

## EXPRESSION OF INTEREST (EOI) - CONSULTANCY SERVICES FOR KINDARUMA UNIT 3 VIBRATIONS AND POWER HOUSE STRUCTURAL MOVEMENT (KGN-HYD-030-2019)

### 1. GENERAL INFORMATION

Kenya Electricity Generating Company PLC (KenGen) is a limited liability company, registered under the Companies Act of the laws of Kenya. The Company was incorporated in 1954 with its core business being development, management and operation of power generation plants. KenGen is listed on the Nairobi Stock Exchange with 70 percent being owned by the Government of Kenya, and 30 percent by the public. It has a total installed capacity of 1,631MW with power plants located in different parts of Kenya. KenGen utilizes various primary sources of energy to generate electricity ranging from hydro, geothermal, thermal and wind. KenGen has entered into power plant specific Power Purchase Agreement with Kenya Power and Lighting Company Limited (Kenya Power) for the sale of electricity generated from its various power plants.

### 2. EASTERN REGION

The Eastern Region power stations area located on Tana River and operate in a cascade with five power stations namely are Masinga (40MW), Kamburu (94.2MW), Gitaru (225MW), Kindaruma (72MW) and Kiambere (168MW). The EOI area of focus is Kindaruma Power Station.

### 3. KINDARUMA POWER STATION

Kindaruma Power Station is situated in Machakos County about 170 kilometres North- East of Nairobi. It is located about 14 kilometres off Embu-Kang'onde road that joins the Thika-Garissa road.

The power station has three Generating Units with a total rated capacity of 72 MW. Power is generated at 11 kV and each unit is rated at 24 MW. Each Generator is connected to a 30 MVA 11/132 kV step-up Generator Transformer and a 0.5 MVA 11/0.415 kV step-down. Unit 1 and 2 are Kaplan turbines and were commissioned in 1968 with major rehabilitation and upgrade in 2013. Unit 3 is a fixed propeller turbine and was commissioned in 2013 by Andritz Hydro, GmbH

### 4. BACKGROUND

Kindaruma Unit 3 after it was commissioned and handed over, started exhibiting unusual vibrations at low load ranges during starting and stopping but becomes stable at loads above 18MW. A decision was reached to have the unit run at base load without being subjected to system load variations. The same was effected, but sometimes due to low power demands, it inevitably gets shutdown for not being required by the system. In 2015, concrete movement at the powerhouse building between Units 2 and 3 started manifesting in form of cracks and relative concrete movement. Monitoring of the same by station staff started in earnest and readings over the years show progressive development of the cracks at some designated points.

The original equipment manufacturer was also contacted to assist in establishing root causes. The problems were suspected to emanate from the operation of turbine aeration valve. Condition Monitoring limited was engaged on 13<sup>th</sup> July 2018, to carry out vibrations measurement while unit was being operated with turbine aeration valve fully open. The position of the valve was first established to have been left on partially open position during the commissioning in 2013. The unit was then operated with the turbine aeration valve fully open and vibrations were still high during the usual low load ranges i.e. start and stop. A series of readings were taken at different positions of the aeration valve and report generated showing high vibrations at loads below 10MW and at speed no load. A section of the aeration pipe was cut to establish if indeed there was any airflow and it was established that there was no airflow. During low loads, when air is required to flow in, the valve appeared to be shut as there was no air inlet but during high loads when no air is required, a thin stream of air was felt. This prompted the unit to be stopped and dewatered to check if the valve was installed properly. The valve was found to be properly installed.

### 5. OBJECTIVE OF EOI

KenGen intends to engage a consultant to study the causes of excessive vibrations of Kindaruma Unit 3 plant and subsequent effects on the powerhouse structures and mechanical equipment. The consultant shall submit reports with clear recommendations and measures required to address the vibration of the unit and, remedy the damage of the civil structures.

In addition to the report the consultant shall prepare and submit detailed designs, tender documentation and cost estimates for the remedial works required to address the problem.

The scope of this consultancy covers the following:

- 1.1 Provision of Highly qualified and experienced staff in the following fields:
  - a) Turbine Engineer with over 15 years' experience in design, installation and commissioning with special experience in fixed blades propeller turbines
  - b) Structural Engineer with over 15 years' experience in design, Construction, supervision, investigations and Inspections for Hydro Powerhouses.
  - c) Power Systems Engineer with over 15 years' experience in plant and systems operations.
  - d) Vibrations Engineer/Analyst with over 15 years' experience in vibration monitoring, measurements and analysis on vertical hydro turbines
  - e) Geomatics Specialist with 10 years' experience in surveying.
- 5.2 Provision of studies, tender documentation and cost estimate for the following:

- a) Kindaruma Unit 3 turbine behaviour in various operating conditions
- b) Recommendations to address effects of excessive vibrations
- c) Structural investigation of the powerhouse and recommendation for remedial works including design and tender documentation

- 5.3 Provision of survey services, vibration measurements and all tests required for the successful completion of deliverables.

The deliverables (reports, drawings, cost estimates and tender documents) shall be submitted in hard and soft copies.

### 6. EVALUATION CRITERIA:

Interested contractors shall submit the listed documents below with the EOI in order to demonstrate capability to undertake the project: -

- 1.1 Certificate of registration or incorporation in country of origin in English.
- 1.2 Tax compliance certificate.
- 1.3 Valid business permit.
- 1.4 Demonstrate Experience in Hydro machinery efficiency, performance, structural design and vibration measurement, analysis and interpretation (at least 5 projects) in the last 15 years. Reference from previous clients is Mandatory. Indicating Specific roles, value of project (in USD), and area covered
- 1.5 Provide a detailed technical approach and specify ISO standards or equivalent to be applied, including the instrumentation and tools to be used
- 1.6 Provide detailed methodology and ISO standards or other standards to be applied and task assignment
- 1.7 Estimated period of study, work plan in form a Gantt chart.
- 1.8 Qualified and competent personnel to handle the assignment shall be supported by relevant education and signed CV by the person authorized to do so by the consultant.
- 1.9 The key personnel shall possess and demonstrate skills in the relevant fields proposed in the methodology:
  - i. Turbine Engineer with over 15 years' experience in design, installation and commissioning with special experience in fixed blades propeller turbines
  - ii. Structural Engineer with over 15 years' experience in design, Construction, supervision, investigations and Inspections for Hydro Powerhouses.
  - iii. Power Systems Engineer with over 15 years' experience in plant and systems operations.
  - iv. Vibrations Engineer/Analyst with over 15 years' experience in vibration monitoring, measurements and analysis on vertical hydro turbines.
  - v. Geomatics Specialist with 10 years' experience in surveying.
- 1.10 Demonstrate participation of local expertise, including materials and services

### 7. CLARIFICATIONS

The interested parties may request for clarifications on this EOI up to seven (7) days before the submission deadline. Any additional information/clarifications/addendums on this EOI will be posted on the KenGen website (<http://www.kengen.co.ke/tenders>)

Any request for clarification must be sent in writing by paper mail, facsimile, or electronic mail to:

#### OPERATIONS DIRECTOR

Kenya Electricity Generating Company PLC,  
Stima Plaza III, Kolobot Road, Parklands,  
P.O. Box 47936 - 00100,  
Nairobi, Kenya.

Tel: +254-20-3666407

Email: [skariuki@kengen.co.ke](mailto:skariuki@kengen.co.ke)

CC: [tenders@kengen.co.ke](mailto:tenders@kengen.co.ke); [jodumbe@kengen.co.ke](mailto:jodumbe@kengen.co.ke);

[skimani@kengen.co.ke](mailto:skimani@kengen.co.ke); [jtheuri@kengen.co.ke](mailto:jtheuri@kengen.co.ke);

[itarus@kengen.co.ke](mailto:itarus@kengen.co.ke)

### 8. EOI SUBMISSION

The EOI shall be submitted in a sealed envelope on **Monday, 1<sup>st</sup> July 2019 by 1400 hrs** to the following address:

**Company Secretary, Legal & Corporate Affairs Director,**

**Kenya Electricity Generating Company PLC,**

**Stima Plaza III, 7th Floor Kolobot Road, Parklands**

**P. O. Box 47936 - 00100,**

**Nairobi, Kenya**

**Tel: + 254 20 3666708; Fax: +254 20 248848**

Confidential, **Expression of Interest (EOI) for consultancy services for Kindaruma Unit 3 vibrations and power house structural movement:** Do not open before **Monday, 1<sup>st</sup> July 2019 at 1430 hrs**. The EOI documents shall be opened at 1430 hours on the same day in public at the Tenders Room on the ground floor of RBS building and bidders or their representatives are invited to attend. Only firms shortlisted under this procedure will be invited to tender in RFP.

### SUPPLY CHAIN DIRECTOR