

	<b>Strategy</b>	<b>Research, Testing &amp; Development</b>
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## **1. INTRODUCTION**

Eskom faces significant challenges in inspecting and maintaining critical infrastructure, such as power station equipment, power lines, substations, and other equipment. Traditional methods often require human technicians to perform hazardous tasks such as attending to nuclear radiation alarms at Koeberg Substation, leading to safety risks, high operational costs, and potential downtime. The rising cost of maintenance and frequent equipment failures further exacerbate these challenges, impacting the reliability and efficiency of power supply.

Eskom recognises the need to embrace digitalisation to address these challenges. By integrating advanced technologies such as artificial intelligence (AI) and robotics, Research, Testing and Development (RT&D) through the Digitalisation and System Dynamics Centre of Excellence (CoE) aims to enhance operational efficiency, reduce maintenance costs, and improve the reliability of Eskom divisions' infrastructure by driving innovation and exploring new solutions to modernise power utility operations.

The acquisition and integration of the humanoid (a robot that has an appearance and characters resembling that of a human) represent a significant step towards achieving these goals. The latest advancement of technology capabilities in inspection, maintenance, and data analysis, combined with AI-driven predictive maintenance models, offer a promising solution to the challenges faced by the power utility sector. RT&D aims to lead the way in digitalising power utility operations and setting new standards for efficiency and reliability.

## **2. SUPPORTING CLAUSES**

### **2.1 SCOPE**

The scope of this document is to capture the tender technical evaluation strategy for the supply, delivery, installation and commissioning of a humanoid Robot platform that can support power utility infrastructure research. The solution shall include a complete autonomous humanoid system with AI capabilities, comprehensive software, operator training, technical support, pilot testing services etc. The vendor shall provide technical and development support for reprogramming and training of the humanoid, including training to the end user.

The Scope of work for the product supply is as follows

#### **2.1.1 Product Supply**

- Supply of complete humanoid robot, full-body bipedal locomotion.
- Real-time perception and obstacle avoidance.
- Human-like interaction via voice, gesture, and vision.
- Remote control and autonomous operation modes.

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- SDK and API access for custom programming.

### **2.1.2 Installation and Commissioning**

- On-site delivery, unboxing, assembling and testing
- Initial setup and calibration of humanoid robot platform
- Integration with existing Eskom systems and communication network

### **2.1.3 Training and knowledge transfer**

- Comprehensive operator training program
- Technical documentation and user manuals
- Maintenance procedures and troubleshooting guides

### **2.1.4 On going Support**

- Remote and onsite technical support and maintenance services
- Software updates and system enhancements as technology evolves
- Spare parts supply and warranty coverage
- Performance monitoring and optimization support

## **2.2 SPECIFICATION OF PRODUCTS OR GOODS**

**Table 1: Specification of Products or Goods**

	<b>Feature</b>	<b>Specification</b>
<b>Mechanical Design</b>	Height	≥1.52 m
	Weight	≥ 35 kg
	Degrees of Freedom	≥ 20 total (arms, fingers, legs, torso)
	Material	Lightweight alloy or composite with impact resistance
	Payload capacity	≥ 2 kg per arm
<b>Mobility</b>		
	Locomotion	Bipedal walking with dynamic balance
	Speed	≥ 1.5m/s
	Terrain Adaptability	Indoor and flat outdoor surfaces
	Fall recovery	Autonomous recovery
<b>Hand</b>	Degrees of Freedom	Thumb x4 Index Finger x3 Middle Finger x3 Ring Finger x3 Little Finger x3
	Four-Finger lateral Swing	±22°

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	Number of sensors	≥ 12 (94 pressure sensors in total)
	Vision	Stereo or depth camera (≥1080p)
	Audio	Microphone array with noise cancellation
	Touch	Tactile sensors on hands and feet
	IMU	9-axis inertia measurement unit
	LiDAR (optional)	For enhanced navigation and mapping
<b>Processing &amp; Control</b>	CPU	NVIDIA Jetson Orin NX or equivalent
	GPU	Integrated or discrete for AI inference
	RAM	≥ 16 GB
	Storage	≥ 256 GB
	OS	Linux-based or proprietary with SDK support
<b>Communication</b>	Wireless	≥ Wi-Fi 6, Bluetooth 5.0
	Wired	USB-C, Ethernet
	Remote Control	App-based and joystick control
<b>Software &amp; Programming</b>	Programming Interface	Python, C++, ROS2
	AI Capabilities	Object detection, speech recognition, gesture tracking
	Behaviour customisation	GUI and code-based programming
	Safety features	Emergency stop, compliance control, collision detection
<b>Compliance &amp; Certification</b>		
		CE or equivalent safety certification
		RoHS compliance
	Manufacturer warranty	Minimum 1 year
	Local service support	Availability in South Africa

## 2.3 PURPOSE

The purpose of this tender technical evaluation strategy is to define the Mandatory Evaluation Criteria, Qualitative Evaluation Criteria and TET member responsibilities for tender technical evaluation. The technical evaluation strategy serves as basis for the tender technical evaluation process.

## 2.4 APPLICABILITY

This document applies to the Risk and Sustainability Division.

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## **2.5 NORMATIVE/INFORMATIVE REFERENCES**

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

### **2.5.1 Normative**

- [1] 240-48929482: Tender Technical Evaluation Procedure
- [2] Scope of *supply, delivery, installation and commissioning of a humanoid Robot platform that can support power utility infrastructure research. The solution shall include a complete autonomous humanoid system with AI capabilities, comprehensive software, operator training, technical support, pilot testing services etc. The vendor shall provide technical and development support for reprogramming and training of the humanoid, including training to the end user.*

### **2.5.2 Informative**

- [3] ISO 9001 Quality Management Systems

## **2.6 DEFINITIONS**

### **2.6.1 Classification**

**Controlled Disclosure:** Controlled Disclosure to external parties (either enforced by law, or discretionary).

## **2.7 ABBREVIATIONS**

<b>Abbreviation</b>	<b>Description</b>
API	Application Programming Interphase
CPU	Central Processing Unit
CV	Curriculum Vitae
DOF	Degrees of Freedom
GPU	Graphics Processing Unit
IMU	Inertia Measurement Unit
OEM	Original Equipment Manufacturer
OS	Operational Software
PS	Power Station
RT&D	Research, Testing & Development
SDK	Software Development Kit
TET	Technical Evaluation Team
USB	Universal Serial Bus

## **2.8 ROLES AND RESPONSIBILITIES**

As per 240-48929482: Tender Technical Evaluation Procedure

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## **2.9 PROCESS FOR MONITORING**

N/A

## **2.10 RELATED/SUPPORTING DOCUMENTS**

N/A

## **3. TENDER TECHNICAL EVALUATION STRATEGY**

### **3.1 TECHNICAL EVALUATION THRESHOLD**

Mandatory Technical Evaluation Criteria (gatekeepers) are a 'must meet' criteria. These criteria shall not be weighted, or point scored but shall be assessed on a Yes/No basis as to whether or not the criteria are met. An assessment of 'No' against any criterion shall technically disqualify the tenderer and shall not be further evaluated against Qualitative Criteria.

Qualitative Technical Evaluation Criteria are weighted evaluation criteria used to identify the highest technically ranked tenderer after determining that all the Mandatory Evaluation Criteria have been met. The Qualitative Evaluation Criteria are weighted to reflect the relevant importance of each criterion. The minimum weighted final score (threshold) required for a tender to be considered from a technical perspective is 80%.

The evaluation of the tender submission will be based on the tenderer's ability to meet the Engineering requirements. A weighted score card approach will be used to evaluate the tender submission against the specifications and Employer's requirements.

The scoring method will be as shown Table 2.

**Table 2: Qualitative Evaluation Criteria Scoring**

<b>Score</b>	<b>(%)</b>	<b>Definition</b>
5	100	<b>COMPLIANT</b> <ul style="list-style-type: none"><li>• Meet technical requirement(s) AND;</li><li>• No foreseen technical risk(s) in meeting technical requirements.</li></ul>
4	80	<b>COMPLIANT WITH ASSOCIATED QUALIFICATIONS</b> Meet technical requirement(s) with; <ul style="list-style-type: none"><li>• Acceptable technical risk(s) AND/OR;</li><li>• Acceptable exceptions AND/OR;</li><li>• Acceptable conditions.</li></ul>
2	40	<b>NON-COMPLIANT</b> <ul style="list-style-type: none"><li>• Does not meet technical requirement(s) AND/OR;</li><li>• Unacceptable technical risk(s) AND/OR;</li><li>• Unacceptable exceptions AND/OR;</li><li>• Unacceptable conditions.</li></ul>
0	0	<b>TOTALLY DEFICIENT OR NON-RESPONSIVE</b>

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### **3.2 MANDATORY TECHNICAL EVALUATION CRITERIA**

N/A

### **3.3 QUALITATIVE TECHNICAL EVALUATION CRITERIA**

**Table 4: Qualitative Technical Evaluation Criteria**

	<b>Qualitative Technical Criteria Description</b>		<b>Reference to Technical Specification / Tender Returnable</b>	<b>Scoring Criteria</b>	<b>Criteria Weighting (%)</b>	<b>Criteria Sub Weighting (%)</b>
<b>1.</b>	<b>Relevant Experience and Execution of the Works</b>		As per the Scope of work		<b>30</b>	
	1.1	Capabilities of the supplier	Tenderer submit a letter from the OEM confirming that the supplier is a local agent and proof of previous contract/orders similar to this scope of work.	5- Letter and contract/orders submitted. 2.5- Submit one letter or proof of previous contracts 0- Letter and contract/orders not submitted.		5
	1.2	Company Profile 1. Manufacturers details; 2. Company Profile, projects, footprint,	The tenderer submits a detailed company profile which includes organogram and structures of the company.	Refer to table 2		10

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		<p>etc</p> <p>3. proven operational performance (local and international),</p> <p>4. the number of units in operations including letters of recommendation,</p> <p>5. response time on any defects or repair,</p> <p>6. local availability of critical spares and</p> <p>7. list of certified/accepted service agents.</p>				
	1.3	Complete Delivery Set	<p>Full operational and maintenance manual must be provided with the tender documentation as well as on delivery.</p> <p>The supplier to clearly specify all the items which are supplied with the unit (what in the box list). As well as a list of critical spares to be provided, or a</p>	Refer to table 2		10

			list of spares that are provided as a standard 'Spares Kit'. (Battery)			
	1.5	Demonstration video	<ol style="list-style-type: none"> <li>1. Supplier to provide a demo video on the flash disk submitted with the tender or a link to an internet site (e.g. YouTube) with a demonstration video. This video should demonstrate:</li> <li>2. Unit assembly, setup including all inspections.</li> <li>3. Startup and field operations (navigation, crossing panels, etc)</li> </ol>	<p><b>Scoring Note:</b></p> <p>5 = Video / link is provided showing that the product fully meets the requirements in the scope.</p> <p>4 = Video / link is provided showing that the product meets the requirements in the scope with acceptable risk.</p> <p>3 = Video / link is provided showing that the product does not fully meet the requirements, this may present risk.</p> <p>2 = Video / link is provided showing that the product does not meet requirements.</p> <p>1 = Major deviation observed in the video, presenting high risk.</p>		5

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				0 = no submission		
<b>2.</b>	Humanoid Robot Required Specifications		Provide specifications indicating the capabilities listed in sections 2.1 to 2.5 below.	As outlined below in 2.1 to 2.12.	<b>70</b>	
	2.1	Height	Height of the humanoid Robot to be from 1.27 m to $\geq 1.52$ m	5- Height is between 1.52 m and above 2 – Height is $< 1.52$ m 0-Height is $< 1.27$ m		5
	2.2	Hands	Dexterous hand with at least 18 DOF or more	5 – Hands are 18 DOF or more 0 – Hands are not 18 DOF		5
	2.3	DOF each leg	DOF each leg should be 6	5 – DOF of each leg is 6 0 – DOF of each leg is not 6		5
	2.4	Basic Computing Power	8-core high performance CPU or NVIDIA	5 – Basic computing power is of 8-core high performance CPU or NVIDIA 0 – Basic computing power does not meet the specification of (of 8-core high performance CPU or NVIDIA)		5

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	2.5	High Computing Power	Minimum Intel Core i7 or NVIDIA Jetson Orin	5 – High computing power is of Minimum Intel Core i7 or NVIDIA Jetson Orin 0 – High computing power does not meet specification of (Minimum Intel Core i7 or NVIDIA Jetson Orin)		5
	2.6	Sensing Configuration	Sensing configuration must meet specification of 3D LiDAR + Depth Camera	5 – Sensing configuration must meet specification of 3D LiDAR + Depth Camera 0 – Sensing configuration does not meet specification of 3D LiDAR + Depth Camera		5
	2.7	Speaker	Stereo, 5W or more	5 – Speaker has a Stereo specification of 5W or more 0 – Speaker has a stereo specification of less than 5W		5
	2.8	Battery Life	2 hours	5 – The humanoid robot has a battery life of 2 hours or more		5

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				0 – The humanoid robot has a battery life of less than 2 hours		
	2.9	Control	Remote and autonomous operation modes	10 – The humanoid robot can be controlled remotely and in autonomous operation mode.  5- The humanoid robot can be controlled remotely only  0 – The humanoid robot cannot be controlled remotely and in autonomous operation model		10
	2.10	Arm load	7 kg or more	5 – The humanoid robot arm can support a weight load of 7 kg or more.  2.5- The humanoid robot arm can support a weight load of between 1kg and 5 kg.  0 – The humanoid robot can only support a weight load of less than 1 kg		5

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	2.11	Secondary Development	SDK and / or API access	10 – The humanoid robot secondary Development supports SDK and / or API access requirement  0 – The humanoid robot secondary Development does not support the SDK and / or API access requirement		10
	2.12	Warranty period  The supplier to specify the warranty period as well as provide a letter in an official letterhead confirming that any claims against the warranty and technical support will be managed by the supplier.	Minimum 24 months	5 –24 months warranty 4-18 months warranty 3-12 months warranty 0 – Less than 12 months warranty		5
					<b>TOTAL:</b>	<b>100</b>





Risk		Description
1.		
2.		
3.		
4.		
5.		

**3.4.2 Exceptions / Conditions**

**Table 8: Acceptable Technical Exceptions / Conditions**

Risk	Description
1.	None identified at this stage.

**Table 9: Unacceptable Technical Exceptions / Conditions**

Risk	Description
1.	None identified at this stage.

