



KENYA ELECTRICITY GENERATING COMPANY PLC.

KGN-HYD-055-2018.

**TENDER FOR DESIGN, MANUFACTURE, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF NEW FRANCIS TURBINE RUNNERS FOR KAMBURU POWER STATION.**

25<sup>th</sup> January, 2019.

**CLARIFICATION NO 2.**

In Accordance with the Tender for “Design, Manufacture, Delivery, Installation, Test and Commissioning of New Francis Turbine Runners for Kamburu Power Station”. KenGen hereby issues **Clarification No.2**

NO.	CLARIFICATION SOUGHT	CLARIFICATION
1	By using following data out from specification: Q rated- 43.5cms, Prated: 31.4MW, Hrated: 72m, a turbine efficiency of 103% results. Please clarify and indicate the right discharges. Please clarify on which head shall the required 35MW occur?	See item 3 in clarification NO. 1.
2	Missing data: <ul style="list-style-type: none"> <li>a. Performance curve and hill chart of existing turbine or used model reference</li> <li>b. Efficiency measurement of existing turbine (current conditions)</li> <li>c. Turbine operating data of all 3 units (full load, low load, stand still)</li> <li>d. Current turbine behaviour by normal operation (rough operation, pulsation, vibrations, cavitation)</li> <li>e. Water Levels (HWL, TWL) maximum, rated and minimum</li> <li>f. Existing maximum allowable axial thrust, runner weight</li> <li>g. Maximum overpressure (transient behaviour)</li> <li>h. Design discharge and required maximum discharge for turbine upgrade</li> </ul>	<ul style="list-style-type: none"> <li>a. Available data shall be provided with this clarification.</li> <li>b. Commissioning report to be shared.</li> <li>c. SCADA data provided</li> <li>d. Units running smoothly in the normal operating range</li> <li>e. As in commissioning report</li> <li>f. Runner weight 7.689 Tons, Hydraulic Thrust</li> <li>g. 50%</li> <li>h. 43.7m<sup>3</sup>/sec @72m Net Head</li> </ul>
3	Guarantees: <ul style="list-style-type: none"> <li>i. Definition of efficiency guarantee (weighted efficiency and formula)</li> <li>ii. Procedure for efficiency verification at site</li> <li>iii. LD's by efficiency shortfall</li> <li>iv. Definition of required power output guarantee (required 35MW on which head)</li> </ul>	<ul style="list-style-type: none"> <li>i. Defined below this table</li> <li>ii. Defined below this table</li> <li>iii. Defined below this table</li> <li>iv. Not defined. Can be extracted by extrapolation of availed graphs.</li> </ul>
4	Drawings:	Provided with clarification NO. 1

	<ul style="list-style-type: none"> <li>- Whole waterway from intake to draft tube outlet for transient calculations= only required by discharge increase</li> <li>- Draft tube end part</li> <li>- Guide vane drawing (view from above)</li> <li>- Stay vane drawing (view from above)</li> <li>- Guide vane mechanism incl. max. guide vane opening</li> </ul>	
5	Sectional Drawing of Draft Tube Elbow and concrete section of Draft Tube	Provided with clarification NO. 1
6	Did KenGen provide properties of Water?	Ordinary river water. Silted during the rainy season. Silt not abrasive.
7	On Cavitation and Cracking-Has the mode of running the machines changed from the time of commissioning?	No change. Problems have persisted form the beginning
8	Please provide Commissioning Report?	To provide
9	Any benefit for providing a more efficient Runner? Not just a replacement for original runners?	Defined below.
10	What's the capacity of the Powerhouse crane?	60 tons main hoist, 10 tons auxiliary hoist
11	What's the delivery period?	18 months
12	Length of outage to install new Runner? 8 days?	8 days outage. Pre outage preparations shall be undertaken as necessary to keep to this outage period.
13	Is the Runner lifting Platform in good condition?	Yes
14	Weight of original Runner and Number of blades 16?	Weight 7.689 Tons, 16 blades
15	New guide vanes same as original except being replaced with stainless ones?	Same profiles as the original
16	Runners Manufactures Can you please inform us the original manufacture of the replaced runners in Units 1, 2 and 3?	No. The manufacturers may be interested bidders.
17	Units operation mode Is there any difference, in terms of operation mode, between the 3 units? Did the operation mode change over time?	No difference in operation mode and no change in mode over time.
18	Constraints on manufacturing location * Is there any geographical constrains for runner manufacturing?	See section V: Technical Evaluation and clause 2.27.7 on due diligence.
19	Preference What is the meaning of clause 2.25 ? Please clarify.	Clause does not apply. Delete this clause.
20	Efficiency What are efficiency requirements? Are there LD's related with efficiency? How will efficiency be evaluated?	Defined below this table
21	Time for completion Please confirm if the below understanding is correct: - 18 months to deliver the first runner at site.	Confirmed. - 18 months to deliver and install the first runner at site. - Site works will start depending on outage management – 8 days per unit.

	<ul style="list-style-type: none"> <li>- Site works will start depending on outage management – 8 days per unit.</li> <li>- There will be a minimum period of 3 months between units site works.</li> </ul>	<ul style="list-style-type: none"> <li>- There will be a minimum period of 3 months between units site works to fall in different quarters of the maintenance year.</li> </ul>
22	<p>Is 8 days for replace the runner reasonable? What is KenGen experience on this subject?</p>	8 days are adequate for replacement of runners. The bidders are expected to provide their program of works as they consider appropriate.
23	<p>Special tools to install the runner Are all special tools available and in good condition?</p>	Special tools are available and in good condition. Specified tools shall be delivered and used during the installation.
24	<p>Runners Commissioning report Can you share the runners commissioning report?</p>	Shared with this clarification
25	<p>Asbestos Can you confirm that all areas and equipment affected by this runner change are asbestos free?</p>	Confirmed. The area is asbestos free.
26	<p>Joint venture members Is it mandatory for all Joint Venture members to have participate in the site visit?</p>	No. It is in the interest of the bidder to send qualified persons who understand site requirements.
27	<p>Subcontractor Is it possible for an entity without the required runner design and manufacturing experience to subcontract the runner design and manufacturing?</p>	No. See section V: Technical Evaluation
28	<p><b>Tender Currencies</b> <b>2.11.1</b> <i>“Prices shall be quoted in Kenya Shillings unless otherwise specified in the Appendix to Instructions to Tenderers.”</i> <b>RFC:</b> As this is an international tender, please confirm that foreign bidders may quote in <b>EURO [€]</b></p>	In freely convertible currencies as explained in clarification NO. 1
29	<p><b>Tender Security</b> <b>ITT, 2.14.4</b> <i>“The tender security shall be denominated in Kenya Shillings or in another freely convertible currency, and shall be in the form of an on-demand bank guarantee issued by a reputable bank located in Kenya or where the bank is located abroad, it must have a local correspondent bank.”</i> <b>RFC:</b> Please confirm that tender security may be issued in <b>EURO [€]</b></p>	In freely convertible currencies as explained in clarification NO. 1
30	<p><b>Payment</b> <b>SCC, 3.12.- Terms of Payment:</b> <i>“Advance payment shall not be applicable . Payment shall be made within 30 days from the date of receipt of certified invoices, delivery notes; goods receipt notes and signing of satisfactory and acceptance report by the engineer. “</i> <b>RFC:</b> With exception of above article, tender is not defining terms of payment. In addition, it is not specifying how the payments to Contractor will be secured.</p>	Defined in clarification NO. 1. The finer details can be clarified before signing contract execution with the winning bidder.
32	<p><b>GCC/SCC, 3.10.1 Delivery terms:</b> <i>“Delivered At Place (DAP) – Kamburu Power Station (INCOTERMS 2010)”</i></p>	This remains as per tender document.

	<b>RFC:</b> Instead DAP we propose: “ <i>Cost &amp; Freight</i> ” (CFR) Mombasa Port (INCOTERMS® 2010)	<b>Delivery terms:</b> “ <i>Delivered At Place (DAP) – Kamburu Power Station (INCOTERMS 2010)</i> ”
33	<p><i>“If the tenderer fails to deliver any or all of the goods within the period(s) specified in the contract, the procuring entity shall, without prejudice to its other remedies under the contract, deduct from the contract prices liquidated damages sum equivalent to 0.5% of the delivered price of the delayed items up to a maximum deduction of 10% of the delayed goods. After this the tenderer may consider termination of the contract.”</i></p> <p><b>RFC:</b></p> <p><input type="checkbox"/> We believe that there is a typing error, meaning that Procuring entity has the right to terminate the contract.</p> <p><input type="checkbox"/> In such case we propose replace the strikethrough wording above as follows: “<i>After this the Procuring entity may consider termination of the contract if it is obvious that tenderer shall not deliver Goods in four (4) months after deadline in Time schedule</i>”</p>	KenGen tender requirement remains
34	<p><b>Resolution of Disputes</b></p> <p><b>3.18.2</b> “If, after thirty (30) days from the commencement of such informal negotiations both parties have been unable to resolve amicably a contract dispute, either party may require adjudication in an agreed national or international forum, and/or international arbitration”</p> <p><b>RFC:</b></p> <p>Replace the strikethrough wording above as follows: “<i>all disputes or claims arising out of or in connection with this contract including disputes relating to its validity, breach, termination or nullity shall be finally settled before the International Court of Arbitration of International Chamber of Commerce (ICC) in accordance with the Rules of Arbitration of the International Chamber of</i> 3/3 <i>Commerce (ICC Rules of Arbitration) by sole arbitrator appointed in accordance with the said Rules. The place of arbitration shall be Nairobi.</i>”</p>	KenGen tender requirement remains
35	<p><b>3.18.2- Dispute Resolution</b></p> <p><b>RFC:</b> ICC arbitration shall apply. Please confirm.</p>	KenGen tender requirement remains

## Turbine Guarantees

### Turbine Guaranteed Efficiency

The turbine shall have a guaranteed maximum efficiency of not less than 93.0% at the design net head of 72m with an output of 21,000, 24,000 to 28,000 kW. In determining the above efficiency due account shall

be taken of the spiral casing velocity head and the velocity head in the draft tube. For the purpose of ascertaining that the guaranteed efficiency a detailed CFD analysis shall be conducted as specified.

Guaranteed efficiencies in excess of the required minimum will be valued at a rate of 5,000 USD per 0.1 per cent of efficiency. The rate above shall be used both for Tender evaluation and for determination of penalties for non-compliance with the guarantees.

Efficiency guarantees given in the tenders shall be verified by CFD tests to be performed by the contractor as part of the present works.

Guaranteed turbine efficiencies given in the tender shall not be higher than those actually upscaled from model test(s) given as reference by the Tenderer. For tender evaluation purposes the Tenderer shall pre-sent with his Tender complete copies of model test results for the reference turbine(s) according to IEC Code. The Tenderer shall include full information about the corrections (if any) assumed to take into consideration the difference between the model and the geometry of existing water ways.

The Moody formula shall be used for upscaling the efficiency from model to prototype:

$$(1-\eta_p)/(1-\eta_m) = (D_m/D_p)^{0.2}$$

where: sub-script "m" is referring to the model, and sub-script "p" is referring to the prototype. The correction shall be calculated for the point of best efficiency and applied to all points of curve.

The mean weighted guaranteed efficiency is defined as the arithmetic mean of efficiencies for a number of operation points corresponding to three different net heads. For each head, the operation points shall be defined by the percentage to the maximum discharge (for continuous operation) at this head.

η1	H = 78 m	Qmax at 78 m	weight coefficient 1
η2	H = 78 m	0.9 Qmax at 78 m	weight coefficient 1
η3	H = 78 m	0.8 Qmax at 78 m	weight coefficient 1
η4	H = 78 m	0.7 Qmax at 78 m	weight coefficient 0.5
η5	H = 72 m	Qmax at 72 m	weight coefficient 3
η6	H = 72 m	0.9 Qmax at 72 m	weight coefficient 3
η7	H = 72 m	0.8 Qmax at 72 m	weight coefficient 3
η8	H = 72 m	0.7 Qmax at 72 m	weight coefficient 2
η9	H = 68 m	Qmax at 68 m	weight coefficient 1
η10	H = 68 m	0.9 Qmax at 68 m	weight coefficient 1
η11	H = 68 m	0.8 Qmax at 68 m	weight coefficient 1
η12	H = 68 m	0.7 Qmax at 68 m	weight coefficient 0.5

$$\eta_{\text{Guaranteed}} = (\eta_1 + \eta_2 + \eta_3 + 0.5\eta_4 + 3\eta_5 + 3\eta_6 + 3\eta_7 + 2\eta_8 + \eta_9 + \eta_{10} + \eta_{11} + 0.5\eta_{12}) / 18$$

Guaranteed efficiency values shall be stipulated on basis of net head measured according to the IEC Codes 41 and 193. During tender evaluation, the mean weighted efficiency guaranteed by each tenderer will be compared, and the difference will be valued as defined above.

Field efficiency tests shall be performed as a supplementary control of the guaranteed values. Liquidated damages will be applied at the same rate as given above, in the case of efficiency not in accordance with the guarantees. In case of difference between the efficiency obtained from the model tests (upscaled), and from the field efficiency tests, the later shall be the base for the calculation of the liquidated damages.

### **Turbine Efficiency Test**

The Contractor shall carry out a turbine index test by the Winter-Kennedy method to determine the relative overall efficiency of the turbine.

All equipment necessary for such tests shall be provided, including an accurate manometer or dead weight tester for spiral casing pressure, accurate manometer for Winter Kennedy pressure differential and device for tail water level measurement at draft tube gate slot. In addition, observations of reservoir and tail water levels will be made. A pressure transducer with a calibrated indicating instrument may be used as an alternative to a manometer. The tests will be supervised and coordinated by the Engineer or his representative. The net head for the index tests shall not vary outside 71 to 73 metres and each test shall be carried out with the minimum of change in total station output.

The Contractor shall provide a full report not later than 120 calendar days after completion of the tests giving a brief description of apparatus used, procedures adopted, all measurements and tabulated calculations of results for both units reduced to the design head of 72m. Head losses for intake to spiral casing and draft tube outlet shall be shown separately. The report shall include a graph which can be easily interpolated showing overall efficiency curves for net heads of 68m, 74m and 78m. The Tenderer shall include a hill chart in H and Q co-ordinates for efficiencies, covering the whole operation area from minimum net head to the maximum net head.

Liquidated damages will be applied at the same rate as given above if the guaranteed efficiencies are not achieved during the turbine index tests.

**Price Comparison**

For the purpose of price comparison insert the following under clause 2.22.4 of PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS.

c. Financial evaluation

- (a) For each every 0.1% efficiency above the required turbine guaranteed efficiency, the tender price will be adjusted by minus five thousand (5,000) US dollars for purposes of tender comparison.

**ACKNOWLEDGEMENT OF CLARIFICATION NO 2.**

We, the undersigned hereby certify that the Clarification is an integral part of the document and has been incorporated in the tender proposal.

Signed.....

Tenderer.....

Date.....