



# **INFORMATION SHEET FOR PROCUREMENT OF 3000Kva STEP-UP TRANSFORMER**

**Reference No: FNK-I/IUL/2023/292**

Issued on: 08<sup>th</sup> November 2023

Issued by:

Fenaka Corporation Limited

Male', Republic of Maldives

## Section I: Instruction to Bidders

A. General	
<b>1. Scope of Bid</b>	1.1 Fenaka Corporation Limited requests quotations for transformer(s) in accordance with <i>Section III, Technical Specifications</i>
	1.2 It is in Fenaka Corporation Limited's discretion to cancel this bid invitation at any time.
<b>2. Eligible Participants</b>	2.1 Local companies registered in Maldives are eligible to participate in the tender
	2.2 Foreign companies are eligible to participate in the tender only if the total bid value is above 2,500,000 Maldivian Rufiyaa.
B. Preparation of the Bid	
<b>3. Bid Prices</b>	3.1 The unit price of each item and the total price shall be clearly indicated in the quotation
	3.2 All items shall be quoted in the bid (please refer to <i>Section III, Technical Specifications</i> for the details of required items)
	3.3 Quotation shall separately indicate the additional charges such as freight charges and Insurance.
	3.4 The bidder shall submit quotation on CIF basis to Male' port
<b>4. Currency</b>	4.1 The bidder shall quote entirely in Maldivian Rufiyaa
<b>5. Alternative Bids</b>	5.1 Bidders can submit a maximum of two (2) options
<b>6. Validity of Bids</b>	6.1 Quotation shall remain valid for minimum sixty (60) days from the date of bid opening
<b>7. Bid Security</b>	7.1 All bids should be accompanied with a bid security of 2,000.00 (Two Thousand US Dollars) or its equivalent in Maldivian Rufiyaa
	7.2 The bid security should be: <ul style="list-style-type: none"> <li>- Original bank guarantee letter (or)</li> <li>- Bank guaranteed and stamped check (or)</li> <li>- An insurance policy from Maldives Monetary Authority (MMA) registered insurance company</li> </ul>

	<p>7.3 Any bid not accompanied by a Bid Security shall be rejected during bid opening</p> <p>7.4 The bid security must be valid for a minimum of twenty (20) additional days beyond the validity of quotation</p>
<b>8. Technical Compliance</b>	<p>8.1 All relevant information including the brand shall be given to enable technical evaluation of quoted items</p> <p>8.2 If the manufacturer or assembler is not the same as the bidder, a document indicating that manufacturer or assembler is willing to sell the item to the bidder is required</p> <p>8.3 Manufacturer's Authorization letter will be required to enable technical evaluation</p> <p>8.4 If the goods do not comply with the requirements mentioned in <i>Section III, Technical Specifications</i>, the bid will be rejected during evaluation.</p>
<b>9. Documents Comprising the Bid</b>	<p>9.1 Quotation (inclusive of the delivery period and payment terms)</p> <p>9.2 Specifications of the offered product</p> <p>9.3 Engineering drawings of offered product</p> <p>9.4 Details of the company</p> <ul style="list-style-type: none"> <li>- Company profile/background</li> <li>- Company registration certificate</li> <li>- GST registration certificate (for local bidders only)</li> <li>- TAX clearance report (6 months validity)</li> <li>- Manufacturer's Authorization letter</li> <li>- Contact details (name, designation, mobile number and e-mail address)</li> </ul> <p>9.5 Experience letters, if available</p> <ul style="list-style-type: none"> <li>- Letters within past five (5) years</li> <li>- Relevant experience letters</li> <li>- Letters with project name and value</li> </ul> <p>9.6 One (1) compact disc with original bid document scanned and written</p> <p>9.7 Bids lacking the documents above are subjected to be rejected during the bid opening</p>

<p><b>10. Format of Bid</b></p>	<p>10.1 The Bidder shall submit two (2) sets of the bid document (1 original and 1 copy), enclosed separately in two envelopes and sealed with company stamp</p> <p>10.2 All pages of the bid document shall be stamped and bound properly (excluding the bid security)</p>
<p><b>C. Bid Submission</b></p>	
<p><b>11. Sealing and Marking Bid Document</b></p>	<p>11.1 The bid document shall be sealed properly in an envelope clearly marked ‘ORIGINAL’ or ‘COPY’, with the name of the company and the tender reference number (FNK-I/IUL/2023/292)</p>
<p><b>12. Bid Opening</b></p>	<p>12.1 The bids will be opened on 14<sup>th</sup> November 2023, 1130hrs in the presence of bidders</p> <p>12.2 Bids will be opened at: Fenaka Corporation Limited Hilaalee Magu, K. Male’, Republic of Maldives</p> <p>12.3 Bids received electronically will not be accepted</p>
<p><b>13. Bid Rejection</b></p>	<p>13.1 Fenaka Corporation Limited shall not consider any bidders that arrive after the deadline for submission</p> <p>13.2 Bidders that do not register for the tender are unable to participate in the bid opening</p> <p>13.3 Bids lacking the documents mentioned in 9. <i>Documents Comprising the Bid</i> (except 9.5 <i>Experience letters</i>) and that do not comply with 10. <i>Format of Bid</i> are subjected to be rejected</p>
<p><b>D. Awarding of Contract</b></p>	
<p><b>14. Payment Terms</b></p>	<p>14.1 An advance payment will not be released for this project</p> <p>14.2 Proposed payment terms should not be tied with submission of Bill of Lading.</p>
<p><b>15. Factory Acceptance Testing</b></p>	<p>15.1 The transformer(s) shall be fully tested at the manufacturer workshop in the presence of Client’s appointees via video conferencing</p> <p>15.2 The testing shall be conducted at internationally accepted testing standards</p> <p>15.3 The transformer(s) shall undergo protection testing and operation testing</p>

- |   |
|---|
| <p>15.4 The transformer(s) shall be checked for dimension and the supplier shall provide the dimensions of the transformer(s) during the virtual factory acceptance testing.</p> <p>15.5 Recorded video clips while operating the units will not be accepted as virtual factory acceptance testing.</p> |
|---|



## Section II: Evaluation Criteria

**Proposal Cost:** 70 points for the lowest price

- $(\text{Lowest price} / \text{proposed price}) \times 70$

**Delivery:** 20 points for the lowest delivery period

- $(\text{Lowest delivery period} / \text{proposed delivery period}) \times 20$
- If the delivery period indicates 'ex-stock', it shall be taken same as the party offering the longest delivery period.

**Credit Period:** 10 points for the maximum credit period

- $(\text{Proposed credit period} / \text{longest credit period}) \times 10$

**Note:** Any discrepancy in technical details specified in quotation with technical specification document, the specification shall prevail.

## Section III: Technical Specifications

### TECHNICAL SPECIFICATION FOR 0.415/11 KV STEP-UP TRANSFORMER

#### 1.0 SCOPE

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of 3 Phase, 50 Hz, 0.415 / 11 kV, YNd1, double wound with copper conductor, hermetically sealed, oil immersed, ONAN cooled power transformer of capacities as specified Chapter 5.2 **Rated Power**.

The design of the tank, fittings, bushings, etc. shall be such that it will not be necessary to keep the transformer energized to prevent deterioration as the transformers may be held in reserve or outdoors,

The equipment / materials supplied shall be rated to be used under system parameters and service conditions given and clause 2.0 and 3.0 respectively.

#### 2.0 SYSTEM PARAMETERS

Parameter	Low Voltage System	11kV System
Nominal Voltage	0.415 / 0.240 kV	11 kV
Highest System Voltage	0.44 / 0.255 kV	12 kV
Number of Phases	3PN	3
Frequency	50 Hz	50Hz
Neutral Earthing	Solidly Earthed	Solidly earth
3 Phase Short Circuit Levels	Up to 65 kA / 1s	Up to 20 kA / 1s
Impulse Withstand Voltage	6 kV	75 kV (peak)
Power Freq. Withstand Voltage 1 min	2.5 kV	28 kV

#### 3.0 SERVICE CONDITIONS

Parameter	Value
Climate	Typical tropical coast line
Atmosphere	Saliferous, corrosive and dusty
Max. Ambient Temperature	38 °C
Max. Daily average ambient temp.	29 °C
Min Ambient Temp	24 °C
Maximum Humidity	90 %
Maximum altitude above M.S.l.	Average 2 m
Average days of rainfall	145 days/ yr
Maximum wind speed	gusts up to 100 km/hr

**4.0 APPLICABLE STANDARDS:**

The equipment and material supplied shall be in accordance with the latest editions of the Standards specified below and amendments thereof.

Standard	Title
<b>IEC Standards :</b>	
IEC 60071	Insulation co-ordination
IEC 60076	Power transformers
IEC 60156	Method for the determination of the electric strength of insulating oils
IEC 60296	Specification for unused mineral insulating oils for transformer and switchgear
IEC 60354	Loading guide for oil-immersed power transformers
IEC 60437	Radio interference test on high-voltage insulators
IEC 60551	Determination of transformer and reactor sound levels
IEC 60616	Terminal and tapping markings for power transformers
IEC 60722	Guide to the lightning impulse and switching impulse testing of power transformers and reactors
<b>ISO Standards :</b>	
ISO 1459	Metallic coatings - Protection against Corrosion by Hot Dip Galvanising - Guiding Principles
ISO 1460	Metallic coatings - Hot dip galvanized coatings on ferrous materials. Gravimetric determination of the mass per unit area
ISO 2178	Non-magnetic coatings on magnetic substrates - Measurements of coating thickness - Magnetic method
ISO 9000:	Quality management and quality assurance standards - Guidelines for selection and use
<b>CENELEC/CEN Harmonized European Standards:</b>	
HD 428	Distribution Transformers

Material conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above, would also be acceptable. In case the Bidders who wish to offer material conforming to the other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Two copies of such standards with authentic English Translations shall be furnished along with the offer.

**5.0 TECHNICAL REQUIREMENTS**

**5.1 MAIN FEATURES:**



Description		Requirement
Rated Voltage	HV	11 kV
	LV	415 V
Frequency		50 Hz
Number of Phases		3
Power ratings		3000 kVA
Type		Oil immersed, hermetically sealed
Applicable Standard		IEC 60076
Cooling		Self-cooled (ONAN)
Voltage Variation		Off-load tap changer with 5 positions in the HV winding giving $\pm 2 \times 2.5 \%$ .
Windings		Copper
Core		Grain orientated silicon steel or Amorphous metal
HV and LV Bushings		Outdoor type
Vector Group		YNd1
Impulse Withstand Voltage		75 kV (peak)
Power Freq. Withstand Voltage 1 min		28 kV
Short time withstand current duration (Under three phase faults)		3 s
Minimum short circuit impedance voltage at 75°C		7%
Average winding temperature rise (by resistance measurement) at steady state Continuous Maximum Rating at normal ambient (30°C) under normal service condition.		55 K
Top oil temperature rise at normal ambient (30°C) under normal service condition		50 K
Losses		Maximum Level 1 stipulated loss values as per IEC TS 60076-20 :2017.

## 5.2 Rated Power

The continuous rating of the step-up power transformer shall be 3000 kVA.

Each Transformer shall be capable of supplying its rated power being the product of rated voltage and rated current on the line side winding (at center tap) expressed in kVA, as defined in IEC 60076-1.

The transformer shall also be capable of delivering rated current at an applied voltage equal to 105% of the rated voltage.

Also, transformer shall be capable of supplying its rated power continuously under ambient temperature conditions without the temperature rise of the top oil exceeding 50°C and without the temperature rise of the windings as measured by resistance exceeding 55°C.

### 5.3 Overload Capacity

The transformer shall be capable of operating in accordance with the loading guidelines of IEC 60076-7 without exceeding the normal daily use of life and without the transformer winding hot spot temperature exceeding 140°C.

The Supplier shall submit calculations demonstrating that above requirements are met. These calculations shall disregard the effect of winding thermal capacity.

### 5.4 Impedance Voltage

The guaranteed value of impedance measured at 75°C and center tap shall be approx. 7% for the transformer subject to the tolerances as specified in IEC 60076.

The resistance component of impedance measured at 75°C on the center tap shall not exceed 25 % for all kVA ratings

### 5.5 Short Circuit Performance

The transformer shall be capable of withstanding the thermal and dynamic effects of short circuits. It shall be able to withstand specified system short circuit level and the duration.

The short circuit characteristics shall be as follows:

- The X/R ratio shall conform to HD 398 / HD 428
- The initial winding hot spot temperature shall be 98°C
- The final winding hot spot temperature shall be 250°C

The ability to withstand the thermal and dynamic effects of a short circuit shall be demonstrated in accordance with IEC 60076 and IEC 60354. Calculations / test certificates shall be submitted for approval.

### 5.6 Transformer Losses

Maximum load losses and maximum no load losses of transformer shall not exceed values Level 1 loss values as per IEC TS 60076-20 :2017.

The Bidder shall state the guaranteed losses. No positive tolerance is allowable on the guaranteed values. Transformers supplied with losses exceeding the guaranteed values will be rejected. The Bidder shall also state the value of guaranteed magnetizing current, subject to the tolerance specified in IEC 60076.

#### 5.6 Flux Density

The flux density at any point of the magnetic circuit when the transformer is connected on the center tap and operating at normal voltage and frequency shall not exceed 1.65 Tesla. Saturation must not occur at 10 % over voltage.

#### 5.7 Noise Level

The average noise level of the transformers shall not exceed the values given in IEC 60076-10. The measurements shall be carried out in accordance with the above standard at a distance of 300 mm from the envelope of the transformer.

#### 5.8 Tap Changing Characteristics

Each transformer shall be fitted with 5 taps with  $\pm 2 \times 2.5\%$  voltage variation. Tap changing and the tap changing mechanism shall have the following characteristics:

- Tap changing shall be carried out with the transformer off-load. An externally operated self-positioning tapping switch shall be provided.
- Provision shall be made for locking the tap switch handle with a padlock.
- Tap changer handles shall be fitted with gasketed covers, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.

### 6.0 MATERIALS AND CONSTRUCTION

#### 6.1 Core and Coils

The HV and LV windings shall be made of high conductivity copper.

The windings shall be uniformly insulated, and the HV neutral point shall be insulated for full voltage. The insulation material of windings and connections shall be high quality, free from insulation softening, shrinking, or collapsing during service. Moreover, none of the material used shall disintegrate, carbonize, or become brittle under the action of hot oil, under all load conditions.

The core shall be manufactured from non-aging, grain-orientated silicon steel or Amorphous metal. The core and coil assembly shall have the core and coils rigidly connected to the tank and suitable closed lugs shall be provided for removing the core and coil assembly from the tank.

#### 6.2 Cable Boxes and Terminals

Cable boxes for both HV and LV terminations shall be provided. All cable boxes shall be so designed that there will be no excessive stress on any parts due to temperature changes and adequate means shall be provided to accommodate conductor expansion. Insulation levels for bushings shall be at least equal to those specified for the windings.

The Bushings shall be so installed that they are easy to be checked and removed without removing

the tank cover and the pipe work.

The creepage distances for the bushings and the insulators shall not be less than 25 mm/kV for maximum phase to phase system voltage.

Both HV and LV cable boxes shall be complete with suitable for terminating Copper conductors of as details given below:

HV: For terminating XLPE insulated Copper cables up to 2 Nos 185 sqmm cables per phase.

LV: For terminating XLPE insulated Copper cables up to 6 Nos 630 sqmm cables per phase.

### 6.3 Earthing Terminals

All transformers shall be provided with a main earthing terminal of stainless steel welded to the tank and be fitted with a stainless steel M12 bolt, nut, spring washer and a lock washer.

### 6.4 Tank Fabrication

The transformer tank shall be of rigid construction, shall not leak and shall be designed so that the completed transformer can be lifted and transported without permanent deformation or oil leakage. The Supplier shall state what method of leak testing is used.

The tank shall be fabricated of mild steel or stainless steel. If stainless steel is used it shall not discolor or corrode; a minimum grade 304 L is required.

The minimum thickness of the steel tank shall be 3 mm for mild steel and an equivalent thickness for stainless steel such that its mechanical strength shall be the same as that of the 3 mm thick mild steel tank. Thickness below the minimum value will be considered only in exceptional cases, such as where special protective finishes are used. The Contractor shall provide full information about any such special finish, including any field experience.

The transformer tank and the top cover shall be designed in such a manner as to leave no external pockets in which water can lodge or dust deposits can build up.

The top cover shall be of the bolted type and fitted with neoprene bonded cork seals suitable for temperature as stipulated in this specification. Surfaces at gasketed joints shall be such that an even face is presented to the gasket, thereby eliminating the necessity for the gasket to take up surface irregularities.

The cooling surfaces may be oil filled fins or radiators. Only larger faces of the transformer shall be used to attach cooling surfaces.

All pipes and radiators, which are welded to the tank wall, shall be welded externally.

Transformers shall be wheel mounted. Skids shall be aligned at right angles to the line of the HV bushings.

### 6.5 Surface Treatment

The transformer tank, radiators and accessories should be adequately protected against corrosion

and the Supplier shall submit details of the proposed method of protection. All surfaces shall be thoroughly cleaned of rust, scale, grease and dirt and other foreign matter and all imperfections shall be removed by means of approved methods.

The transformer tank and its steel attachments shall be hot dip galvanized (80microns) or zinc metallized, followed by painting. The painting system used should be C5 level, proven and documented and suitable for salty, hot and humid environments.

The outside of the tank shall be painted Gray. The inside of the tank shall be painted with an approved oil & heat resisting (hot oil proof) varnish for inside surface so that the oil cannot come into contact with the tank metal at any time.

#### 6.6 Tank Fittings and Attachments

The following fittings and attachments shall be provided in all transformers:

- Tap changer (off-circuit with pad lockable switch)
- HV bushing assembly
- LV bushings assembly
- Main earthing terminal
- Lifting eyes pulling eyes and jacking pads
- Stainless steel engraved rating and connection plate
- Pressure relief valve
- **Dial Type thermometer with contacts and control box for relays**
- Protecting irons
- Terminal marking

#### 6.7 Transformer Assembly

The core and windings shall be dried in a vacuum drying oven. The heating and vacuum drying cycle shall be approved by the Purchaser. The tank, complete with core and windings, shall be filled with oil under a vacuum.

#### 6.8 Transformer Oil

The transformers shall be supplied with class 1 mineral oil conforming to IEC 60296. The Supplier shall submit a detailed specification for the type of oil proposed. The oil shall not contain polychlorinated biphenyls (PCB). The Employer may require evidence that the oil is not contaminated by PCB. If an anti-oxidant is recommended, its use shall be subject to the Employer's approval.

#### 7.0 TESTS

The tests listed hereinafter shall be carried out in accordance with provisions in the referenced standards in the specification.

#### 7.1 Routine Tests

Routine tests shall be carried out on all transformers and the tests shall be conducted in accordance with IEC 60076 /other standards as applicable. Copies of routine test reports shall be provided to the Purchaser upon request.

The following routine measurements and tests shall be carried out:

- Measurement of winding resistance
- Measurement of voltage ratio and check of polarity and vector group
- Measurement of impedance voltages
- Measurement of load losses
- Measurement of no load losses and no load current, including measurement of harmonics
- Induced overvoltage withstand test
- Separate source voltage-withstand tests on HV and LV windings
- Bushing routine tests
- Oil leakage test
- Relief Device test
- Dielectric Routine Tests
- Galvanizing tests.

Galvanizing tests shall be carried out on transformer tanks prior to painting. Those shall be routine tests, which shall be part of the routine tests documentation. Testing shall be in accordance with ISO 1460 and is summarized as follows;

The following tests, measurements or inspections shall be carried out on each of the selected samples:

- Visual inspection
- Thickness of galvanizing coat
- Uniformity of galvanizing coat

In the event of disagreement or dispute over the results of the above tests a coating mass test shall be carried out. The result of this test shall be definite and binding.

## 7.2 Type Tests

Certified copies of the type test carried out in accordance with IEC 60076 /other standards as indicated below shall be furnished with the offer. The test certificates should clearly identify the equipment / material concerned, showing the manufacturer's identity, type/model and basic technical parameters. The type test certificates referred to, shall be issued within 5 years from the date of bid opening from a recognized independent testing authority accredited to ISO/IEC 17025:2005 for carrying out specified type tests and acceptable to the Purchaser.

- Temperature Rise Test - This test shall be carried out on the tap having maximum losses
- Short Circuit Withstand test
- Measurement of zero-sequence Impedances
- Impulse Voltage Test and Power Frequency Test
- Acoustic Sound Level Measurement
- Tank Vacuum Test
- Measurement of Harmonic Level in no load condition
- Oil Analysis

## 8.0 INSPECTION AND TESTING

The selected Bidder shall make necessary arrangements for inspection by two (02) of the Purchasers representatives of goods prior to dispatch and to carry out sample / acceptance tests and checks in his

presence. Travel, accommodation, transport, food and daily allowance for the representatives shall be borne by the Seller.

## 9.0 OTHER REQUIREMENTS

### 9.1 Manufacturing Experience

The manufacturer shall have at least 05 years' experience in manufacturing and supply of offered type of transformers and manufacturer shall furnish documentary evidence with the offer to prove his manufacturing experience. The documentary evidence can consist of purchase orders / client letters.

### 9.2 Rating Plate

A weatherproof rating plate shall be provided in accordance with IEC 60076 and showing the following information, indelibly marked:

- Type of transformer
- Specification to which standard it was manufactured
- Manufacturer's name
- Serial number
- Year of manufacturer
- Number of phases
- Rated power
- Rated frequency
- Rated voltage
- Rated currents
- Vector group
- Percentage impedance voltage at rated current
- Type of cooling
- Continuous ambient temperature at which ratings apply
- Property of Fenaka

### 9.3 Packing and Delivery

The transformer shall be suitably packed for transportation and installation strictly according to the manufacturer's recommendations. Packing shall be suitable for transportation under restricted volumes and rough conditions for local transportation between Male and respective Islands.

### 9.4 Operations Manual, Technical Literature and Drawings

The selected Bidder shall supply along with the equipment five copies of operational and maintenance manuals for step-up transformer including all relevant drawings and technical literature.

## 10.0 QUALITY ASSURANCE

The manufacturer shall possess valid ISO 9001 Quality Assurance Certification for the process of design, manufacturer and testing of the transformers. The Bidder shall furnish a copy of the ISO Certificate certified as true copy of the original by the Manufacturer, along with the offer.

**11.0 SPARE PARTS AND TOOLS**

Spare parts required for 5-year trouble-free operation of the transformer, as recommended by the Manufacturer shall be supplied. Bidder shall submit the list of spare parts that would be supplied accordingly along with the Bid submission.

**12.0 WARRANTY**

The Bidder shall warrant that all equipment supplied shall have no defect arising from design, materials or workmanship or from any act or omission of the supplier that may develop under normal use of the supplied equipment / material.

This Warranty shall remain valid for 18 months.

**13.0 INFORMATION TO BE SUPPLIED BY THE BIDDER**

- Catalogues and drawings describing the transformer and indicating construction details, compliance standards etc. (in English Language).
- Rated values and other technical information as required in specifications.
- Type test certificates.
- Manufacturers ISO 9001 Certification.
- Manufacturer experience records