**ANNEXURE A (SCOPE OF WORK)**

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|---|---|
| **Emergent Rehabilitation of Unit No. 6 via Replacement of Underwater Parts (excluding Generator Electrical Works) at Dehar Power House, BBMB, Slapper, Himachal Pradesh** | |
| | **IMPORTANT NOTES:-** |
| 1 | **Mandatory Scope of work:-** Emergent Rehabilitation of Unit No. 6 via Replacement of Underwater Parts (excluding Generator Electrical Works) at Dehar Power House, BBMB, Slapper, Himachal Pradesh. **Unit#6 is under Forced shutdown and thus the Replacement of Under Water Parts is planned for the Unit.** |
| 2 | **COMPLETION PERIOD:- 60- days** (From date of handing over of Unit#6 to successful Spinning of the Unit) |
| 3 | **Defect Liability Period shall be:-**<br>**SIX (6) MONTHS** from the date of commissioning (Synchronisation) of the Unit. Subcontract shall provide sub-contractor must offer comprehensive support free of cost to ensure that Unit vibrations, temp etc. levels within rated/design values as per EIC.<br>**NOTE: -**<br>1. If any Deduction on the part of non- execution of work during defect liability is done by Customer shall be back to back deducted from vendor along with overheads as applicable.<br>2. Any defect reported by customer within defect liability period. Sub-contractor will attend to defect(s) free of cost.<br>3. Subcontractor will not be relieved from its liability even if attended defect (Reported by customer within defect liability period) repeats even after attending of the defect and vendor has to attend to defect(s) free of cost<br>**Security Deposit Refund:** Shall fall due after completion of Defect Liability or guarantee period subject to compliance of performance guarantee whichever is later. |
| 4 | **List of Annexures:** |
| | Annexure I-A Scope of Work for Emergent Rehabilitation of Unit No. 6 |
| | Annexure II - Tentative list of T&P. |
| | Annexure III - Tentative list of Manpower. |
| 5 | **Third party Insurance:** The contractor must take and maintain ESI /Workman compensation Policy for the workmen engaged for this work **and shall also have to take Third party Insurance** (for property and third person) for Rs 50,00,000/- (Fifty Lakhs) in Joint name of BHEL and BBMB for the period of work (up to the end of the Defects Liability Period) and document in this regard for both policy should be submitted to BHEL before commencement of work: Coverage shall be :<br>(i) loss of or damage to the Contractor's T&P;<br>(ii) loss of or damage to the property other than Works including those of third parties and<br>(iii) injury or death of personnel belonging to the Contractor or any other party.<br>Coverage of the Third party insurance shall include any loss or damage to Staff, Supervisors, Engineers and others who are not covered by Workmen Compensation Act. Workman & Third party insurance shall be submitted for the BBMB (Engineer-in-Charge) approval before the date of commencement of the Works.<br>The Contractor shall extend support to BBMB for lodging of claims for its own material with the insurers for claim against Policies taken by BBMB. |
| 6 | It shall be in interest of the vendor to visit the site before quoting for the work. |

| RATE SCHEDULE | | | | | | |
|---|---|---|---|---|---|---|
| **A** | **Lumpsum (LS) price for the TOTAL SOW as per (Annexure-A) inclusive of all consumables, input materials and supervision) excluding GST.** | **Amount to be Quoted: _____** | | | | |
| **B** | **Break up of Price quoted at S. No. A** | | | | | |
| **S. No.** | **Job Description** | **Qty** | **UoM** | **% age Allotted of the QV at S. No. A** | **Completion Period (Days)** | **Remarks, If any** |
| B.1 | Emergent Rehabilitation of Unit No. 6 via Replacement of Underwater Parts (excluding Generator Electrical Works) at DEHAR POWER HOUSE (165 MW) SLAPPER, Himachal Pradesh. | 1 Unit | Job | 100.0% | 60- days (From date of handing over of Unit#6 **to** Successful Spinning of the Unit) | - |

| ANNEXURE -I(A) Scope of Work for "Emergent Rehabilitation of Unit No. 6 via Replacement of Underwater Parts (excluding Generator Electrical Works) at Dehar Power House, BBMB, Slapper, Himachal Pradesh" | | |
|---|---|---|
| **A)** | ***DISMANTLING OF MACHINE*** | **Allotted % CV** |
| **1.0** | **Common activities** | |
| 1.1 | Opening and closing of the manholes of draft tube and spiral casing. | 7 |
| 1.2 | Installation and removal of platform in the draft tube, I- section, channels, wooden planks, plates and other scaffolding material are to be provided by BBMB. Internal illumination of draft tube and spiral casing will be in the scope of work. Only DC Supply and its Lamps shall be used inside the Spiral casing. | |
| 1.3 | Draining the oil from the generator & turbine guide bearing reservoirs, removal of RTDs, thermocouple etc. | |
| 1.4 | Dismantling of Turbine main shaft seal assembly, turbine & generator guide bearings & guide pads check and record centring of the machine. | |
| 1.5 | Checking dismantling reading like levelling and alignment of machine. | |
| 1.6 | Dismantling of oil vapour seal assembly. | |
| 1.7 | Detailed dismantling report post dismantling inspection is to be made hence Vendor has to ensure all the dismantling reading and ensure Dimensional records of Shaft Diameters and Coupling holes and bolts size. The Instruments required like Micrometers, Bore Gauge etc. shall be in scope. | |
| **2.0** | ***Rotor Assembly*** | |
| 2.1 | Remove the top & bottom guide ring, end winding plates/winding covers, oil retaining sleeve and top bracket. | 8 |
| 2.2 | Disconnect the rotor shaft leads between the spider and shaft. | |
| 2.3 | Remove drive bolts and dowels between the spider and thrust block. | |
| 2.4 | Removal of coupling nut guard of the turbine and generator shaft couplings. | |
| 2.5 | Decouple the turbine & generator shaft and lower the runner to place it on throat ring. | |
| 2.6 | Lift the generator rotor and place in the service bay. | |
| Note:- | Dismantling readings as per instruction of EIC is to be recorded in protocols. | |
| **3.0** | **LOWER MAIN BRACKET & OIL COOLERS & AIR COOLERS** | |
| 3.1 | Disconnect all pipe work, thermometers and auxiliary wiring from bracket. | 5 |
| 3.2 | Remove dowels and holding down bolts. | |
| 3.3 | Lift the bracket out of the pit after ensuring the turbine shaft and runner are suitably supported. Decouple the generator shaft from the turbine shaft and removal of over speed device and pit air seal etc. | |
| 3.4 | Removal of oil & air coolers. | |
| **4.0** | **GUIDE APPARATUS, TOP COVER, RUNNER, RUNNER SHAFT, PIVOT RING** | |
| 4.1 | Dismantle and take out the breaking links, rotating-oil sump, fork ends of guide vane servomotors and regulating ring. | 8 |
| 4.2 | Dismantle and take out the guide vane levers, bush housing and top cover. | |
| 4.3 | Take out the runner with shaft and place the draft tube cover plate in the turbine pit and take out the guide vanes. | |
| 4.4 | Dismantle and take out the pivot ring. | |

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| **5.0** | **Minor Work in Pressure Pumping (PP) SET** | |
| 5.1 | Dismantling of the Components, Cleaning & minor works related to attending leakage in Oil lines as per instruction of EIC to the extent required at site. | 1 |
| 5.2 | Take out turbine oil from PP set. Oil shall be filtered by BBMB & refilled by the Vendor. BHEL shall hand over the filled oil drums to BBMB and the same will be returned after filtration/new oil. The approximated quantity will be registered before handing over and taking over the oil. | |
| **6.0** | **Dismantling & Cleaning in CW System/Strainers** | |
| 6.1 | Dismantling & Cleaning of Strainer to the extent required as per instruction of EIC. | |
| | **TOTAL DISMANTLING (A)** | **29** |
| **B)** | ***ASSEMBLY OF TURBINE*** | |
| 1 | Replacement of top cover, pivot ring, Runner, guide vanes & bush housings (Repaired underwater parts shall be provided by BBMB). | 8 |
| 2 | Repair/Replacement the shafts sleeve of the turbine shaft, welding electrodes (Mo 309 SS) to be supplied by the vendor. | |
| 3 | Test the 24 nos. guide vane Bush Housing at 40 Kg/cm2 for at least 10 mints. In case of replacement New shaft sleeve will be supplied by BBMB. | |
| 4 | Assembly of runner and runner shaft and runner aeration cone. | |
| 5 | Cleaning and painting of foundation ring, turbine pit liner, spiral casing and other allied equipment. (Colter based Black Epoxy Paint and Red Oxide Zinc chromate Primer suitable for Epoxy paint to be supplied by BBMB). | |
| 6 | Lower the pivot ring on the foundation ring, lowering of top cover and 8 nos. guide vanes & bush housing without runner, place lower main bracket in position with original dowels. Centring of pivot ring and top cover with piano wire w.r.t centre axis of generator shaft to maintain radial clearance as per requirement, re-dowelling of repaired top cover and pivot ring. | |
| 7 | Trial assembly of runner to ensure radial clearance & freeness of runner. | 9 |
| 8 | Assembly of guide vanes and top cover, record clearance of guide vanes with top cover and pivot ring, correction of the same as per requirement. | |
| 9 | Final assembly of runner, top cover, bush housing, guide vane apparatus, base plate of shaft gland, servomotor fork ends, breaking links, levers etc. and painting of guide vane apparatus. (Paint shall be provided by BBMB) | |
| 10 | Fit the rotating oil sump on the turbine shaft and turbine guide bearing assembly of outer shell of turbine & generator guide bearing. DPT and UT of inner shell of TGB & all bearing Pads and bearing shells. Hydraulic test of bearing shell. (All nut bolts for the Jali & rotating oil Sump shall be provided by the BBMB) | |
| 11 | Lower and fit LMB and rotor in generator pit and couple both turbine and generator shafts. | |
| 12 | Levelling and alignment of coupled turbine generator shaft and correction of the same by putting the shims in between the turbine and generator coupling flanges as per requirement. | |
| 13 | Centring of the unit, record centring readings at labyrinth of pivot ring/top cover, shaft seal, TGB, UGB, Air gap etc. Keep the machine at best suitable centre position. | |
| 14 | Assembly of generator guide bearing pads & turbine shaft seal and turbine bearing. Hydraulic test of the bearing shell. | |
| 15 | Calibration and assembly of temperature gauges of TGB, Generator guide bearings. Thrust bearing pads. | |

| | | |
|---|---|---|
| 16 | Carrying out UT, DPT & Leakage testing of inner shell of TGB. Polish the white metal surface of inner shell with combination stone and replace the rubber strip of outer shell, if required. (Rubber strip, Grub Screws, TGB Oil flap & turbine Main shaft gland system flaps shall be provided by the BBMB) | 3 |
| 17 | Assemble turbine shaft gland system & Carryout the operation of air seal in the presence of BBMB. (Air Seal if faulty will be provided by BBMB) | |
| 18 | Carry out the bedding of guide vanes to match there sealing surfaces. | |
| 19 | Carry out the dry stroking of guide vanes near & about same opening at 30°/60°/90° (in co-ordination with the EMD-BBMB) | 4 |
| 20 | Dismantle and remove the platform from draft tube and close the draft tube door and spiral casing manhole. | |
| 21 | Disengage the isolating seal and mechanical lock of rotary valve and then open the 8" bye-pass gate valve for spiral filling. | |
| | **TOTAL TURBINE ASSEMBLY (B)** | **24** |
| **C** | **ASSEMBLY OF GENERATOR.** | |
| **1** | **Stator** | |
| | Assistance in Minor work of Clean the stator & Rotor (suitable/ standard cleaning agent to be provided by Customer), in Presence of OEM of Stator & its Reassembly as per instruction of EIC is only in Scope. | 8 |
| **2** | **Alignment checking of generator shaft** | |
| | Alignment / throw checking of generator shaft (it will be done after removing any additional weigh if it is mounted on rotor/spider in past to balance the rotor) and correction of the same by putting the shims between runner disc (without coupling with Turbine shaft). Shim of suitable thickness viz 0.05 / 0.07 / 0.1 / 0.2 mm etc. will be in scope of the firm is found short with Customer. | |
| **3** | **Rotor** | |
| | Assistance in Minor work of Clean the Rotor as per instruction of BHEL, in Presence of OEM or Customer. | |
| **4** | **THRUST BEARING/UGB/LGB/BEARING SUMP.** | |
| | Carryout UT & DPT test of Thrust bearing, Top and bottom guide pads. Clean and polish all the thrust/guide bearing pads after blue matching. If any of the guide bearing pads is found damaged, it may be replaced and its clearance be re-set without changing the other pads. The radial clearance between shaft journal and guide pads should be as per requirement. Inspection of runner disc joint if gap found more than desire limit the same shall be reduced up to some extent possible by replacement of joint bolts supplied by BBMB. | 12 |
| **5** | **Minor Maintenance of slip ring and brush gear ass.** | |
| | Clean the slip rings, brush gear assembly. Check the condition of brush holders and Carbon brushes repair/replace, if any as per instruction of EIC. Carbon brush/holder will be supplied by BBMB. | |
| **6** | **Maintenance of oil cooler** | |
| | Dismantle and clean the water boxes of coolers clean the cooler tubes with brush and a jet of water. Replace neoprene 'O' ring. Test the coolers for any leakage as per OEM/ BBMB checklist. | 2 |
| **7** | **Maintenance of air coolers** | |
| | Dismantle and clean the water boxes of coolers. Clean the cooler tube with brush and a jet of water. The outside of the tubes and fins should be cleaned with the help of compressed air and a high pressure jet of water. Replace all the gaskets and Test the coolers for any leakage at the pressure as per BHEL/BBMB check list. | 2 |
| 8 | **BRAKING AND JACKING SYSTEM** | |
| | Servicing of brake jack system, replacement of cup seal, spring etc. Replace the brake pads, if found worn out. Drain the sludge/moisture trapped in oil turn dish. Check the tightness of brake track holding bolt. (New Brake pads and other spares shall be arranged by BBMB) | |

| | | |
|---|---|---|
| 9 | **BOX UP OF GENERATOR** | |
| | Assembly of UGB / Slip ring, brush gear assembly. Fix the lock plates of both guide bearings & thrust bearing. Change the polarity of collector rings. Fit the vapour seals and allied piping's. Check tension on brushes as per OEM norms. Fit the top & bottom guide rings, end winding plates and flooring plates. Check that no foreign material is trapped between plates, and flooring plates. Check that no foreign material is trapped between stator core and rotor poles. Final inspection of machine and box up. Mechanical/heat run of the machine for 72 hours or the period till desired IR/PI is achieved. | 8 |
| 10 | Painting of all cooling water pipe lines of bearings oil & stator coolers. (Paint in scope of the BBMB). | 1 |
| 11 | Painting of the flooring plates, railing etc. (Paint in scope of the BBMB). | |
| 12 | Cleaning of 11KV Bus duct near manhole & Replacement of manhole gaskets with verification by BBMB (EMD). (All spares shall be provided by BBMB) | |
| 13 | Spinning, commissioning of Unit. Manpower assistance during commissioning & correction required in bearing clearance re-adjustments in case of abnormalities observed during bearing run or 72 hrs trial run commissioning test shall be in scope. Final synchronization of the machine and Vibration Testing/Analysis. | 2 |
| **Note:-** | **Deputation of vibration Expert along with Vibration analysis kit (** Bentley Nevada ADRE-408,208 or Equivalent) & Trim Balancing expert team:- Vendor has to mobilize the Vibration analysis and trim balancing team (Expert Vibration Analyst having vast experience and certification) timely long with Kit for Vibration analysis and trim balancing, during final commissioning of the Unit till satisfactory completion of works. The contractor have to arrange suitable balancing weights for reducing vibration during trim balancing at site. | 7 |
| | **TOTAL GENERATOR ASSEMBLY (C)** | **42** |
| **D** | ***GENERAL TERMS & CONDITIONS*** | |
| 1 | The contractor shall deploy crane operators (EOT) and riggers to facilitate the timely completion of the work. However, Crane shall be provided free of cost by Customer. | 3 |
| 2 | Workshop machines as available at Dehar Power House will be provided as on where basis to contractor, but without any assistance for their operation. **Operators** to be arranged by bidder, if required. | |
| 3 | All kind of General purpose Consumables which do not go into the equipment permanently consumables such as Paint remover, Rustolene, Diesel, welding Electrodes, super therm, (E-7018), Mo-309-S.S etc.), and other general purpose consumables such as bonding material, sealing material, cleaning material, DA, Oxygen, Nitrogen and Argon gas cylinders, DP test kits, M-seal etc. S.S. Shims off sizes required during assembly of machine, M.S Flat off sizes for locking various nut and bolts, etc. as per site requirement for the completion & assembly work of the unit shall be in the scope of the bidder. | |
| 4 | Portable machinery, and general-purpose tools required for the complete execution of the work shall be arranged by the contractor. Any machining work required to run the system shall in be in sub-contractor scope. (Taping, Reaming, Honing or any other in-situ machining activity shall be in scope of vendor) However, only special T&P/special tools, if required, shall be provided by **BBMB.** | |
| 5 | To provide one full time office boy/attendant for BHEL office in shifts and One Cook and commercial LPG cylinders for BHEL Mess and utensils for tea/coffee at BHEL site office at least for 4-6 persons. Housekeeping of Office and Site work area shall be in Scope. Which is to be provided during entire Job period. | 2 |
| 6 | Arranging one personal computer /laptop with latest configuration, Internet connection with 4G/5G Support, 3 in 1 printer, scanner & Copier and its other accessories & Consumables for the complete period up to commissioning. PC shall be installed with latest windows (at least Windows 10). | |
| | **TOTAL GENERAL TERMS (D)** | **5** |
| | **GRAND TOTAL FOR COH (A+B+C+D)** | **100** |

| | TERMS & CONDITIONS (Included in Scope of work) | |
|---|---|---|
| 1 | Any other work, which is not specified /covered or the work which can be done at site/got done from local market and is not specified /covered in the above scope of work, but is required to be done to completeness the work, is deemed to be covered in the scope of work. | |
| 2 | Contractor shall be fully responsible for all the hardware/components, which are dismantled from the unit and shall keep them in safe custody. The contractor at his own risk shall arrange any missing item and BBMB will not be responsible in any way. Contractor will also be responsible for proper upkeep and maintenance of any special tools provided to him, which shall be returned by the contractor in good and working condition. He shall also make any other damage to any equipment or property of BHEL / BBMB due to mishandling or carelessness of any staff of the contractor good at his own cost. The contractor at his own expenses shall keep all the places, surrounding of his working neat & clean and out of danger to any person or assets. At work site, provide and maintain at his own cost all lights, guards, fencing, warning signage, when and where necessary or required by the Engineer-in-Charge. If any component gets damaged, the cost of the same shall be recovered from subcontractor, as per rates decided by Customer plus overheads as applicable. | |
| 3 | Any other minor components like Dowell, gaskets and general purpose fasteners etc. shall have to be supplied by sub-contractor as per site requirement. | |
| 4 | The contractor shall maintain a site order book, which will be available at site so that instructions could be passed by BBMB officer in charge or engineer(s) deputed by him. | |
| 5 | Any change/modification in scaffolding or shortfall shall be carried out by contractor with his own material. | |
| 6 | The contractor shall submit Bar/PERT chart and Daily progress report preceding day before noon on next day to the BHEL site engineer. | |
| 7 | Non-satisfactory results may hinder initiation/finalization of payment process at any stage and in worst case may lead to recovery of payment already made. | |
| 8 | Firm's representative is required to report at site well before time & conduct a site visit and document diverse factors like unit vibrations, temperatures, oil and water leakage, etc. prior to handing over the unit. | |
| 9 | Fabrication of any fixture or device for measurement/rectification shall also be in scope. | |
| 10 | The contractor shall submit along with any tender, or prior to any works commencing the following: - | |
| a | Copies of employer's liability and public liability insurance certificates. | |
| b | Safety assurance plans related to work to be submitted. | |
| 11 | Temporary lighting at site of work. Sub contractor will arrange bulbs, two core cables, bulb holders and step down transformers etc. 24V Distribution transformer & board along with proper cables, plugs and tops. Main switches of 100A/63A, hand lamps, torch and flood lights be arranged by the contractor. All tools and tackles required to complete the Scope of work shall be in scope of the party. | |
| 12 | Covid or any other Govt. Guideline at the time of execution of work is to be arranged at own cost. | |

| | | |
|---|---|---|
| 13 | All safety articles such as safety belts, safety helmets, electrical/mechanical/normal hand gloves, electrical/mechanical safety shoes, Gum boots, rain coat, protective glass, & welding, cutting glasses etc. shall be arranged by contractor. Sub - contractor will strictly follow and display as per the HSE guidelines of BHEL. **Experienced Safety engineer and Graduate engineer shall be in scope as per BHEL policy.** At work site, provide and maintain at his own cost all lights, guards, fencing, warning signage, when and where necessary or required by the Engineer-in-Charge. Vendor is required to follow best practises as per **BBMB CODE FOR PRACTISE** of General Safety Requirements within BBMB Premises. | |
| 14 | Contractor shall be arrange labour license before start of the job and Compliance other statutory requirements of labour laws as per labour act. | |
| 15 | **Material handling :-** Local Site transportation of Material. Material handling from Power House to Customer / BHEL stores or vice versa in in Sub-contractor scope. Making all necessary arrangements of manpower for the same, shall be in scope. (Mobile Crane, Truck/Trailer for material handling from DPH main Store to DPH Power House i.e. **upto about 2.5km shall be provided by BBMB**) | |
| 16 | If any work is denied or refused same shall be carried out at Risk and cost of the vendor and cost as per actual for execution to meet urgency shall be recovered with overheads as per NIT. | |
| 17 | No Idling, Demobilisation/ Re-mobilization charges will be applicable. | |
| 18 | Sub-contractor shall have sufficient man power to complete the as per schedule. The contractor shall submit Bar/PERT chart and Daily progress report to the BHEL site engineer. Accommodation is provided, as per availability with customer. | |
| 19 | Sub contractor has **Workers compensation policy**: The contractor must take and maintain ESI and Workman compensation Policy for the workmen engaged for this work in accordance with the statutory requirements applicable where the contract or any part thereof is executed. Deduction of any payment done by BBMB on the part of non compliance of statutory requirements by any of the authorities of State/Central Government shall be done back to back as per actual along with Overheads as per EIC. | |
| 20 | Percentage (%age) Allotted as per detailed breakup of 100% shall be deducted in case of non Execution of the same due to site/Customer requirements. | |
| 21 | **Third party Insurance:** The contractor must take and maintain ESI /Workman compensation Policy for the workmen engaged for this work and shall also have to take Third party Insurance (for property and third person) for Rs 50,00,000/- (Fifty Lakhs) in Joint name of BHEL and BBMB for the period of work (up to the end of the Defects Liability Period) and document in this regard for both policy should be submitted to BHEL before commencement of work: Coverage shall be :<br>(i) loss of or damage to the Contractor's T&P;<br>(ii) loss of or damage to the property other than Works including those of third parties and<br>(iii) injury or death of personnel belonging to the Contractor or any other party.<br>Coverage of the Third party insurance shall include any loss or damage to Staff, Supervisors, Engineers and others who are not covered by Workmen Compensation Act. Workman & Third party insurance shall be submitted for the BBMB (Engineer-in-Charge) approval before the date of commencement of the Works. The Contractor shall extend support to BBMB for lodging of claims for its own material with the insurers for claim against Policies taken by BBMB. | |
| 22 | **Contract should provide for submission of supporting documents for deployment of office attendant, laptop/computer, printer, safety officer, digital megger, crane operator as per contract requirement for releasing payment against Miscellaneous Services.** | |

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|---|---|---|
| 23 | Vendor has to obtain necessary "Police Verification" from local PS and "Gate Pass" from Project Security Officer to enter into the project area for his entire manpower including its permanent staff & vehicle. ID proofs of all the workers shall be supplied by the contractor & Submitted to EIC. | |
| 24 | The Vendor shall comply with all provisions of the Code on Wages-2019, Code on Social Security-2020, Code on Occupational Safety, Health and Working Conditions- 2020, and Code on Industrial Relations-2020, along with applicable State Rules and notifications. | |
| 25 | The Vendor shall indemnify and hold harmless the Principal Employer against any claims, penalties, or liabilities arising from non-compliance with labour codes. | |
| 26 | Taking of NOC/NDC from the EIC of MMD & EMD of BBMB after completion of works shall be in scope & submission of the same along with Final Bill. | |
| 27 | Suitable accommodation for contractor/sub-contractor's personnel on chargeable basis as per availability, the charges for which shall be payable directly by contractor/sub-contractor to BBMB. | |
| 28 | **Expert/Skilled man power:** The supervisor/workmen shall be well qualified and well versed in similar nature of work having a vast experience in installation of hydro power stations | |
| 29 | In case of contradiction between GSCC, Conditions will prevail & be final. | |

**Annexure -II**

## Emergent Rehabilitation of Unit No. 6 via Replacement of Underwater Parts (excluding Generator Electrical Works) at Dehar Power House, BBMB, Slapper, Himachal Pradesh

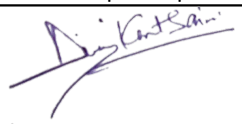
## Tools & Plants (T&P) and Monitoring & Measuring Equipments (MMEs)

| | |
|---|---|
| 1 | Following T&P and consumables falls in the scope of sub-contractor scope and no additional payment over and above quoted rates will be made against supply of same. The list is suggestive/indicative in nature. |
| 2 | Contractor shall deploy sufficient T&P like hydraulic jack alognwith pump, Measuring & Testing equipment (i.e. micrometres, slip gauge, dial gauges, telescopic gauges, dial bore gauges for carrying out the scope of work to complete the job within scheduled time. Tentative **T&P as detailed below** shall be made available at site before start of work as shall be got checked from engineer-in-charge. MMEs to be deployed as per work front availability as decided by BHEL Engineer In charge. Being very short duration shutdown period **, In case works/activity gets delayed due the absence of any T&P or MMEs by more than (5 days), than same shall be arranged at the risk and cost of contractor to meet contract timelines/schedules and payment shall be made from contractor's bill/dues with BHEL. Decision made by BHEL Site In charge shall be final & binding to bidder/contractor**. Contractor must submit all **calibration certificate** before the start of work. Test certificate of all lifting tools shall be submitted. Any deduction made by customer due to non availability of tested or calibrated instrument or kit shall be done back to back plus overheads as per rules/norms. |
| 3 | Sub-contractor shall ensure use of only calibrated Inspection, Measuring & Testing equipment (i.e. Micrometers, slip gauge, dial gauges, telescopic gauges, dial bore gauges, measuring tape, Vernier callipers etc.) confirming to the national standards. Valid calibration certificates shall accompany these equipment's. Subcontractor shall submit complete list of T&P along with their calibration certificates to BHEL, well before (at least 7 days) start of the job. |
| 4 | Consumable like, Gasket Sheet (2mm-3mm), Neoprene Rubber sheet (2, 3,4 mm),cotton tape, araldite, permanent markers, white paint, m-seal, Bulbs, all welding electrodes, tarpin oil, DPT kit, waste cloth, hand gloves , MT Oil, Lectra clean Oil, Benzene Oil, CRC 26, acetone, grinding wheels, cutting wheels, Teflon tape, pvc tape roll, Emery papers, Markin cloth, cleaning cloth, safety caution roll, etc. to complete the work shall be in scope. |
| 5 | Use of Digital IMET's & Pneumatic or battery operated impact wrench machine (having various range of spanner size) is mandatory in plant to ensure timely completion of work within schedule. Fabrication of any fixture or device for measurement/rectification shall also be in scope. |
| 6 | Transportation of testing / measuring equipment's of BHEL/BBMB, if required at site will be transported by sub-contractor from BHEL office or any BHEL/BBMB site to DPH site & back to respective site/office. |
| 7 | Any other minor components like rubber, rubber gaskets and general purpose fasteners etc. shall have to be supplied by sub-contractor as per site requirement. Asbestos cloth and Asbestos powder shall be arranged by contractor. |

### List of Tentative MME (Monitoring & Measuring Equipments )

| Sl.No. | Description | Size/Range | Quantity |
|---|---|---|---|
| 1 | Digital/Analog Multi-meter | As per requirement | As per requirement |
| 2 | ~~Digital Megger (Meggar 5 kV)~~ | ~~0-1000-2000-5000V~~ | ~~As per requirement~~ |
| 3 | ~~Primary current / Voltage injection kit~~ | ~~5A 240V AC~~ | ~~As per requirement~~ |
| 4 | ~~Tong Testers~~ | ~~DC 30/60/300 A~~ | ~~1 each or As per requirement~~ |
| 5 | ~~Tong Testers~~ | ~~4-20 mA (DC & AC)~~ | ~~1 each or As per requirement~~ |
| 6 | ~~Impedance Measurement Kit~~ | ~~150 A (240V)~~ | ~~As per requirement~~ |
| 7 | ~~Tan Delta Test kit With Operator~~ | | ~~As per requirement~~ |
| 8 | ~~DC Winding Testing Kit With Operator~~ | | ~~As per requirement~~ |
| 9 | ~~ELCID Test Kit With Operator~~ | | |

| | | | |
|---|---|---|---|
| 10 | ~~Digital micro Ohm meter~~ | ~~As per requirement~~ | ~~As per requirement~~ |
| 11 | Precision/standard Thermometer for calibration | As per requirement | 1 or As per requirement |
| 12 | Digital Handhold Temperature meter, | 0-100-200 Degree C | As per requirement |
| 13 | Vacuum cleaner | Heavy Duty/ Industrial Use | 1 or As per requirement |
| 14 | DP/UT /MPI Kit along with Level-II certified. | | As per requirement |
| 15 | ~~Rectiformer for dry out.~~ | | ~~As per requirement~~ |
| | **Tentative List of T&P** | | |
| **Sl.No.** | **Description** | **Size/Range** | **Quantity** |
| 1 | SLIDE WRENCH | 10"-12" | As per requirement |
| 2 | Square Ring Spanner | 50x50 mm | 1 or As per requirement |
| 3 | Ratchet(square drive) | 3/4" x 3/4" | 4 or As per requirement |
| 4 | Double end Open & Ring Spanner of Size | 12x13, 14x15, 18x19 | 2 set or as per Requirement |
| | | 21x23, 24x26, 30x32 | |
| | | 32x36 & 36x41 | |
| 5 | Slogging Spanner | 55 mm to 85 mm | 1 set each or As per requirement |
| 6 | SPANNER RING SLOGGING (size in mm) | 12x13, 14x15, 18x19 | 1 each or As per requirement |
| | | 21x23, 24x26, 30x32 | |
| | | 32x36 & 36x41 | |
| 7 | Heavy Duty Ring Spanner | 1-1/2", 2-3/16" | 1 each or As per requirement |
| | | 2-1/4", 2-3/4" | |
| 8 | Adjustable wrench | 10" & 12" | 1 each or As per requirement |
| 9 | Spanner for nuts of coupling bolt | 125 mm | 4 nos & As per requirement |
| 10 | TORQE WRENCH | 540-1380NM (55 - 140 Kg) | As per requirement |
| 11 | Pipe wrench | 10” and 18” and 24” | 1 each or As per requirement |
| 12 | COPPER ROD | 1/2"/1,1"/2,1.5"/1 | As per requirement |
| 13 | Box spanner set | | 2 set or As per requirement |
| 14 | Screw Driver | 10", 12" & 18" | 2 no each or As per requirement |
| 15 | Cutting Plier | 8" | 2 no each or As per requirement |
| 16 | Hammer | 2lbs, 10lbs, 16lbs | 2 no each or As per requirement |
| 17 | Calliper inside & outside | 0 to 6” & 0 to 12” | 1 each or As per requirement |
| 18 | Hexa Frame | 12" | 1 no or As per requirement |
| 19 | Mechanical & hydraulic jack | 5 Ton & 100 Ton capacity | 2 no each or As per requirement |
| 20 | Mechanical & hydraulic jack | 15, 25 & 50 Ton capacity | 4 no each or As per requirement |
| 21 | Hydraulic jack | 200 Ton Capacity | 2 no each or As per requirement |
| 22 | Ratchet Hoist | 3 Ton capacity | 4 no or As per requirement |
| 23 | Ratchet Hoist | 5 Ton capacity | 1 no or As per requirement |
| 24 | Lifting pulley | 3/5 Ton capacity | 2 No each or As per requirement |
| 25 | I-Bolts | 8''-36'' | As per requirement |
| 26 | D-Shackle | 2,5,10,15 & 40 MT | 4 no each or As per requirement |
| 27 | Slings | As per requirement | As per requirement |
| 28 | Nylon sling 3mtr & 5mtr | 2-10T | As per requirement |
| 29 | TAP and die set | M8, 10,12,14 up to 24,36 upto 42mm | As per requirement |
| 30 | Welding set ( including Portable set) | As per requirement | 2 set or As per requirement |
| 31 | Gas cutting set (CutoGen) | As per requirement | 1 set or As per requirement |
| 32 | Gouging holder set | As per requirement | 1 set or As per requirement |



| | | | |
|---|---|---|---|
| 33 | Pneumatic or battery operated wrench | Up to 2” | 1 no or As per requirement |
| 34 | Magnetic base drill machine | As per requirement | 1 no or As per requirement |
| 35 | Boring Machine | As per requirement | 1 No |
| 36 | Inside micro meter | 50 mm to 1000 mm | 2 no or As per requirement |
| 37 | Stick Micro meter | 1 Mtr. To 5 Mtr. | 1 no or As per requirement |
| 38 | Dial indicator with stand | 0 to 5 & 0 to 10mm. LC 0.01mm | 2 no & 6 no or As per requirement |
| 39 | Puller for bearing | 2” to 6” | 1 no or As per requirement |
| 40 | Outside micro meter | Various size(up to 1000 mm) | 1 no or As per requirement |
| 41 | **Outside micro meter** | **For Measurement of Shaft Journal at Various Locations** | 1 no or As per requirement |
| 42 | PITCH GAUGE | As per requirement | As per requirement |
| 43 | Depth Gauge | As per requirement | 1 no or As per requirement |
| 44 | SLIP GAUGE | As per requirement | 1 set or As per requirement |
| 45 | TELESCOPIC GAUGE | 15 to 60 mm | As per requirement |
| 46 | Vernier Calliper | 0 to 200mm, 0 to 300mm, 0 to 500 mm | 1 no each or As per requirement |
| 47 | Pneumatic Angle grinder, AG4, AG5 & AG7 | As per requirement | 1 each or As per requirement |
| 48 | Pneumatic straight grinder | 6" | 2 no or As per requirement |
| 49 | Electric disc grinder | 7" | 2 no or As per requirement |
| 50 | Electric straight grinder | 4" | 2 no or As per requirement |
| 51 | Electric flexible straight grinder | 4" | 2 no or As per requirement |
| 52 | Hot/Air Blower | Heavy Duty | 1 no or As per requirement |
| 53 | Precision level and Micro level | As per requirement | As per requirement |
| 54 | Rotor level / Master Level | 0 to 0.01 mm/meter | 1 no or As per requirement |
| 55 | Filler gauge set (Reputed make & New ) | 6" & 12" | 2 no each or As per requirement |
| 56 | OVEN Welding Rod (PORTABLE) | As per requirement | As per requirement |
| 57 | BORE GAUGE | 0- 150mm | 1 no or As per requirement |
| 58 | PLUMB WITH DORI | SMALL/2, 2.5Kg/1 | As per requirement |
| 59 | CHAIN PULLY BLOCK | 2 Ton, 3T, 5Ton | As per requirement |
| 60 | SURFACE PLATE | 300x300 | As per requirement |
| 61 | Torch LED/Dry Cell/Battery | | 2 no or As per requirement |
| 62 | Pressure testing Pump Set | WITH HOSE & GAUGE | 1 set or As per requirement |
| 63 | Pressure Gauge | 0-10Kg/sqcm | 2 no or As per requirement |
| 64 | Cabin house of 5 ton capacity (for elongation of the coupling bolts, lifting of TGB inner shell / Outer Shell / Oil Sump etc.) | As per requirement | 2 no or As per requirement |
| 65 | Nose Plier & Plier | As per requirement | 2 no or As per requirement |
| 66 | Measuring steel Scale | 6",12",24"& 48" | 1 no each or As per requirement |
| 67 | Measuring steel tape | 5, 10 & 20 Mtr. | 1 no each or As per requirement |
| 68 | Measuring steel tape | As per requirement | As per requirement |
| 69 | FF-2 Portable Grinding machine. | As per requirement | 1 no or As per requirement |
| 70 | Oxygen & DA Cylinder | As per requirement | As per requirement |
| 71 | Wooden and nylon mallets. | As per requirement | 2 no or As per requirement |
| 72 | Safety Shoe & Helmets | | To all Employees |
| Note:- | T&P Other than mentioned above but is required to complete the work of COH shall be in scope of work. | | |

**Annexure -III**

**Emergent Rehabilitation of Unit No. 6 via Replacement of Underwater Parts (excluding Generator Electrical Works) at Dehar Power House, BBMB, Slapper, Himachal Pradesh**

| | |
|---|---|
| 1 | List of Tentative **manpower** required for the job is mentioned below. Contractor has to depute sufficient skilled manpower to ensure round the clock working in three shifts as per Labour laws/codes to complete the work as per schedule. |
| 2 | Dedicated skilled teams **Specially** for GENERATOR & TURBINE MECHANICAL System in PARALLAL to be deployed for smooth restoration work Having **Supervisors, Electrician, Fitters/ Jr. Fitters** as per requirement. |
| 3 | Being **Forced shutdown** job, completion of work on time is essence of contract. In case bidder/contractor fails to deploy skilled manpower during work execution by more than 5 days then, Penalty for less/delayed deployment of manpower shall be done by BHEL. **Penalty @ Rs. 1500/person/day** shall be deducted. If any penalty is deducted by Customer same shall be deducted from RAB bills along with applicable overheads. |
| 4 | The Contractor must commit to deploy certified workers to the extent of 25% of total worker's strength. Valid certificates issued by a recognized University, technical Board, or Ministry of Government of India would only be taken cognizance |
| 5 | The following personnel shall be treated as fixed manpower and shall remain deployed at site at all times during the execution of works, irrespective of the nature and quantum of work Project Manager or Site in charge, Engineer, Foreman, Crane Operators, rigger group, Store keeper welder, electrician, Safety Engineer & Supervisors. |

| | MANPOWER DESCRIPTION | CATEGORY | NO. OF PERSONS |
|---|---|---|---|
| 1 | Site In charge/Project Manager | Site-In charge on Role of Vendor Firm (Graduate Electrical/Mechanical Engineer or Having Vast Experience in the Field of Hydro Turbine) | 1 |
| 2 | Engineer/Supervisor (Mechanical) | Experienced /Diploma Having at least 3 Years of Experience of capital Mtc. of Francis Hydro turbine **or** Executed maintenance of at least 2 No. units of Similar Unit as at DPH. | 2 |
| 3 | Engineer/Supervisor (Electrical) | Experienced /Diploma Having at least 3 Years of Experience of capital Mtc. of Francis Hydro turbine **or** Executed maintenance of at least 2 No. units of Similar Unit as at DPH. | 1 |
| 4 | Ex BBMB/ Ex BHEL/Engineer (MMD or Turbine) | Experienced (at least 5 Yrs.) | 2 |
| 5 | Ex BBMB F/M or Ex BHEL (EMD Or Generator) | Experienced (at least 5 Yrs.) | 0 |
| 6 | Safety Engineer/Supervisor | Diploma / Graduate | 2 |
| 7 | Crane Operator | Certified skilled operator | 2 |
| 8 | Fitter (Hydro Turbine/ Mechanical) | Skilled | 4 |
| 9 | Fitter (Hydro Generator) | Skilled | 2 |
| 10 | Welder | Skilled (Certified) | 2 |
| 11 | Gas cutter | Semi Skilled | 1 |
| 12 | Electrician | Skilled | 1 |
| 13 | Electrician (Generator) | Skilled | 2 |
| 14 | Grinder man | Skilled | 1 |
| 15 | Skilled labour | Semi-Skilled (4 Gen works +6 Turbine works) | 10 |
| 16 | Store Keeper | Semi-Skilled | 2 |
| 17 | Helper | Un-skilled | 20 |
| | | **Total** | **55** |