The thickness at the weld section to be taken as 1/4th of the thickness of the original pipe thickness. Should the maximum stress at the weld section be limited to the weld yield stress after the provision of CFRP.</td><td>The thickness of Weld Section to be taken as % of the thickness of the original pipe thickness to simulate the cracks of weld.
The maximum stress in weld is to considered same as allowed in the case of steel plate.</td></tr>
<tr><td>10.</td><td>-do-</td><td>3.2g (Point-1)</td><td>Design Requirements</td><td>In this section, the bidder is required to provide FEM analysis of load transfer from MIV Inlet Pipe to CFRP Lining. Does this mean that the termination of FRP is at MIV 3 and MIV 4 and runs till Line D? or is the FRP needs to be wrapped on the concrete of MIV? What we understand from this is that an analysis is to check the bond stresses of CFRP. Is this the correct understanding? Please clarify. Could we get some detailed drawing of</td><td>Technical requirement for transfer of Hydraulic Thrust is clearly spelt out in the Bid document. Designer needs to carry out the detailed analysis and suggest adequate methodology for transfer of the Hydraulic Thrust as well as termination details of CFRP.
The following Drawings pertaining to details of Penstock Pipe Beyond BP-19B are enclosed herewith:</td></tr>
</table>

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				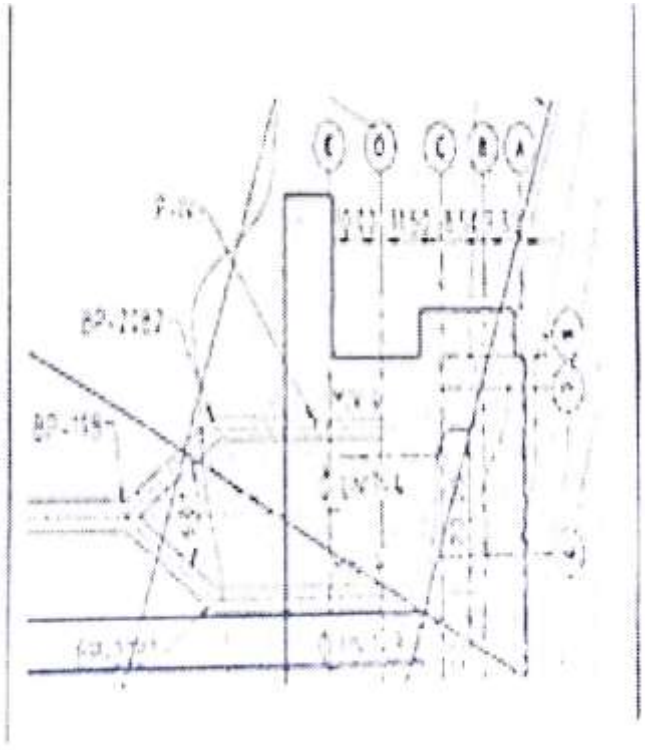 MIV3 and MIV4 with the details of the lower diameter section beyond BP19B in order to understand the connections details. What are the expectations for the termination details of CFRP?	1. Drawing No. OMML/393/S-12, R-1 2. Drawing No. OMML/393/S-80, R-2 Also, drawing No. 02000015252, R-11, 02000015251, R-11 & 0-212-00-15501, R-3 pertaining to MIV are enclosed herewith.

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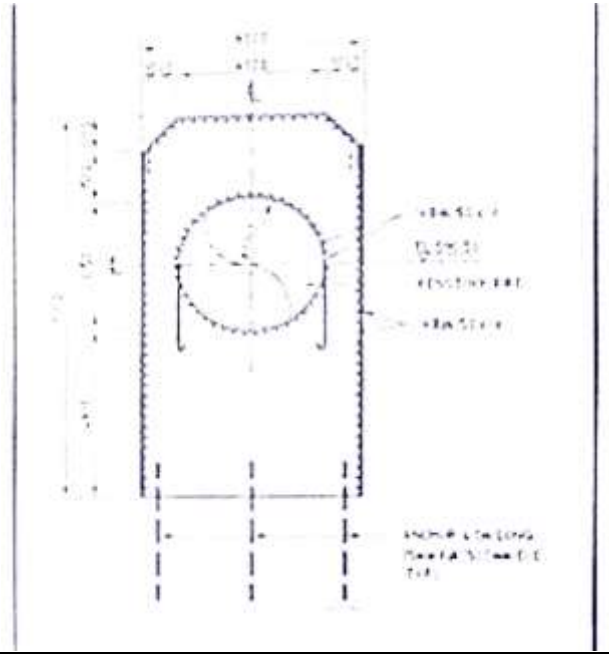
11.	Part- 5 Technical Specifications	3.2g (Point-2)		In this section, it is not clear how can there be a direct interaction between concrete in Anchor Blocks and CFRP Strain as the CFRP will be installed on to the Internal Surface of the Pipe Please Clarify. 	Designer of the bidder has to decide and suggest.
12.	-do-	4.1a	Table- 2, Sl. No. 5- Tex	Should read: 800g/km or 1600g/kg with 12K or 24K Tow Size respectively	Depending on the GSM of the Fabric, both may be considered.
13.	-do-	4.1a	Table- 2, Sl. No. 11- Spool Size	Spool Sizes for different manufactures are variable and not all set to 6 Kg	No limit on Spool Sizes. However, 6kg is specified to reduce Fabric Joints.

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14.	-do-	4.2d	Width	Width of fabric should not be fixed and a range from	Width of Fabric shall vary from 750mm (min.) to 1250mm (max.).
15.	-do-	4.2e	End Count	This item denotes bi-direction carbon. May We assume it is Unidirectional with end count only in the Warp direction	End Count depends on UD or BD Fabric & GSM.
16.	-do-	4.2h	Breaking Strength	Is the Breaking strength 400kg/mm or 400kg/inch	Bid Stipulations (Breaking Strength = 400kg/mm) shall prevail.
17.	Part- 5 Technical Specifications	4.2i	Thickness	Thickness of the fabric can vary greatly with the type of weave selected even if the weight of fabric is the same in both weaves. The result is also variable as the ASTM D1777 test relies on the amount of pressure placed on the dry fabric. We suggest this test be removed as it is not applicable. Only Areal Density in Should be considered as accurate.	GSM, Thickness & Breaking Strength of Fabric shall be specified in the Submittals. Inspection to be carried out as per ASTM.S[1]
18.	-do-	4.3	E- Glass Fabric	Unidirectional as well as bi-direction glass of required 800gsm or greater should be considered as such 4.3.e. should not specify the warp and weft count specifically as the glass is only o be used a di-electric barrier. Also widths of 500mm to 1200mm in 4.3.d should be considered acceptable.	Required thickness of di-electric layer to be decided by the bidder and accordingly, details of E-Glass Fabric of Weave Type & GSM shall be included in their submittal.
19.	-do-	4.4j	Gel Time in Resin Mix	Different Resin to Hardener Mix rations should be considered as different manufactures have different mix ratios.	Agreed. However, minimum Pot Life 90 min. is required.
20.	-do-	Extra	Dryness	Penstock should be handed over to the bidder totally in dry condition before start of FRP work	All leaking joints shall be made tight with welding by NEEPCO. Minor leakages, if any, shall be made good by the Contractor. All other surface preparation works required for successful installation of CFRP system is under the scope of the Contractor.

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21	Part-1: Detail NIB	6.3(i), (ii)	Financial Qualifying Requirement	• In your previous tender No. NEEPCO/PEN/IND/001 dated 26.03.2019, the minimum average annual turnover required was INR 56.00 Crores in the best three financial years out of 5 financial years whereas in your latest NIB No. 330 dated 14.08.2019 it is mentioned as INR 470.00 Crores. • Requirement for Minimum Liquid assets earlier was INR 21.00 Crores whereas it is now mentioned as INR 90.00 Crores. As per our understanding, the required acceptance criteria are exceptionally very high and thus it is not possible for us to meet the same. Although the fact remains that our organization has the financial capacity to execute the project with respect to guidelines specified in tender while maintaining the highest quality standards and the project schedule.	MAAT is modified vide **Corrigendum No. 5 Dated 20-09-2019.**
22	Part-3: ITB	27(i)	Contract Performance Bank Guarantee	There should be 2 BGs of 5% each totalling to 10%. One of them of 5% shall be retained for Defect Liability Period and other 5% after completion of the project.	Bid stipulation shall prevail.
23	Part-3: ITB	27(ii)	Contract Performance Bank Guarantee by Sub contractor	In case of sub contractor for submission of additional BG of 5% of value of works to be sub contracted. It should be limited to 1 crore.	Bid stipulation shall prevail.
24	Part-4A: GCC	25(i)	Compensation for delay	This should be limited to 5% instead of 15%.	Bid stipulation shall prevail.

25	Technical Queries	The revised scope of work indicates circumferential cracks only as the design criteria. Please confirm that the FRP design is not to factor in any longitudinal cracks.	It may be confirmed that Design should be based on circumferential as well as longitudinal cracks for the entire penstock
26	-do-	Please confirm that ¼ (1 mm) of the pipe cross-section is welded in the inner surface of the pipe at the aforementioned circumferential cracks.	It may be confirmed that welding for 1/4th of the thickness of Ferrule for both joints are from inside.
27	-do-	Quake Wrap carbon and glass fibre fabrics/laminates do not meet some of the criteria listed in Tables 5.2 and 5.3. We suspect no FRP supplier in the infrastructure rehabilitation industry will fully meet these criteria and request the following exceptions: • Carbon Fabric Breaking Force: Reduce from 400 kgf/mm to 200 kgf/mm • Glass Fabric Tensile Strength: Reduce from 300 MPa to 230 MPa	It may be confirmed that Carbon Fabric Breaking Force can be reduced to 200 kgf/mm. However, composite strength & modulus should meet the requirements of the technical specification. The Glass fabric tensile Strength can also be reduced to 200 MPa.
28	-do-	Please confirm that the aerial weight and thickness values indicated in Table 5.3 are minimum values required.	Considering objective to minimize the number of FRP layers, we have given GSM as well as composite thickness (1mm or 2mm) depending on the weaver these values may vary.
29	-do-	Does the “Hydraulic Thrust of 1850 MT” entail a surge pressure of 1850 m of water column? If that is the case and a safety factor of 5 is required for internal pressure, then it is more than likely that the design will result in an unreasonable number of CFRP layers. Is the required internal pressure 1850 m of water column (18.1 MPa) or 6.87 MPa as required as the max (design) pressure indicated in the original bid documents? This makes a lot of difference. For 6.87 MPa, a few layers of CFRP will be adequate even with a safety factor of 5, but	It has been proposed to stimulate two full scale tests with internal pressure only and having a life of 50 years (as per ASME Code), strain limit is coming to 1100 micro-strains only. It is proposed to increase the strain limit to 2000 micro-strains and FoS required for internal pressure on FRP layer should be 5. The Hydraulic Thrust of 1850 MT comes into play on closure of the MIV located in downstream end of Penstock. It shall act longitudinally along the flow of water and same shall not be considered as Internal

		for 18.1 MPa, we will need about 15 layers, which will drive up the cost drastically.	Pressure. Thus it has no role towards required no. of CFRP layers. However, some mechanical arrangement shall be kept at the downstream end of Penstock for Load Transfer.
30	-do-	Does the safety factor of 5 apply to both steel substrate and FRP? We are getting low stresses (below the yield stress) at circumferential cracks with the 1/4th of the wall welded (without any FRP), unless a SF 5 is required for steel as well.	It may be confirmed that the Safety Factor of 5 applies to FRP only.
31	-do-	What is the anticipated start date for the project? We need to start making arrangements to secure such large quantities of materials if our team is the successful bidder.	After finalisation of the award.
32	Technical Queries	Design details after LOI within 4 weeks. Kindly confirm.	Bid Stipulations shall prevail.
33	-do-	Tentative Cost of Hydraulic Testing	The Hydraulic Testing shall be carried out by the Owner. However, all costs barring cost of basic test article shall be recovered from the bidder. The bidder shall consider the same while quoting their rate.
34	Clause 65, Part-4(A) of Bid Document	Can be Defect Liability Period capped at 60 Months only, including intermediate repairs.	Stipulation modified vide **Corrigendum No. 5 Dated 20-09-2019.**
35	Technical Queries	Number of Installer Representative to be deployed at site. Any specific requirement from NEEPCO for experience, qualification & number of representative.	If the applicator is subcontractor, Firm shall depute minimum 25 numbers of engineers/technicians to site from start of the rehabilitation works to the commissioning of the power plant (minimum of 5 years of experience in composite field).
36	-do-	Should the Designer Representative stationed at site.	If the designer is a sub-contractor, Firm shall depute minimum of 5 engineers/ representatives from start of

			the rehabilitation works to the commissioning of the power plant.
37	-do-	Factor of Safety will be 5 or 2 as discussed in Hyderabad or Allowable Strain of 2000 Micro Strain will be governing factor for design.	It may be confirmed that the Safety Factor of 5 applies to FRP only.
38	-do-	Density of Fabric will be 750- 1400 GSM or as per specification of 1400- 1500 GSM. Fabric Thickness mentioned 1-1.2mm while other range mentioned is 1.5-1.6mm.	The bidder can select any GSM to minimize no. of layers as per the design requirements.
39	-do-	Is the fabric to be UD or BD	It may be confirmed that, CFRP is UD and GFRP is UD or BD.
40	-do-	If the Strain Value is limited to 0.002 is governing factor, kindly provide relevance of tensile strength of Carbon Fibre > 4500 MPa.	Design shall be carried out with 2000µs Strain Value and Factor of Safety of 5 limited with strain for all layers.
41	-do-	Where the Metallic Polyester Putty to be applied? Kindly provide the area of application.	Designer of the Bidder has to decide the requirement of Metallic or Epoxy Putty.
42	-do-	Sealing of Leaks. Can Provide the Quantum?	Quantum of defect in the entire Penstock is appended with the Bid document. Designer of the Bidder has to decide.
43	-do-	Saturation by Machine or Hand Saturation, where not possible. Kindly elaborate of conditions?	It is saturation, it can be allowed to do inside. If machine, it can only outside.
44	-do-	Removal of Coal Tar? Want to discuss.	Prior to application of CFRP, Coal Tar shall be removed.
45	-do-	200 days of work completion period: Doesn't seems feasible citing the Quantity of Lay-Ups required.	Bid stipulations shall prevail.

46	-do-	3.2.l: Design Life: 50 years us asked for; what about periodic maintenance of the system whose scope.	Bid stipulations shall prevail.
47	-do-	3.2. e. says Factor of Safety is still at 5 for Internal Pressure: This will increase the layups for better system design. Again, strain asked for here 2000 µs is very low will result in propping up the fabric requirement in no. of layups.	Bid stipulations shall prevail.
48	-do-	3.2.m. says: CFRP system should be designed for perfect bonding to host pipe wall as per design: last time we discussed for a standalone system wherein bonding was not necessary except at terminal ends so what now fully bonded system is required?	Bid stipulations shall prevail.
49	-do-	Different material manufacturers will give different properties based on different codes for their products and so after design; layups for each will be different and so apple to apple comparison will be difficult. In this case, we suggest having a design done independently by NEEPCO suggesting no. of layers required and all contractors be put on same page. Or alternatively Let the sample section for pressure testing be done for all individual bids based on their individual layups and material consideration after which contractor be selected for installation instead of risking the whole project again.	Bid stipulations shall prevail.
50	-do-	10.3 asks or no. of tests such as adhesion, slurry erosion test, hydrostatic test, whose scope is this and at what time of project?	All the test shall be carried out after award of work in line with Bid stipulations.

		We see as NEEPCO should conduct testing's to compare this systems offered pre-hand before selecting contractor.	
51	-do-	Bidders not having Qualifying Criteria are eligible with associate subcontractors: being such a critical work why project is being risked by considering novices to FRP applications as main bidders.	Bid stipulations shall prevail.