

Eol-Ref.: Q/AI/2020-21/UGV

Date: 12-01-2021

Expression of Interest for collaboration for co-production and Supply of Artificial Intelligence (AI) based Unmanned Ground Vehicle (UGV) to Indian Army (MoD/ MHA).

1.0 Back ground:

BEML Limited is a leading multi-technology and multi-location Mini-Ratna category-I company under the Ministry of Defence. BEML is operating its business in three verticals viz., Defence & Aerospace, Mining & Construction and Rail & Metro. It offers high-quality products for diverse sectors of economy, such as coal, mining, steel, limestone, power, irrigation, construction, road building, aviation, defence, metro and railways. It has emerged as the forerunner of heavy engineering industry with a track record of growth and revenues for over five decades.

The company has state-of-the-art manufacturing facilities at Kolar Gold Fields, Mysuru, Bengaluru and Palakkad, all possessing ISO 9001-2015 and ISO 14001 (HSC) certifications. BEML has its own world-class composite R&D establishment for Design & Development of products.

The Company has a nationwide Marketing Network and an International Business Division for Exports activity.

Details of BEML Ltd are available at www.bemlindia.in

2.0 Overview of BEML Capabilities:

BEML Limited, a Central Public Sector Enterprise under the Ministry of Defence was incorporated in 1964. Subsequently it became a listed company and is engaged in the design, development and manufacturing in the areas of Mining & Construction, Defence & Aerospace and Rail & Metro equipment.

2.1 Mining & Construction:

BEML Ltd is engaged in the business of Hydraulic Excavators, Bulldozers, Wheel Loaders, Wheel Dozers, Dump Trucks, Motor Graders, Pipe Layers, Tyre Handlers, Water Sprinklers and Backhoe Loaders to customers in the Mining and Construction segments.

BEML has also developed Mining Dump trucks of 150 Ton and 205 Ton class and Excavators of both Hydraulic and Electrical of 180 Ton capacity.

2.2 Defence & Aerospace:

BEML Ltd is engaged in the business of High Mobility vehicle for all terrain operations, Heavy Recovery Vehicle, Pontoon Mainstream Bridge Systems, Crash Fire Tenders, Mobile Mast Vehicle, Engineering Mine Ploughs, Tank Transportation Trailers, Weapon Loading equipment, Armoured Recovery Vehicle, Milrail Coaches and Wagons, ground support vehicles and other products to the Indian and other Armed Forces.

2.3 Rail & Metro:

BEML Ltd is engaged in the business of Integral Rail Coaches, Overhead Inspection Cars, AC/DC Electrical Multiple Units, Stainless steel EMUs, Utility vehicles, Track Laying Equipment, Broad-gauge Rail bus, Treasury Vans, Spoil disposal Units to the Indian and other Railways.

BEML Ltd has also successfully diversified into manufacturing state-of-the-art technology stainless steel Metro Cars for various urban Metro Corporations and enjoys a dominant market share in this segment

3.0 Research & Development:

BEML Ltd has R&D establishment for Design & Development of high-tech engineering products for its three verticals. It employs over 300 professionals with high experience and skills spanning a wide range of technology areas.

The R&D establishment has CAD Centre, Fluid-power, Powerline, Structural Engineering & Material Science laboratories and is continuously engaged in New Product Development and upgradation of existing products to meet customer requirements. More than 68% of Company's Sales Turnover is through in-house developed R&D products. The R&D expenditure is around 2 ~ 3% of its turnover.

4.0 International Business Division:

BEML has a sizeable market share in export markets with exports to 68 countries across the globe. Over the years this division has exported over 1200 machines covering all the three verticals.

5.0 Objectives of the Eol:

To identify potential partners with whom collaboration can be established for development of AI based Unmanned Ground Vehicle (UGV) which can facilitate carriage of stores thereby supporting ground soldiers.

6.0 Scope of the collaboration

To develop an Artificial Intelligence (AI) based Unmanned Ground Vehicle (UGV) capable of carrying a payload of 100 kg to 750 kg capacity over cross-country terrain to Indian Army (MoD/ MHA)

- a. Scope of BEML: Manufacturing and Marketing of UGV
- b. Collaborator's scope of supply: Design and Development of UGV

Problem Statement

Presently the troops deployed in rugged areas/ terrains in austere environment conditions are required to traverse large distances on foot with heavy loads thereby imposing fatigue & time penalty. In absence of proper roads/ tracks in forward areas it is important that the combat effectiveness of these troops is enhanced by facilitating load carriage through alternative means with matching mobility for extended periods. Unmanned Ground Vehicle (UGV) is proposed accordingly.

7.0 Technical Specifications of AI based Unmanned Ground Vehicle (UGV)

Sl No	Technical description	Requirement
1	Payload Capacity	100 to 750kg
2	Maximum Weight of Robot (Including all components like chassis, motor, battery, wheels, electronics etc.)	250 to 1000 kg
3	Obstacle Negotiation	a) Maximum Gradient- 25 deg.
		b) Maximum Vertical height- 12 inches
4	Size of UGV (for Max. Payload)	Max length- 2.4 m (approx.) Max Width- 1.7 m (approx.) Max Height- 1.5 m (approx.)
5	Drive	a) Shall have all wheel independent drive
		b) Shall have supporting suspension system to balance its CG and avoid it from toppling.
6	Control Modes	Leader Follower(s): 1.5m to 2m
		Remote operation up to 1 km
		Communication: A wireless full duplex communication for controls and half duplex for video with encrypted transmission is to be provided.
7 (i)	Power	The UGV to be powered by Battery power pack. The design shall include onboard IC engine with alternator for online battery charging or sufficient on-board battery backup provided ab-initio to meet the performance criteria given at Para 11 below. The batteries must be easily replaceable in field conditions.
7 (ii)	Maximum endurance with full load operation at speed - 4 Kmph over cross country mountainous terrain - 8 Kmph plain terrain	12 Hours
8	Maximum Operational range with payload. (Plain terrain)	100 km
9	Battery	Li Ion/ Li-Poly battery pack
10	Protection Standard	IP 65 compliant
11	Operating Temperature	-20 to 45 deg C
12	Propulsion	Electric/ Hybrid
13	Application Software	GUI based application software
14	Modular Design	Shall have Modular design

8.0 Eligibility Criteria:

The following are the mandatory conditions to be fulfilled by the firm for responding to the EoI.

- a. Should be a recognized start-up by Department for Promotion of Industry and Internal Trade (DPIIT) under the Ministry of Commerce and Industry.
- b. Should have a Registered office in India.
- c. The firm and its team shall be an OEM company having track record in building an Unmanned Ground Vehicle. Only the OEM needs to respond to this EOI. Dealers/distributors/agents/representatives need not respond.
- d. The firm shall be willing to modify the equipment to the customer's need and coproduce the equipment in BEML's plant in India.
- e. The firm shall transfer the technology to BEML to locally produce the parts/assemblies as per '*Buy & Make (Indian)*' category.
- f. The firm shall note that Govt. of India, Ministry of Defence will be acquiring these products only through a competitive tender process following the Defence Procurement Procedure (DPP) 2016. As per DPP 2016 one equipment has to be offered to the Ministry of Defence /MHA for trial testing on No-Cost-No-Commitment (NC-NC) basis. *The firm shall be agreeable to offer one equipment abiding this condition.*
- g. BEML will have the sole right to market this product in India for military, paramilitary customers in India.
- h. The firm shall accept co-branding of the product.
- i. If Firm is black listed by Govt/PSU/MoD, then it is not eligible to participate in this EoI. firm has to confirm that not black listed by Govt/PSU/MoD
- j. The firm / company shall have to confirm their eligibility as per Govt. guidelines mentioned below. Any bidder from a country which shares a land border with India will be eligible to Bid in any Procurement whether of Goods or Services (Including Consulting Services and non-consultancy services) or Works (Including Turnkey projects) only if the bidder is registered with competent Authority as per Ministry of Finance notification: F. No.6/18/2019-PPD dated 23.07.2020.

9.0 Presentations on proposed Solution/ Methodology

The firms shortlisted based on the eligibility criteria may be invited to make a presentation at a date, time and location notified by BEML. The purpose of the presentation would be to allow the participants to present their solution/ methodology, experience, capabilities, infrastructure, and other key points, if any.

10.0 Benefits of partnering with BEML

BEML Ltd has an extensive Marketing network and service centres. BEML has a strong R&D in all business verticals which have developed high end Mining and Construction equipment such as 150- and 200-Ton Dumpers and 180 Ton Excavators etc. BEML have delivered more than 1600 Metro Cars and have a dominant market share in the Indian Market. BEML Limited keeps the Indian Army and other defence forces abreast with state-of-the-art military equipment. The company manufactures variants for all terrain operations including Bridge Layer, Field Artillery Tractor, Medium & Heavy Recovery Vehicle, Pontoon Mainstream Bridge Systems, Crash Fire Tenders, Mobile Mast Vehicle, etc. BEML also supplies Engineering Mine Ploughs, Tank Transportation Trailers and Weapon Loading equipment, Armoured Recovery Vehicle, Mil-rail Coaches and Wagons. BEML plays a stellar role in the country's Integrated Guided Missile Development Project by supplying ground support vehicles. With extensive manufacturing facilities spread across India, a highly skilled and experienced manpower, presence and reach through its wide network of offices and divisions in India and a successful model of collaborating with other reputed OEMs, BEML is ideally placed to be the partner of choice in India for cooperation.

11.0 Submission of the EOI

The EOI shall be submitted **before 14:00 hours of 20.01.2021** with all the formats duly filled through following email only.

ai@beml.co.in

For any technical queries contact following official

Shri. Sunil R Kharad

General Manager (Corporate materials)

Contact Ph: 080-22963253

Annexure-2			
Annexure-1			
Compliance to point no. 7 (Technical Parameters)			
SI No	Parameter	Requirement	Compliance (Yes / No)
1	General	Should have demonstrable experience of developing/ customizing Unmanned Ground Vehicle (UGV).	
2	Payload Capacity	100 to 750kg	
3	Maximum Weight of Robot (Including all components like chassis, motor, battery, wheels, electronics etc.)	250 to 1000 kg	
4	Obstacle Negotiation	a) Maximum Gradient- 25 deg.	
		b) Maximum Vertical height- 12 inches	
5	Size of UGV (for Max. Payload)	Max length- 2.4 m (approx.) Max Width- 1.7 m (approx.) Max Height- 1.5 m (approx.)	
6	Drive	a) Shall have all wheel independent drive	
		c) Shall have supporting suspension system to balance its CG and avoid it from toppling.	
7(i)	Control Modes	Leader Follower(s) : 1.5m to 2m	
		Remote operation up to 1 km	
		Communication: A wireless full duplex communication for controls and half duplex for video with encrypted transmission is to be provided.	
7(ii)	Power	The UGV to be powered by Battery power pack. The design shall include onboard IC engine with alternator for online battery charging or sufficient on-board battery backup provided ab-initio to meet the performance criteria given at Para 11 below. The batteries must be easily replaceable in field conditions.	
8	Maximum operational endurance with full load operation at a speed of - 4 Kmph over cross country mountainous terrain - 8 Kmph plain terrain	12 Hours	
9	Maximum Operational range with payload. (Plain terrain)	100 km	
10	Battery	Li Ion/ Li-Poly battery pack	
11	Protection Standard	IP 65 compliant	
12	Operating Temperature	-20 to 45 deg C	
13	Propulsion	Electric/ Hybrid	
14	Application Software	GUI based application software	
15	Modular Design	Shall have Modular design	

Compliance to point no. 8 (Qualification criteria)		
Sl No	Parameter	Compliance (Yes / No)
1	Should be a recognized start-up by Department for Promotion of Industry and Internal Trade (DPIIT) under the Ministry of Commerce and Industry.	
2	Should have a Registered office in India.	
3	The firm and its team shall be an OEM company having track record in building an Unmanned Ground Vehicle. Only the OEM needs to respond to this EOI. Dealers/distributors/agents/representatives need not respond.	
4	The firm shall be willing to modify the equipment to the customer's need and co-produce the equipment in BEML's plant in India.	
5	The firm shall transfer the technology to BEML to locally produce the parts/assemblies as per 'Buy & Make (Indian)' category.	
6	The firm shall note that Govt. of India, Ministry of Defence will be acquiring these products only through a competitive tender process following the Defence Procurement Procedure (DPP) 2016. As per DPP 2016 one equipment has to be offered to the Ministry of Defence /MHA for trial testing on No-Cost-No-Commitment (NC-NC) basis. <i>The firm shall be agreeable to offer one equipment abiding this condition.</i>	
7	BEML will have the sole right to market this product in India for military, paramilitary customers in India.	
8	The firm shall accept co-branding of the product.	
9	Firm to confirm that, not black listed by Govt/PSU/MoD	Black listed / Not black listed
10	The firm / company shall have to confirm their eligibility as per Govt. guidelines mentioned below. Any bidder from a country which shares a land border with India will be eligible to Bid in any Procurement whether of Goods or Services (Including Consulting Services and non-consultancy services) or Works (Including Turnkey projects) only if the bidder is registered with competent Authority as per Ministry of Finance notification: F. No.6/18/2019-PPD dated 23.07.2020	