

## **Section 7. Terms of Reference**

### **Project Implementation Consultant for Golovnaya 240MW Hydropower Plant Rehabilitation Project**

#### **1. BACKGROUND**

The Open Joint Stock Company Barki Tojik (BT) is the vertically-integrated state owned electric power utility in Tajikistan. BT wishes to strengthen its generation system by rehabilitating the existing 240 MW Golovnaya Hydroelectric Facility so that it can continue to provide electricity to Tajikistan for at least the next 50 years in accordance with modern technical, operational and environmental standards.

The existing 240 MW Golovnaya Hydroelectric Power Plant, located on the Vaksh River, is to be refurbished and upgraded under two separate turnkey contracts. The first contract is for the replacement of the water-to-wire equipment for 3 of the 6 units, partial refurbishment of 2 other units, new control systems, civil and building works and environmental mitigation measures. The second contract is for the replacement of electric equipment and control systems for the 220/110/10 kV switchyard.

The Project Management Unit of the Ministry of Energy and Water Resources (PMU hereafter) wishes to engage a reputable and experienced firm (“the Implementation Consultant or IC”) to provide assistance with the procurement of contractors for the two projects and for the supervision of construction and commissioning of the Works.

The two contracts are at different stages of development:

1. Bid documents for the first contract (the Powerhouse) have been prepared by SOPI Consultants Manitoba Hydro International as sub-Consultants to Corporate Solutions Consulting under the Power Sector Development Project funded by the Asian Development Bank (ADB hereafter). The bid documents are based on a Condition Assessment Report of the existing Golovnaya Hydropower Project and Feasibility Study carried out by MHI in 2013. Prior to the commencement of services by the Implementation Consultant it is envisaged that bid documents will have been issued and tenders evaluated by PMU with assistance from MHI. The role of the IC for this contract will be to assist PMU in the award of the contract and its subsequent supervision.
2. The second contract (the Switchyard) is at an earlier stage in development. The IC will be required to carry out a detailed condition assessment prior to preparing the outline design and drafting bid documents for this contract. Thereafter the IC will be required to assist PMU with the procurement of a turnkey contractor followed by the supervision of construction.

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It is anticipated that the Powerhouse contract will start first and the Switchyard contract will follow. The two contracts will then run in parallel but one may finish earlier than the other. The current overall implementation programme is shown below, although this is subject to change.

| Activities  | Responsible Party | 2013 |    |    |    | 2014 |   |   |   |   |   |   |   |   |    |    |    | 2015 |   |   |   |   |   |   |   |   |    |    |    | 2016 |   |   |   |   |   |   |   |   |    |    |    | 2017 |    | 2018 |    | 2019 |    | 2020 |    |
|---|-------------------|------|----|----|----|------|---|---|---|---|---|---|---|---|----|----|----|------|---|---|---|---|---|---|---|---|----|----|----|------|---|---|---|---|---|---|---|---|----|----|----|------|----|------|----|------|----|------|----|
| Golovnaya 240 MW HPP Rehabilitation Project                 |                   | 9    | 10 | 11 | 12 | 1    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | H1   | H2 | H1   | H2 | H1   | H2 | H1   | H2 |
| 1. Grant Processing   |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 1.1 MoU Signing   | ADB/GoT           |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 1.2 Staff Review Meeting                                    | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 1.3 Grant Negotiations                                      | ADB / GoT         |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 1.4 Board Approval  | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 1.5 Grant Signing   | ADB / GoT         |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 1.6 Grant Effective Date                                    | ADB / GoT         |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2. Recruitment of Implementation Consultants                |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.1 Preparation of EOI, RFP, incl. Govt. Approval           | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.2 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.3 Proposal Preparation Period                             | Consultants       |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.4 Technical Proposal Evaluation incl. Govt. Approval      | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.5 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.6 Financial Proposal Opening/ Evaluation/ Govt. Approval  | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.7 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.8 Contract Signing and Effectiveness                      | GoT/Consultant    |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 2.9 Implementation Consultant Contract Execution            | Consultant        |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3. Generation Rehab. Contract Procurement                   |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.1 Preparation of Bidding Documents, incl. Govt. Approval  | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.2 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.3 1st Stage Bidding Period incl. Pre-bid Meeting          | Bidders           |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.4 1st Stage Technical Bid Evaluation incl. Govt. Approval | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.5 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.6 2nd Stage Bidding Period                                |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.7 2nd Stage Bid Opening/ Evaluation/ Govt. Approval       | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.8 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.9 Contract Signing  | BT/Bidder         |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 3.10 Contract Effectiveness                                 | BT/Contractor     |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 4. Generation Contract Execution                            |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 4.1 Condition Assessment                                    | Contractor/BT     |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 4.2 Detailed design & model testing                         | Contractor/BT     |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 4.3 Generation Rehabilitation Works                         | Contractor/BT     |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5. Switchyard Rehab. Contract Procurement                   |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.1 Preparation of Bidding Documents, incl. Govt. Approval  | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.2 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.3 Bidding Period incl. Pre-bid Meeting                    | Bidders           |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.4 Technical Bid Evaluation incl. Govt. Approval           | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.5 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.6 Financial Bid Opening/ Evaluation/ Govt. Approval       | BT/GoT            |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.7 ADB Review and Approval                                 | ADB               |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.8 Contract Signing  | BT/Bidder         |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 5.9 Contract Effectiveness                                  | BT/Contractor     |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 6. Switchyard Contract Execution                            |                   |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |
| 6.1 Switchyard Rehabilitation Works                         | Contractor/BT     |      |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |   |   |   |   |   |   |   |   |    |    |    |      |    |      |    |      |    |      |    |

Note: BT - Barki Tajik; EOI - Expression of Interest; GoT - Government of Tajikistan; MoU - Memorandum of Understanding; RFP - Request for Prop. 5 - Indicates number unit commissioned at Golovnaya HPP

## 2. OBJECTIVES OF THE ASSIGNMENT

The objectives of the assignment are the successful implementation of the two contracts through the provision of technical assistance to PMU for the procurement of contractors and implementation of the Works. Since two contracts are involved at different stages of development the Implementation Consultant procured under these Terms of Reference should be experienced in both the design and the supervision of construction of similar hydropower projects

In particular the firm will be responsible for supporting PMU in project administration, design and engineering services, contracting, management control, procurement and expediting of equipment, materials control, inspection of equipment prior to delivery, shipment, transportation, control of schedule and quality, pre-commissioning and completion, performance guarantee testing during construction and commissioning of the project and through the defects liability period.

The IC should be a consulting engineering firm having adequate international experience in detailed design, selection, monitoring, supervision and co-ordination of contractor(s), commissioning, operation and maintenance of hydropower projects. Specific experience is required in the areas of the rehabilitation of live hydropower projects. Since the work will be carried out whilst the Golovnaya Powerhouse and Switchyard are in operation, it is essential that the firm is familiar with the health, safety and commercial operational aspects of working in close proximity to live electrical equipment.

The construction contracts will comprise the following

Contract 1 (Turnkey contract):

- (i) Replacement of water-to-wire equipment (turbines, generators and controls) with new equipment for 3 of the 6 units (No. G1,2 and 5):
- (ii) Replacement of spillway comprising new double leaf gate and refurbishment of the existing hoist and spillway sectional bulkhead.
- (iii) Replacement of two generator transformers (AT-2 and T-3) with new 2 autotransformers 250 MVA 220/110/10.5kV, switchgear and station service transformers with new units and the 380V distribution with new power cables.
- (iv) New control room
- (v) Improvements to the oil containment, oil-water separators, powerhouse drainage and HVAC systems
- (vi) Civil works including demolition and reconstruction of concrete & embedded steel for the new units, grouting behind draft tube liners, repairs to hydraulic passages and gates, rehabilitation of piezometers and general repairs to concrete surfaces to improve safety.
- (vii) Provision of O&M manuals

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- (viii) Training in the operation and maintenance of the rehabilitated facilities.

Contract 2: (Turnkey contract, subject to confirmation):

- (i) 220kV Switchyard: The replacement of circuit breakers, disconnectors & grounding switches, potential & current transformers, lightning arrestors together with associated modifications to foundations, bus connections and support structures; new local control cabinets, battery system, line protection panels, control cables to plant control room (provided under the Powerhouse contract), telecommunications equipment for protection and SCADA.
- (ii) Connection of Powerhouse Block 3 Transformer to 220kV grid involving new 220kV tap line with dead end structures & breakers, disconnects & grounding switches, potential transformers, lightning arrestors, foundations, connections and supports, protection and controls and extension of earth grounding grid and fencing.
- (iii) 110kV/35kV/6kV Switchyard: The replacement of dead end breakers complete with CTs, modifications to foundations, bus connections & supports, new disconnect & grounding switches, potential and current transformers, lightning arrestors, modifications to existing control building & building services, local control cabinets, control cables to plant control room (provided under the Powerhouse contract), telecommunications equipment for protection and SCADA
- (iv) Provision of O&M manuals
- (v) Training in the operation and maintenance of the rehabilitated facilities.

### **3. SCOPE OF SERVICES AND EXPECTED DELIVERABLES**

#### **3.1 Inception Report**

Within one month from the effectiveness of his contract the Implementation Consultant (IC) will prepare and submit to PMU for approval an Inception Report detailing the services he is to provide, including the training programme for capacity building in project management that the IC will provide to PMU.

The Inception Report will also include an overall project implementation schedule covering the bidding and construction stages. The implementation schedule is to be maintained throughout the assignment and updated as required, with the necessary explanations of the reasons for any changes.

#### **3.2 Switchyard Contract: design and preparation of bid documents**

There are two switchyards at the Golovnaya facility, a 220kV switchyard on the right side of the canal and a 110kV switchyard on the left side.

Both switchyards are to be rehabilitated in a single contract which will include the replacement of equipment such as breakers and transformers, provision of new cables and

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controls, modifications to the switchyard to accommodate the rehabilitation of the Powerhouse and connection of Powerhouse Block 3 transformer to the 220kV grid.

The Implementation Consultant will carry out a detailed assessment of the condition of the switchyards and will submit a Design Report to PMU recommending the scope and setting out the proposed details of the rehabilitation. Bid documents will be prepared based upon the agreed scope.

The bid documents shall include the following:

- A design criteria document for the work to be bid including applicable standards to be used for the project as well as project specific information that the bidder must use for bid preparation and final designs;
- A description of the overall work to be accomplished under the Contract package;
- Scope of the works;
- Performance designs for the works, building on the proposals following the condition assessment;
- Sufficient drawings and schematics for bid preparation;
- Appropriate specifications related to the standards of the design criteria;
- Bidder Qualifications forms;
- Bid Forms;
- Suggested required bonds and bid arrangements;
- Suggested selection criteria for bid evaluation.

These documents and others identified by the IC shall be prepared in accordance with ADB bid standards and guidance.

### **3.3 Assistance with selection of the Switchyard Contractor**

The IC will assist PMU with the selection of competent contractors to bid for the Switchyard contract, in accordance with ADB procurement procedures, and will assist with the issue of bid documents to the selected bidders.

Assistance will be given during the bidding period in managing a pre-bid conference (if required) or contractors' site visits, in the receiving and answering of questions raised by bidders during the tender period and the issue of any amendments to the bid documents that are required.

The IC will review all competitive bids as determined by PMU and evaluate each for compliance with the tender design and specifications. A report on the bid review shall be provided to PMU and ADB, presenting the findings and opinions of the IC of:

- The qualifications of the bidding team;
- Completeness of the bid;
- Compliance of the bid with performance requirements;
- Compliance of the bid with technical specifications;
- Assessment of quality of the proposed supply;

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- Compliance of the bid with schedule requirements;
  - Impact of proposed contract exceptions to the bid;
  - Omissions or inconsistencies of the bid.

The report shall include a recommendation for selection based on measurable criteria for evaluating bidders. The draft report shall be submitted within 30 days of receipt of the bids.

### **3.4 Assistance with award of Powerhouse and Switchyard Contracts**

As described earlier in these ToR, the selection of the Powerhouse contractor will be carried out by others whereas the selection of the Switchyard contractor will be assisted by IC.

The IC will assist PMU with the award of both contracts - the Powerhouse contract (following selection of the contractor by others) and the Switchyard contract. This assistance will include the following:

- Negotiations with the preferred bidders in accordance with ADB procurement procedures;
- Notifications of award to the successful and unsuccessful bidders;
- Formalities associated with award of contract;
- Reviewing advance payment and performance bonds and release of bid bonds;
- Reviewing contractors' insurances;
- Reviewing contractors' construction programme submitted in accordance with the contract and preparing an overall project implementation schedule covering both contracts.

### **3.4 Support to PMU during construction**

#### **3.4.1 Project Management System**

Before the commencement of the construction stage the IC shall establish a computerised project management system to maintain records and coordinate the registration, handling and filing of correspondence, construction drawing data base, progress monitoring, cost control, and reporting.

The IC shall establish procedures and methods of reporting and control system to confirm that every work item being performed by the contractors shall fully comply with specifications.

#### **3.4.2 Review and approval of drawings and designs.**

The IC shall review and approve drawings and design documents produced by the contractors.

For the civil works, they consist of:

- Detailed designs of the permanent works,
- Shop drawings,
- Operation and maintenance manual for any plant and equipment incorporated in the permanent works,

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- Documents showing construction method, specifications, data on materials and construction machines furnished,
  - As-built drawings of the permanent works and
  - Other drawings and their support documents prepared by the contractor in accordance with the contract of the said packages.

For the equipment and switchyard, they consist of:

- Manufacturing drawings and design calculations,
- Shop drawings (for work drawings),
- Documents showing construction method, specifications, data on materials and construction machines furnished,
- Operation and maintenance manual,
- As-built drawings,
- Other drawings and their support documents prepared by the contractor in accordance with the contract of the said packages.

### **3.4.3 Supervision, management and monitoring of construction process.**

The IC shall:

- Review and approve the contractors' temporary works, facilities and equipment.
- Review and approve the Contractors' construction methods.
- Taking any action under a civil works contract designating the Consultant as "Engineer", for which action, pursuant to such civil works contract, the written approval of the Client as "Employer" is required."
- Supervise and inspect all construction activities of the contractors so as to ensure compliance with the approved drawings, documents and specifications, and ensure that they are within schedule.
- Regularly review manufacturing schedules and delivery schedules of equipment by the contractor.
- Monitor manufacturing progress and works by regular inspections to ensure the compliance to specifications and specified standards.
- In line with the work programs of the contractors, prepare and advise PMU on the outage planning of existing facilities during implementation.
- Ensure that the contractor's Environmental Management and Monitoring Plans (CEMMPs) for the Contracts 1 and 2 are submitted for their approval at least 10 days before taking possession of any work site. No access to the site will be allowed until the relevant CEMP is approved by the PMU;
- Liaise with BT to coordinate safety measures between live components in operation and components under construction. Give advice and when required training to BT on safety planning and safety measures.

Consultants shall spend minimum 70% of their time on the project site i.e. Golovnaya HPP while Dushanbe office will mainly act as administrative support.

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#### **3.4.4 Witness and approval of equipment testing and commissioning.**

The IC shall:

- Review and approve factory testing procedures and factory test results submitted by the contractor.
- Witness factory testing of major equipment and issue corresponding certificates.
- Review factory test inspection reports and certificates submitted by the contractor.
- Review and approve commissioning test procedures submitted by the contractor for gates, valves, electro-mechanical equipment such as hydraulic turbines, generators etc. for both dry and wet tests.
- When the works are ready for inspection and test for substantial completion,
  - Prepare a program for inspection and test,
  - Examine the works and assure that they are ready for operation, and
  - Issue taking-over certificates to the contractors, if the works are satisfactory for operation or instruct the contractors' remedial works and/or further test if they failed the verification test.
- Supervise O&M training provided by the contractors.

#### **3.4.5 Cost control**

The IC shall:

- Certify the payments to the contractors, after checking and verifying the contractor's measurements
- Report regularly financial status of the project to PMU by
  - Reporting the disbursement result and financial position.
  - Actual cash flow position.
  - Performing detail variation analysis between estimated / budgeted position compared with the actual position.
  - Assessing future requirements and payment schedules.
  - Recommending possible measures for reducing expenditure, if any.
- Investigate, inspect and assess requirements from the contractors for extension of time, additional works, payment for additional works, etc.
- Review claims along with its supporting data, evaluate reports on the claim and assist PMU in settling the claims or disputes (if any).

#### **3.4.6 Training**

The IC shall:

- Plan and execute capacity building measures (classroom lectures and on-the-job training) to enhance PMU's capacity in project management. Details of capacity building programs should be included in the inception report.
- Review and approve operating and maintenance training proposals submitted by the contractors and ensure that the training is fit for purpose.

#### **3.4.7 Downstream Work**

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No downstream Work is envisaged

#### 4. TEAM COMPOSITION & QUALIFICATION REQUIREMENTS FOR KEY EXPERTS

The following table gives an estimate of the International and National Key Experts and person months required for the project.

|  | Positions  | Key Experts (International) |               |            | Key Experts (National) |                |            |
|--|--|-----------------------------|---------------|------------|------------------------|----------------|------------|
|  |  | P-M per expert              | No. of expert | Total P-M  | P-M per expert         | No. of expert  | Total P-M  |
| 1  | Team Leader-Powerhouse Rehabilitation Specialist | 21                          | 1             | 21         | 58                     | 1 <sup>a</sup> | 58         |
| 2  | Resident Site Manager (Powerhouse Specialist)    | 61                          | 1             | 61         | 84                     | 1 <sup>b</sup> | 84         |
| 3  | Electrical Engineer - Powerhouse                 | 13                          | 1             | 13         | 58                     | 1              | 58         |
| 4  | Electrical Engineer - Switchyard                 | 12                          | 1             | 12         |                        | 1              | 0          |
| 5  | Mechanical Engineer                              | 15                          | 1             | 15         | 58                     | 1              | 58         |
| 6  | Civil Engineer                                   | 15                          | 1             | 15         | 58                     | 1              | 58         |
| 7  | Control & Protection Engineer                    | 1                           | 1             | 1          | 8                      | 1              | 8          |
| 8  | Hydro-mechanical Engineer (Gates)                | 5                           | 1             | 5          | 58                     | 1              | 58         |
| 9  | Commissioning Engineer                           | 1                           | 1             | 1          | 2                      | 1              | 2          |
| 10   | SCADA Engineer                                   | 1                           | 1             | 1          | 2                      | 1              | 2          |
| 11   | Environmental Engineer                           | 3                           | 1             | 3          | 8                      | 1              | 8          |
| 12   | Procurement Specialist                           | 3                           | 1             | 3          | 8                      | 1              | 8          |
|  | <b>Subtotal</b>                                  | <b>151</b>                  | <b>12</b>     | <b>151</b> | <b>402</b>             | <b>12</b>      | <b>402</b> |
| <sup>a</sup> Deputy Team Leader/Powerhouse Rehabilitation Specialist |  |                             |               |            |                        |                |            |
| <sup>b</sup> Resident/Deputy Site Manager                            |  |                             |               |            |                        |                |            |

The IC team will comprise a resident site team and visiting specialists. It is preferable that the international Team Leader, Resident Site Manager and visiting specialists should be drawn from the permanent staff of the IC.

The terms of reference outlining the qualifications and specific areas of responsibility/job description for each expert are given below. In addition, the experts are expected to perform any other reasonable duty that may not be mentioned in the job description, but is expected to be performed in an assignment of this nature.

##### Key Experts (International):

##### Team Leader /Powerhouse Rehabilitation Specialist (21 person months)

The Team Leader will have a university degree in electrical, mechanical or civil engineering from a reputable university. The expert shall have at least 20 years post graduate experience in the design and construction supervision of hydropower plants, at least 5 years of which should have involved supervision at a senior level of the refurbishment of a hydropower plant of similar capacity to the Golovnaya plant. The expert should have wide experience in the mechanical, electrical and civil engineering aspects of similar projects as well as a comprehensive understanding of the operational significance of the rehabilitation process. The expert should be aware of the issues relating to the health and safety of personnel working in close proximity to operating plant.

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The Team Leader will be the primary interface between the IC and the Employer (PMU/BT). The expert will either act as the Project Manager under the contracts between BT and the turnkey contractor or the expert will be assigned delegated powers if the Employer retains the role of Project Manager. The expert will be directly responsible to PMU for the performance of the IC and will manage the support which is provided by the resident and visiting teams.

In particular the Team Leader will be responsible for the following:

- Start-up operations. This will involve initially working from PMU office in Dushanbe until a suitable office is provided by the Powerhouse contractor on site.
- Liaison with PMU throughout the assignment.
- Managing the design and preparation of bid documents for the Switchyard contract including liaison with BT.
- Assisting PMU with the tendering, evaluation of bids and award of the Switchyard contract
- Assisting PMU with the award of the Powerhouse Rehabilitation Contract
- Overseeing implementation of both contracts in accordance with the Scope of Services described earlier in these Terms of Reference. Detailed supervision will be carried out by the Resident Site Manager and team, acting under the Team Leader's management.

**Resident Site Manager –(Powerhouse Specialist) (61 person months)**

The Resident Site Manager will have a university degree in electrical, mechanical or civil engineering from a reputable university. The expert shall have at least 15 years post graduate experience in the design and construction supervision of hydropower plants, at least 3 years of which should have involved supervision of the refurbishment of a hydropower plant of similar capacity to the Golovnaya plant. The expert should have wide experience in the mechanical, electrical and civil engineering aspects of similar projects as well as a comprehensive understanding of the operational significance of the rehabilitation process. The expert should be aware of the issues relating to the health and safety of personnel working in close proximity to operating plant.

Since the expert will have a long term presence on site the Resident Site Manager will be the main interface between the IC and the Employer (PMU/BT) whilst the Team Leader is not in Tajikistan. The expert may be assigned delegated powers to act as the Project Manager if agreed between IC and PMU/BT. The expert will manage the site support which is provided by the resident and visiting teams.

In particular the Resident Site Manager will be responsible to the Team Leader for:

- Carrying out detailed site supervision by the expert and team, acting under the Team Leader's overall management.
- Issuing instructions to the contractors during the contract periods, approve payments, issue variation orders, prepare and submit reports as defined above.
- Witnessing Tests on commissioning and issuing the Operational Acceptance

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Certificates.

- Providing support to PMU during the Defect Liability Period and issue the Completion Certificate.
- Designing and delivering the IC's capacity building programme for PMU staff with support from other visiting specialists such as the Contracts specialist
- Ensuring that the contractors provide adequate training to the Employer's personnel under their contract
- Ensuring safety in the workplace.

The following specialist staff, based in the IC's home office, will be available for consultation by the resident team and will make site visits at key stages of the project.

**Electrical Engineer – Powerhouse (13 person months)**

The Electrical Engineer (Powerhouse) will have a university degree in electrical engineering from a reputable university. The expert should have at least 15 years post graduate experience in the design, installation, testing and commissioning of powerhouse electrical equipment. The expert will make regular visits at key stages in the contract to ensure the quality of the work. The expert will review the designs prepared by the turnkey contractor and support the national Electrical Site Engineer with advice on technical issues both from home office and during site visit. The expert will witness manufacture and factory testing of equipment.

**Electrical Engineer – Switchyard (12 person months)**

The Electrical Engineer (Switchyard) will have a university degree in electrical engineering from a reputable university. The expert should have at least 15 years post graduate experience in the design, installation, testing and commissioning of switchyard electrical equipment. The expert will be responsible to the Team Leader for the condition assessment, outline design and preparation of bidding documents for the refurbishment of the switchyard. The expert will provide assistance to the Team Leader and PMU in the procurement of the turnkey contractor. Thereafter the expert will review the designs submitted by the turnkey contractor, make regular visits to site at key stages and will support the national Electrical Site Engineer with advice on technical issues both from home office and during site visits. The expert will witness manufacture and factory testing of equipment.

**Mechanical Engineer (15 person months)**

The Mechanical Engineer will have a university degree in mechanical engineering from a reputable university. The expert should have at least 15 years post graduate experience in the design, installation, testing and commissioning of turbines and other mechanical equipment. The expert will review the designs submitted by the turnkey contractor, support the Team Leader and the visiting Electrical Engineer with advice on mechanical aspects of the switchyard bid documents and will make regular visits to site at key stages of the Powerhouse contract. The expert will support the national Mechanical Site Engineer on technical issues both from home office and during site visits. The expert will witness manufacture and factory testing of equipment.

**Civil Engineer (15 person months)**

The Civil Engineer will have a university degree in civil engineering from a reputable

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university. The expert should have at least 15 years post graduate experience in the rehabilitation of dams and powerhouses, including the associated buildings. The expert will assist the Team Leader, the Resident Site Manager and the national resident Civil Engineer to manage the civil engineering and building aspects of the project through visits and home office support.

**Control & Protection Engineer (1 person month)**

The Control & Protection Engineer will have a university degree in electrical or electronic engineering from a reputable university. The expert should have at least 15 years post graduate experience in the design, installation, testing and commissioning of powerhouse control & protection systems. The expert will review the C&P designs submitted by the turnkey contractor, support the Team Leader and the national Electrical Site Engineer with advice on technical issues both from his home office and during site visits at key stages. The expert will witness manufacture and factory testing (if required) as well as the installation, testing and commissioning of the control & protection equipment.

**Hydro-mechanical Engineer – Gates (5 person months)**

The Hydro-mechanical Engineer (Gates) will have a university degree in civil, mechanical or structural engineering from a reputable university. The expert should have at least 15 years post graduate experience in the design, installation, testing and commissioning of hydraulic gates. The expert will review the gate designs submitted by the turnkey contractor, make visits to site at key stages and will support the Team Leader and the Civil, Mechanical and Electrical Site Engineers with advice on technical issues relating to the rehabilitation of the hydraulic gates both from his home office and during site visits. The expert will witness manufacture and factory testing (if required) as well as the installation, testing and commissioning of the rehabilitated spillway gate.

**Commissioning Engineer (1 person month)**

The Commissioning Engineer will have a university degree in mechanical or electrical engineering from a reputable university. The expert should have at least 15 years post graduate experience in the commissioning of turbines, generators and other mechanical equipment. The expert will attend the commissioning of the first set and establish procedures for the commissioning of subsequent sets.

**SCADA Engineer (1 person month)**

The SCADA Engineer will have a university degree in electrical or electronic engineering from a reputable university. The expert should have at least 15 years post graduate experience in the design, installation, testing and commissioning of SCADA systems. The expert will review the turnkey design proposals of the Switchyard and Powerhouse turnkey contractors.

**Environmental Engineer (3 person months)**

The Environmental Specialist will have a university degree in environmental sciences or environmental engineering from a reputable university. The expert should have at least 10 years post graduate experience in supervising environmental and occupational safety aspects and monitoring environmental impacts caused by hydropower construction contracts. The expert will provide support and guidance to the national resident Environmental Specialist to

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ensure that the IC Team responds appropriately to the environmental issues, including the review and approval of the turnkey contractors' Environmental Management and Monitoring Plans, and the monitoring of the contractors' compliance with the approved plans. The expert will be responsible for organization of trainings on environmental and occupational health issues for contractors and PMU staff.

**Procurement Specialist (3 person months)**

The Procurement Specialist will have a university degree in engineering or law from a reputable university. The expert should have at least 15 years post graduate experience in the administration of multi-laterally funded contracts, particularly those funded by Asian Development Bank. The expert will work with the Electrical Engineer (Switchyard) to prepare the Switchyard bid documents and assist the Team Leader and Resident Site Manager to administer the two contracts and to provide the necessary reports that PMU are required to submit to ADB. The expert will be available to assist the Team Leader in respect of any claims for contract variations that are submitted by the turnkey contractors.

**Key Experts (National):**

**Deputy Team Leader /Powerhouse Rehabilitation Specialist (58 person months)**

The Deputy Team Leader / Powerhouse Rehabilitation Specialist will be a graduate engineer with at least 10 years post-graduate experience in the design, construction and operation of hydroelectric projects.

The Deputy Team Leader / Powerhouse Rehabilitation Specialist will assist the International Team Leader with the management of the project especially in respect of liaison with PMU and BT and coordination of the inputs of the other national members of the IC team.

**Resident / Deputy Site Manager (84 person months)**

The Resident / Deputy Site Manager will be a graduate engineer with at least 10 years post-graduate experience in the design, construction and operation of hydroelectric projects.

The Resident / Deputy Site Manager will assist the International Resident Site Manager with the management of the project especially in respect of detailed supervision of the work and the maintenance of records.

**Electrical Engineer (58 person months)**

The Electrical Engineer will be a graduate electrical engineer with at least 5 years post-graduate experience in the design, construction and operation of hydroelectric projects.

The Electrical Engineer will assist the International and National Site Managers and the visiting International Electrical Engineer to cover the supervision of the electrical works carried out both in the Powerhouse and the Switchyard.

**Mechanical Engineer (58 person months)**

The Mechanical Engineer will be a graduate electrical engineer with at least 5 years post-graduate experience in the design, construction and operation of hydroelectric projects.

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The Mechanical Engineer will assist the International and National Site Managers and the visiting International Mechanical Engineer to cover the supervision of the mechanical works carried out in the Powerhouse.

**Civil Engineer (58 person months)**

The Civil Engineer will be a graduate civil engineer with at least 5 years post-graduate experience in the design, construction and operation of hydroelectric projects.

The Civil Engineer will assist the International and National Site Managers to cover the supervision of the civil and building electrical works carried out in the Powerhouse and the Switchyard, with guidance and assistance as necessary from the visiting International Civil Engineer.

**Control & Protection Engineer (8 person months)**

The Control & Protection Engineer will have a university degree in electrical or electronic engineering with at least 5 years post-graduate experience. The expert will assist the Team Leaders, the Site Managers and the visiting international C&P Engineer and Electrical Engineer to review the C&P designs submitted by the turnkey contractor and supervise the installation, testing and commissioning of the control & protection equipment.

**Hydro-mechanical Engineer – Gates (58 person months)**

The Hydro-mechanical Engineer (Gates) will have a university degree in civil, mechanical or structural engineering with at least 5 years post graduate experience. The expert will witness manufacture and factory testing (if required) as well as the installation, testing and commissioning of the rehabilitated spillway gate.

**Commissioning Engineer (2 person months)**

The Commissioning Engineer will have a university degree in mechanical or electrical engineering with at least 5 years post graduate experience in the commissioning of equipment. The expert will assist in the commissioning of the equipment.

**SCADA Engineer (2 person months)**

The SCADA Engineer will have a university degree in electrical or electronic engineering from a reputable university with at least 5 years post graduate experience. The expert will assist the international SCADA Engineer.

**Environmental Engineer (8 person months)**

The Environmental Engineer will be a graduate environmental scientist with at least 10 years post-graduate experience in the environmental management of construction projects.

The Environmental Engineer will assist the International Team Leader to supervise and monitor implementation of the Environmental Management Plans with guidance and assistance as necessary from the visiting International Environmental Specialist.

**Procurement Specialist (8 person months)**

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The Procurement Specialist will have a university degree in engineering or law from a reputable university. The expert shall have at least 10 years post graduate experience in the administration of multi-laterally funded contracts, particularly those funded by Asian Development Bank. The expert will work with the Team Leaders, Site Managers and the International Procurement specialist to administer the two contracts and to provide the necessary reports that PMU are required to submit to ADB.

## **5. REPORTING REQUIREMENTS AND TIME SCHEDULE FOR DELIVERABLES**

### **5.1 Reporting**

The IC shall:

- Monitor BT compliance with the grant agreement covenant and assist PMU to prepare and submit reports to ADB; track project outputs, outcomes and impacts against ADB's Design Monitoring Framework.
- Prepare monthly progress reports, quarterly reports, project completion report, and other reports deemed necessary by BT and/or ADB.
- Maintain records of construction activities, which will be eventually needed to prepare completion report, operation/maintenance manuals and as-built drawings. They shall include records of:
  - Investigation and monitoring,
  - Drawings,
  - The consultant's activities,
  - The Contractor's activities,
  - Payments,
  - Quality control,
  - Progress of works,
  - Safety control,
  - Notable events and
  - Others as required.
- Provide the following Reports:
  - Inception Report, to be submitted one month after contract effectiveness as defined above.
  - Switchyard Design Report, including detailed condition assessment, recommended scope and proposed outline design of the refurbishment.
  - Monthly progress reports, to be submitted within two weeks from the end of the month that is being reported.
  - Quarterly progress report, to be prepared and submitted within one month from the end of the quarter that is being reported. The format of the progress reports shall be drafted by the consultant and endorsed by PMU and ADB, and they should include, but not limited to, physical progress against schedule and plan for next term, disbursement against schedule and plan for next term, quality test results, safety control, survey of quantity when required, environmental monitoring and any other issues to be raised. Quarterly progress reports shall

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- be in a format consistent with ADB's project performance reporting system.
- Annual reports, to be submitted within one month from the end of the year that is being reported. Variation orders and any other documents deemed necessary by PMU and/or ADB will be prepared. Consolidated annual reports will include (a) progress achieved by output as measured through the indicator's performance targets, (b) key implementation issues and solutions, (c) updated procurement plan and (d) updated implementation plan for next 12 months;
  - Semi-annual Environmental Monitoring Reports;
  - A Completion Report in a form acceptable to PMU, BT and ADB, to be submitted within one month after project completion.
  - Other reports, as described in these ToR (such as tender evaluation reports and technical reports) are to be submitted at the appropriate times in accordance with the agreements reached with PMU.

All reports are to be submitted in draft for review and approval by PMU and ADB, following which the final version is to be submitted after revision, if required.

The Consultant will report in English and in Russian languages in both electronic and hard copy. Five (5) hard copies will be provided in each language of the Inception, Switchyard Design, Monthly, Quarterly, Annual, Semi-annual Environmental Monitoring and other Reports. Seven (7) hard copies in English and 20 hard copies in the Russian language will be provided for the Completion Report,

## **6. CLIENT'S INPUT AND COUNTERPART PERSONNEL**

### **6.1 Accommodation for the Consultant's personnel**

Prior to the start of construction work on site the Client will provide furnished accommodation for the Consultant's personnel in Dushanbe. Furnished accommodation for the Consultant's personnel on site will be provided by the Powerhouse turnkey contractor as a part of his contract. The Consultant is to specify his requirements in his Proposal.

### **6.2 Office Equipment and office maintenance**

The Consultant is to provide and maintain the office equipment that he requires both in Dushanbe and on site. A Provisional Sum is available for the procurement of the equipment and the cost of maintenance of the office and the office equipment is to be included as an expense item.

### **6.3 Office Operations**

The Consultant is to allow for miscellaneous administrative and support requirements in his proposal and detail the same in his proposal. The costs will be covered under an expense item.

### **6.4 Counterpart Personnel**

No counterpart personnel will be provided to the Consultant by the Client and the Consultant is to make provision for all staff resources that he shall require in his proposal.

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## **7. DATA TO BE PROVIDED BY THE CLIENT**

The Client will provide bidders with a copy of the Feasibility Study prepared by the SOPI Consultant. It should be noted that changes to the scope of the contract were made subsequent to the issue of the Feasibility Study in August 2013.