

EXPRESSION OF INTEREST (EOI) FOR CONSULTANCY SERVICES FOR UPDATE OF FEASIBILITY STUDY ON GEOTHERMAL POWER GENERATION FROM BRINE IN KENGEN OLKARIA FIELD

(TENDER REF: KGN-BDD-04-2019)

The Kenya Electricity Generating Company PLC (KenGen) invites expression of interest from eligible consultancy firms to carry out an update of the Feasibility Study on binary power generation from brine produced in KenGen Olkaria field whose specifications are as follows:

1.0 General Information

Kenya Electricity Generating Company PLC (KenGen) is the leading power generating company in Kenya with an installed capacity of 1631.5MW. KenGen owns fourteen (14) hydroelectric power plants, four (4) Thermal power plants, six (6) geothermal power plants, and three (3) Wind farms. The Company's strategy is to increase its generation capacity through renewable energy sources that include optimisation of existing renewable resources in Geothermal and Hydro. KenGen has a geothermal installed Capacity of 534MW with an additional development of about 590MW in the pipeline.

KenGen geothermal plants are single flash with condensing steam turbines. The production wells produce two phase geothermal fluid which is separated into steam and brine. The separated brine from the interconnected wells is re-injected while still at high temperatures (>160°C). KenGen intends to utilize this considerable amount of heat energy in the separated brine for additional power generation using binary technology.

In addition, there are a number of production wells that have been drilled but have not been utilised in the single flash condensing power plants because of their low pressure, long distances to the existing power plants, low enthalpy, and cyclic characteristics of some of the wells. Part of the scope of the study shall involve evaluation of these wells for potential use with the brine for power generation.

KenGen carried out a feasibility study in 2014 to evaluate the possibility of generating power from brine separated at Olkaria-I (45MW) & Olkaria-II (105MW) and the estimated brine quantities from Olkaria IV (150MW) & IAU (150MW) which had not been commissioned by then using binary technology. The Company would like to update the feasibility study taking into account the increased brine quantities from the additional plants, future plants and the un-utilised wells. The update is expected to take about 12 months.

1.1 Brine Production from KenGen Olkaria Field

In Olkaria geothermal field, KenGen has drilled over 180 production wells. These wells supply steam to the existing geothermal power plants and will also supply the plants under development. Drilling of wells for future development plants is also ongoing. In total, the production wells connected to the existing power plants produce over 4,000 tonnes per hour of brine at separation pressures of between 6 and 12 bars and corresponding temperatures of between 158 oC and 188 oC. It is in view of the above

that KenGen wishes to update the previous feasibility study taking into consideration the additional plants that have been installed, the project pipeline and the un-utilised production wells.

The study shall analyse the quality and quantity of brine from the production wells within KenGen's Olkaria field, analyse the un-utilised wells and assess the possibility of connecting them to the proposed binary plants utilising both steam and brine from the un-utilised wells, review existing binary technologies and recommend the most appropriate plant sizes, technology and location. The study will also analyse the physical quality and quantity of the brine for reinjection and recommend reinjection temperatures of the brine as well as the most favourable wells for reinjection that will not have a negative impact on the reservoir. The Consultant shall also prepare the tender documents for procurement of an EPC Contractor.

The successful applicants must have proven technical capabilities and a proven track record in carrying out feasibility studies or operating binary power plants of at least 20MW with an operating life of at least 10 years.

2.0 Objectives of the feasibility study

The objectives of the study are;

- i. To update the previous feasibility study completed in the year 2014;
- ii. To assess the wells production data from the Olkaria Geothermal field concessioned to KenGen and advise on the additional data required to carry out successful feasibility study of binary power generation;
- iii. To analyse the physical and chemical parameters of the brine produced from the fields and determine the available temperature range that can be further utilized without precipitation of silica;
- iv. To analyse the quantities of brine to determine the generation potential using modern binary generation technologies;
- v. To analyse all the un-utilised wells fluid characteristics including the physical and chemical properties;
- vi. To analyse the available geothermal fluid from the un-utilised wells that could be connected to the proposed binary plants taking into account the distances from the existing brine gathering systems and fluid separation requirements;
- vii. To identify the development strategy that best matches the brine parameters and the reservoir response for long term exploitation of the field;
- viii. To advise KenGen on the eventual disposal of the brine after utilization at the binary plants and the expected impacts on the reservoirs with respect to selection of reinjection points and potential scaling in the disposal pipelines and re-injection well bores. In particular, determine if the present reinjection wells will still serve the purpose after the binary units are installed or if new re-injection wells will have to be provided and if so, their locations;
- ix. To recommend the optimum development of the field, the location and sizes of the binary power plants to be installed, centralised operation system for the plants, and the development sequence;

- x. To recommend appropriate long-term management and monitoring strategy for the binary power generation system and waste brine system including any additional studies required;
- xi. To prepare cost estimates of proposed binary power plants and binary transmission lines as well as substations required to connect the power to the national grid;
- xii. To carry out ESIA for the recommended power plant sites;
- xiii. To carry out a conceptual design for the recommended option of the power plants including power evacuation and grid connection;
- xiv. To carry out geotechnical and topographical survey of the proposed project;
- xv. To prepare economic and financial analysis of proposed binary plants and recommended development options; This shall include deriving the LCOE and the proposed tariff;
- xvi. Prepare an implementation schedule of the recommended option of the power plants;
- xvii. Prepare a risk matrix and mitigation plan for the project covering both Project Construction and operational Phases; and
- xviii. Develop documentation for procurement of an EPC Contractor for the proposed project.

3.0 Evaluation Criteria

Interested consultants must provide information indicating that they are qualified to successfully undertake the feasibility study. Shortlisting of consultants will be based on the following:

- (i) Demonstrate at least 15 years' experience in consulting services for geothermal binary feasibility studies of at least 20MW;
- (ii) Demonstrate at least 15 years' experience in designing of geothermal binary power plants;
- (iii) Demonstrate comprehensive and proven knowledge of Geothermal Binary Power Plants operations;
- (iv) Additional experience in a feasibility study for a brown field geothermal power plant will be an added advantage;
- (v) In addition to the firms experience, a list of proposed professional staff and disciplines expected to take part in the feasibility study, including but not limited to a Power systems Engineer, Power Plant Engineer, Mechanical Engineer, Civil & Structural Engineers, Geothermal experts including a Geothermal steam field expert and geochemist all who must have a minimum of fifteen(15) years relevant working experience each, Geotechnical and Topographical surveyor, Environmental and Social scientist, Financial/Economic analyst all with a minimum of fifteen (15) years relevant experience and a Team Leader, with a minimum of fifteen (15) years' experience in project management, design, construction and operation of Geothermal binary power plants and Feasibility studies on binary plants
- (vi) Must have at least one operational grid connected binary technology geothermal power plant of not less than 20MW and in operation for not less than 10 years based on their feasibility study

- (vii) Demonstrate a strong financial status by positive cash flows, minimum average annual turnover of USD 1 Million, net worth and profitability for at least 3 years.

4.0 Documents to be submitted:

- a) Documents detailing that the party or parties fulfils the minimum requirements in item 3.0 above;
- b) Certificate of incorporation (and any certificate of change of name), certified by an authorized representative of the bidder or (as the case may be) the consortium member;
- c) Certified copies of Memorandum / Articles of Association;
- d) Financial Statements for the last 3 years including Tax registration and Tax compliance certificates or equivalent documents applicable in the bidder's Country of origin. (For consortium arrangements, each member must meet the requirements);
- e) List of consultancy services on Geothermal Feasibility studies, power plant design assignments in geothermal, and any feasibility study for a brown field geothermal power plant carried out in the last 15 years. Including a brief description of the study (scale and scope) and the status of the projects;
- f) A list of Geothermal projects in which the bidder has experience in operating and maintaining; and
- g) Where the Applicant is a consortium, a list of the proposed members of the consortium and the proposed Leader of the consortium and the roles of each member.

5.0 CLARIFICATIONS

The interested parties may request for clarifications on this Expression of Interest up to ten (10) days before the EOI submission date. Any request for clarification must be sent in writing by paper mail, facsimile, or electronic mail to:

Capital Planning & PPP Manager,
Kenya Electricity Generating Company PLC,
RBS PENSION PLAZA 1, Kolobot Road, Parklands,
P.O. Box 47936 – 00100,
Nairobi, Kenya.
Tel: +254-20-3666427
Fax: +254-20-2248848
Email: tenders@kengen.co.ke; CC: enjenga@kengen.co.ke;
fmakhanu@kengen.co.ke; fkamanja@kengen.co.ke; mogonji@kengen.co.ke

6.0 EOI SUBMISSION

The EOI documents made in English must be received in a plain sealed envelope and delivered or registered to:

The Company Secretary & Legal Affairs Director,
Kenya Electricity Generating Company PLC,
10th Floor, KenGen Pension Plaza II, Kolobot Road, Parklands
P. O. Box 47936 - 00100,
Nairobi, Kenya.

The bid document must be dropped in the tender box located on the ground floor near the Security Desk, or on 10th Floor KenGen Pension Plaza II in the Company Secretary's office.

Bidders should submit one (1) Original and two (2) copies of the EoI on or before **1400 hours** (East African Time) on **26TH June 2019**. The information on the outer envelope of the submission should also include: Confidential, EoI FOR **CONSULTANCY SERVICES FOR UPDATE OF FEASIBILITY STUDY ON GEOTHERMAL POWER GENERATION FROM BRINE IN KENGEN OLKARIA FIELD: Do not open before, 26TH June 2019. at 1430hrs East African Time.** The EoI will be opened immediately thereafter in the presence of bidders representative who choose to attend at Tender Opening Room, Ground Floor.

The Expression of Interest can also be viewed and downloaded from the KenGen website www.kengen.co.ke. Bidders are advised to be checking the website from time to time up to ten (10) days before submission date for any uploaded information through clarification/addendum.

KenGen reserves the right to accept or reject any or all applications without the obligation to assign any reason for the decision. Only individuals pre-qualified under this procedure will issued with the Request for Proposal (RFP) and be invited to submit their technical and financial proposal.

SUPPLY CHAIN DIRECTOR