

## **REQUEST FOR EXPRESSIONS OF INTEREST**

**TENDER TITLE: RECRUITMENT OF A CONSULTANCY FIRM TO PROVIDE TECHNICAL SERVICES FOR AUTOMATIC VOLTAGE REGULATION, GENERATOR EXCITATION AND AIR GAP & VIBRATION MONITORING SYSTEMS AT NYABARONGO HYDRO POWER PLANT**

**TENDER REFERENCE NO: 11.07.22/C/205/REOI/2020-2021/PROC-DGEN-EUCL/MD/AZ/28**

### **1. Introduction and Background To The Assignment**

NYABARONGO Power Station is a hydropower plant in Rwanda, completed in October 2014, with a commissioning date in November 2014. The installed capacity is 28 MW. The project involves a dam, with run of river design, across the River MWOGO, one of the tributaries of NYABARONGO River, Both the units were synchronized to the Rwandan grid on 27 October 2014 and 30 October 2014. The power station was completed and handed over by consortium to client on 28 November 2014. Unit number one of NYABARONGO hydro power plant shows abnormal response to the grid dynamic behavior. AVR unexpectedly changes from auto mode to manual mode and unit not able to follow grid voltage and frequency to control the reactive power and load. In addition to the AVR miss-function described above, the vibration and Air gap monitoring system also doesn't work where HMIs do not display any information. Intervention by client's operation and maintenance personnel could not completely solve these problems. EUCL wishes to recruit a consultancy firm to provide technical expertise in automation and control system of AVR, vibration and Air gap monitoring system on both units is required to ensure smooth, safe and reliable operations of the power plant.

### **2. Objective**

The desired /selected consultancy shall provide different qualified technical experts (the "Personnel") for the provision of technical services in respect of excitation system and Automatic Voltage Regulator system as well as on vibration and Air gap monitoring systems at NYABARONGO Hydro Power plant in accordance with Contract that shall be signed by parties.

### **3. Competencies and qualification of service provider's experts**

The minimum professional and technical standards required for experts to be proposed by interested consultancy firms are:

#### **3.1 AUTOMATIC VOLTAGE REGULATION (AVR)**

##### **3.1.1 Academic Qualifications:**

- The desired technical expert must have at least a bachelor degree in electrical, control and automation or related field. Higher academic qualifications will be an added advantage

##### **3.1.2 Work Experience:**

- The desired technical expert must have a minimum of at least 5 years of general experience in power plant commissioning and operation. More years of experience will be an added advantage.
- The desired technical expert must have a minimum of at least 3 years of specific experience in AVR VXB32D and BESTCOMS SOFTWARE DECS 300, type installed at NYABARONGO I HPP or similar version to be justified by certificate of good completion and service delivery

## **3.2 VIBRATION AND AIR GAP MONITORING SYSTEM**

### **3.2.1 Academic Qualifications:**

- The desired technical expert must have at least a bachelor degree in electrical, control and automation or related field. Higher academic qualifications will be an added advantage

### **3.2.2 Work Experience:**

- The desired technical expert must have a minimum of at least 5 years of general experience in power plant commissioning and operation. More years of experience will be an added advantage.
- The desired technical expert must have a minimum of at least 3 years of specific experience in Vibration and Air gap monitoring system and PMS -100 Monitoring System, type installed at Nyabarongo I HPP or similar version to be justified by certificate of good completion and service delivery.

### **N.B.:**

- Curriculums Vitae (CVs) shall be detailed, updated, and initialed and signed by the consultant experts.
- Only Consultancy firms that meet the required minimum academic qualifications and work experience will be shortlisted and given Request For Proposals (RFP)

The selection will be based on the detailed Terms of Reference (TOR) for this assignment with specific objectives, scope of the assignments, Key deliverables, Timing, Competence and Qualifications and other requirements. These are available at [www.reg.rw](http://www.reg.rw) and DG market website: [www.dgmarket.com](http://www.dgmarket.com). The selection of consultants will be done in accordance with the REG procurement manual, through the Quality Cost Based Selection method.

## **4. Application and Submission**

Interested and suitably qualified firms should submit their Expression of Interest including CVs and a motivation letter highlighting how they meet the requirements detailed in the TOR. All applications shall be submitted to the Secretariat of the Procurement Management Unit of REG/EUCL and should be addressed to:

**Managing Director**

**Energy Utility Corporation Limited (EUCL),**

**KN82 ST 3, NYARUGENGE, 1<sup>st</sup> Floor – Room G114 (Procurement Secretariat)**

**P.O Box 5634 Kigali, Rwanda**

Electronic applications will also be accepted and may be sent through: [onizeyimana@reg.rw](mailto:onizeyimana@reg.rw) copy to [gyemukama@eucl.reg.rw](mailto:gyemukama@eucl.reg.rw) and [procurement-eucl@eucl.reg.rw](mailto:procurement-eucl@eucl.reg.rw).

The outer cover for envelopes shall be clearly marked: **REQUEST FOR EXPRESSION OF INTEREST (REOI) RECRUITMENT OF SPECIALIZED FIRM TO PROVIDE TECHNICAL SERVICES AT NYABARONGO AUTOMATIC VOLTAGE REGULATION, GENERATOR EXCITATION AND AIR GAP & VIBRATION MONITORING SYSTEMS.**

The deadline for submission of expression of interest will be on **15<sup>th</sup> March, 2021 at 10H30 Kigali time.**

Further information can be obtained via email addresses mentioned above during office hours i.e. from 07H00 hours to 17H00 on all working days.

Done at Kigali, on **19 /02/ 2021.**

**Gerald YEMUKAMA**  
**Ag. Head Procurement Management**

**Armand ZINGIRO**  
**Managing Director**

## TERMS OF REFERENCE

### **RECRUITMENT OF A CONSULTANCY FIRM TO PROVIDE TECHNICAL SERVICES FOR AUTOMATIC VOLTAGE REGULATION, GENERATOR EXCITATION AND AIR GAP & VIBRATION MONITORING SYSTEMS AT NYABARONGO HYDRO POWER PLANT**

#### **1. INTRODUCTION AND BACKGROUND TO THE ASSIGNMENT**

NYABARONGO Power Station is a hydropower plant in Rwanda, completed in October 2014, with a commissioning date in November 2014. The installed capacity is 28 MW. The project involves a dam, with run of river design, across the River MWOGO, one of the tributaries of NYABARONGO River, Both the units were synchronized to the Rwandan grid on 27 October 2014 and 30 October 2014. The power station was completed and handed over by consortium to client on 28 November 2014. Unit number one of NYABARONGO hydro power plant shows abnormal response to the grid dynamic behavior. AVR unexpectedly changes from auto mode to manual mode and unit not able to follow grid voltage and frequency to control the reactive power and load. In addition to the AVR miss-function described above, the vibration and Air gap monitoring system also doesn't work where HMIs do not display any information. Intervention by client's operation and maintenance personnel could not completely solve these problems. EUCL wishes to recruit a consultancy firm to provide technical expertise in automation and control system of AVR, vibration and Air gap monitoring system on both units is required to ensure smooth, safe and reliable operations of the power plant.

#### **2. OBJECTIVE**

The desired /selected consultancy shall provide different qualified technical experts (the "Personnel") for the provision of technical services in respect of excitation system and Automatic Voltage Regulator system as well as on vibration and Air gap monitoring systems at NYABARONGO Hydro Power plant in accordance with Contract that shall be signed by parties

#### **3. SCOPE OF THE ASSIGNMENT, DUTIES AND RESPONSIBILITIES OF CONSULTANT FIRM**

The scope of work to be done by selected consultant firm will be to mobilize technical experts to stabilize automatic voltage regulation, generator excitation and air gap & vibration monitoring systems at NYABARONGO hydro power plant

##### **3.1. AUTOMATIC VOLTAGE REGULATOR:**

- Perform a visual inspection of AVR control system
- Analyze the status and behavior of AVR control system
- Review of operational data and analyze the response of machine under different operating conditions (startup, synchronization, and continuous running)
- Carry out necessary tests to determine the cause of abnormal behavior of machine
- Define necessary modifications, maintenance, adjustment to be carried out on AVR, its ancillaries and control system (both software and hardware parts)
- Provide maintenance supervision and technical guidance to the client's technical team to ensure necessary maintenance activities (Changing system setting, Sending and receiving setting, System

configuration, setting adjustment, analysis, protection and uploading files, data logging & event reporting and Bestwave software), if required are carried out in safety manner and in accordance with the standards to ensure stable operations of the machines

- Supervise the testing and restarting of the system to check improvement in operation
- Conduct short site training to EUCL staff on AVR VXB32D, DECS 300, BESTCOMS SOFTWARE DECS 300.
- If necessary and reasonably appropriate propose required spare parts to be purchased by the client and required upgrades.

The scope also include provide of on-site training on operation and maintenance of AUTOMATIC VOLTAGE REGURATOR (AVR) type VXB32D and its excitation system of generating set at NYABARONGO I hydro power plant.

### **3.2. VIBRATION AND AIR GAP MONITORING SYSTEM**

The scope of work for vibration and air gap monitoring, covers support in maintenance of PMS-100 monitoring system at NYABARONGO I hydro power plant.

The expert deployed to this part of assignment with aim to stabilize the operation of the machine will:

- Perform a visual inspection of Vibration and Air gap monitoring system
- Analyze the status and behavior of Vibration and Air gap monitoring system
- Review of operational data and analyze the response of machine under different operating conditions (startup, synchronization, and continuous running)
- Carry out necessary tests to determine the cause of abnormal behavior of PMS-100 monitoring system
- Activate the software required to run the monitoring and vibration on two machines of NYABARONGO hydro power plant
- Define necessary modifications, maintenance, adjustment to be carried out on PMS-100 monitoring system, its ancillaries and control system (both software and hardware parts)
- Provide maintenance supervision and technical guidance to the client's technical team to ensure necessary maintenance activities (Changing system setting, Sending and receiving setting, System configuration, setting adjustment, analysis, protection and uploading files, data logging & event reporting and profisignal V3.1 Software), if required are carried out in safety manner and in accordance with the standards to ensure stable operations of the machines
- Supervise the testing and restarting of the system to check improvement in operation
- Conduct short site training to EUCL staff on Vibration and Air gap monitoring system with its Profisignal Clicks Software.
- If necessary and reasonably appropriate propose required spare parts to be purchased by the client and required upgrades.

Under this advisory assignment, the consultant firm will be responsible of:

- Mobilizing of at least two experts
- Prepare inspection schedule and manpower deployment chart
- Hold opening meeting with customer representative
- Carry out safety induction and job safety analysis
- Issuance of on job training certificates to participants who successful passed the training
- Payment of travel cost, insurance and other expenses in contractor's country

#### **4. DURATION OF THE ASSIGNMENT**

The duration of the assignment is estimated at 10 working days at a rate of 8 hours a day.

#### **5. DETAIL OUTPUTS (KEY DELIVERABLES TO BE ACCOMPLISHED)**

The service provider will provide a technical report with detailed information on:

- Cause of abnormal behavior of the machine and the two subsystems
- Activities (tests, repairs, adjustment etc.) completed at the power plant.
- Maintenance activities (if any) to be done in future to ensure stable operation of the machine and requirement related thereto.
  
- Training materials and covered subject. The hand on should at least cover the following:
  - **AUTOMATIC VOLTAGE REGULATOR**
    - I. Introduction on DECS-300 voltage regulator
    - II. Fundamentals
      - Generator Fundamentals
      - Voltage Regulator Fundamentals
    - III. DECS-300 Features
      - Basic Block diagram
      - Control Modes
        - a. AVR
        - b. FCR
        - c. VAR
        - d. FF
      - PID groups
      - Pre-position
      - Soft start
      - Limiters
      - Sensing Types
      - Sensing inputs
      - Auto-Tracking
      - Protection Functions
      - Metering
      - Data Logging
      - Droop Compensation
      - Communications

- Contact Inputs

#### IV. Limiters and Protection

- Over excitation Limiter (OEL)
  - a. On-Line
  - b. Off-Line
- Under excitation Limiter
- Under frequency Limiter
  - a. UF Limiting
  - b. V/Hz Limiting
- Stator Current Limiter
- Protective Functions
  - a. Field Overvoltage
  - b. Field Overcurrent
  - c. Field Overtemperature
  - d. Generator Undervoltage
  - e. Generator Overvoltage
  - f. Loss of Sensing
  - g. System Below 10 Hz
  - h. Soft Start
  - i. Loss of Field

#### V. DECS-300 System Construction and Functionality

- Component Layout
  - a. Main Field Systems
  - b. Exciter Field Systems
  - c. Special Systems
- Interface Firing Module (IFM)
- Rectifier Chassis
- Field Isolation Module
- PLC Interface and Operation

#### VI. DECS-300 Operation

- Human Machine Interface
- Bestcoms Software

- IFM Software
- Protection Coordination
- Output Relay Configuration
- Tuning
- Preventive Maintenance
- Calibration
- Troubleshooting and Repair
  
- **Vibration and air gap monitoring system**
- System description, configuration and generation operation
- Sensing mode and mean
- Data transfer
- Information treatment
- HMI
- Troubleshooting and Maintenance requirement

For successful completion of assignment and future running of the system, the service provider will also avail a PC with following hardware requirements to ensure problem free operation of the Delphin products.

#### **- Operating System**

Microsoft Windows XP 32-bit or Windows Vista and Windows 7 in the 32 bit or 64 bit versions, English versions.

- **Main memory:** At least 1024 MB\*

Recommended: 2 ... 3 GB for 32-bit systems, 4 ... 8 GB for 64-bit-systems

- **Monitor:** At least 1024 x 768 pixel, 96 dpi resolution

- **CPU:** A PC with at least 1.6-GHz\*

Recommended: Systems with dual or 4-core processors from 2.5 GHz or greater

- **Hard disk**

for ProfiSignal-Go at least 70 MB of free hard disk space

for ProfiSignal-Viewer at least 70 MB of free hard disk space

for ProfiSigna I-Klicks at least 500 MB of free hard disk space

for other ProfiSignal-- versions at least 200 MB of free hard disk space

All materials used under this assignment will remain the properties of EUCL.

#### **6. GENERAL EXPERIENCE OF THE SERVICE PROVIDER AND IMPORTANT ASPECTS OF THE PROJECT TO BE FOCUSED**

The consultant firm should have more than 10 years of general experience in engineering manufacturing or installation of electrical systems in power plants. 5 years of experience in commissioning of AVR system and/or vibration and air gap monitoring. The firm should prove that it has sufficient staff to successfully carry out the assignment.



## **7. COMPETENCIES AND QUALIFICATION OF SERVICE PROVIDER'S EXPERTS**

The minimum professional and technical standards required for experts to be proposed by interested consultancy firms are:

### **6.1 AUTOMATIC VOLTAGE REGULATION (AVR)**

#### **6.1.1 Academic Qualifications:**

- The desired technical expert must have at least a bachelor degree in electrical, control and automation or related field. Higher academic qualifications will be an added advantage

#### **6.2.2 Work Experience:**

- The desired technical expert must have a minimum of at least 5 years of general experience in power plant commissioning and operation. More years of experience will be an added advantage.
- The desired technical expert must have a minimum of at least 3 years of specific experience in AVR VXB32D and BESTCOMS SOFTWARE DECS 300, type installed at NYABARONGO I HPP or similar version to be justified by certificate of good completion and service delivery

### **6.2 VIBRATION AND AIR GAP MONITORING SYSTEM**

#### **6.2.1 Academic Qualifications:**

- The desired technical expert must have at least a bachelor degree in electrical, control and automation or related field. Higher academic qualifications will be an added advantage

#### **6.2.3 Work Experience:**

- The desired technical expert must have a minimum of at least 5 years of general experience in power plant commissioning and operation. More years of experience will be an added advantage.
- The desired technical expert must have a minimum of at least 3 years of specific experience in Vibration and Air gap monitoring system and PMS -100 Monitoring System, type installed at Nyabarongo I HPP or similar version to be justified by certificate of good completion and service delivery.

#### **N.B.:**

- Curriculum Vitae (CVs) shall be detailed, updated, and initialed and signed by the consultant experts.
- Only Consultancy firms that meet the required minimum academic qualifications and work experience will be shortlisted and given Request For Proposals (RFP)

## **8. SET THE TIME PERIODS FOR THE KEY DELIVERABLES IDENTIFIED**

The work is expected to start immediately after signature of the contract however a period less than 20 days may be accorded to the service period if required for preliminary preparations. A discussion with the client representative to clarify any outstanding issues should be held not later than one week after the signature of the contract.

The final report shall be provided to the client for approval in soft and hard copies not later than 10 days following expert return from the site.

## **9. SERVICES AND SURVEYS NECESSARY TO CARRY OUT THE ASSIGNMENTS**

The expert upon arrival at the site shall review the available documentation and make tour in the power plant premises prior to starting of work.

At least the following documentation will be provided to the expert for consultation:

- O&M manual for AVR VXB32D



- Computer laptop installed with BESTCOMS SOFTWARE DECS 300
- And any other document as may be required by expert (If available)
- O&M manual for Vibration and Air gap monitoring system
- And another document as may be required by expert (If available)

## **10. DETAILS OF THE SERVICES, FACILITIES AND COUNTERPART STAFF TO BE PROVIDED BY EUCL**

EUCL will designate a representative to co-ordinate the work scope with service provider onsite, and technical supervisory during the entire job and to resolve procedural activities.

Removal of any electrical/instrument item from machines and re-assembling will be done by EUCL's technical staff under supervision of recruited expert. EUCL shall provide transportation facilitation within Rwanda

## **11. REPORTING ARRANGEMENT AND OVERALL COORDINATION**

The services provider will report to the Managing Director of EUCL.

The consultant will work under the supervision of the director of Generation Operations and Maintenance. The supervisor will have frequent interactions with the consultant at various stages to brief the consultant on the situation/assignment; agree on the process and clarify the deliverables; provide feedback and comments on intermediary products; and track the progress made by the consultant. The supervisor will evaluate the consultant's work and certify deliverables.

## **12. REQUIREMENTS FOR TRANSFER OF KNOWLEDGE/ TRAINING AS PART OF THE ASSIGNMENT**

The consultant's experts, through an interactive training method will provide a short training to EUCL technicians and engineers. The experts will focus on:

- General operating principle of operation of AVR VXB32D, Excitation system.
- Manipulation, maintenance and parameter setting/ adjustment in BESTCOMS SOFTWARE DECS 300
- Vibration monitoring and air gap system PMS-100

## **13. APPLICATION AND SUBMISSION**

Interested and suitably qualified firms should submit their Expression of Interest including CVs and a motivation letter highlighting how they meet the requirements detailed in the TOR. All applications shall be submitted to the Secretariat of the Procurement Management Unit of REG/EUCL and should be addressed to:

**Managing Director**

**Energy Utility Corporation Limited (EUCL),**

**KN82 ST 3, NYARUGENGE, 1<sup>st</sup> Floor – Room G114 (Procurement Secretariat)**

**P.O Box 5634 Kigali, Rwanda**

Electronic applications will also be accepted and may be sent through: [onizeyimana@reg.rw](mailto:onizeyimana@reg.rw) copy to [gyemukama@eucl.reg.rw](mailto:gyemukama@eucl.reg.rw) and [procurement-eucl@eucl.reg.rw](mailto:procurement-eucl@eucl.reg.rw).

The outer cover for envelopes shall be clearly marked: **REQUEST FOR EXPRESSION OF INTEREST (REOI) RECRUITMENT OF SPECIALIZED FIRM TO PROVIDE TECHNICAL SERVICES AT NYABARONGO AUTOMATIC VOLTAGE REGULATION, GENERATOR EXCITATION AND AIR GAP & VIBRATION MONITORING SYSTEMS.**

The deadline for submission of expression of interest will be on **15<sup>th</sup> March, 2021** at **10H30 Kigali time**. Further information can be obtained via email addresses mentioned above during office hours i.e. from 07H00 hours to 17H00 on all working days.

The selection will be based on the detailed Terms of Reference (TOR) for this assignment with specific objectives, scope of the assignments, Key deliverables, Timing, Competence and Qualifications and other requirements. These are available at [www.reg.rw](http://www.reg.rw) and DG market website: [www.dgmarket.com](http://www.dgmarket.com). The selection of consultants will be done in accordance with the REG procurement manual, through the Quality Cost Based Selection method.

Done at Kigali, on **19 /02/ 2021**.