

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

Date: 12-01-2021

Expression of Interest (Eol) for supply of AI based Lighting system (Head Lamps / Fog Lamps) on Heavy Earth Moving Machinery(HEMM)

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 EoI:

To identify potential partners with whom collaboration can be established for development of AI based Lighting system (Head Lamps / Fog Lamps) on HEMM.

6.0 Scope of the collaboration



DUMPER



EXCAVATOR

- a) BEML scope of Supply: BEML shall provide the equipment for installation & testing.
- b) Collaborator's scope of supply software development along with necessary Hardware, engineering on the equipment and proving of system.

BEML makes heavy equipment for mines, defence and construction industry. Such equipment is prone to operate in rough and dusty environments.

Problem Statement

There is a need and scope of controlling the power consumed by equipment electric lamps in presence of ambient or surrounding light. The development of the proposed system shall utilize an Artificial Intelligence-based control system to control a lamp dimmer circuit based on the light present in the surrounding. Also based on the ambient condition or poor visibility, the system senses and decides to switch ON or OFF the lights, without operator intervention. The light intensity impact on operator approaching from the opposite side can be reduced and considerable energy savings can be achieved by the proposed system.

Current Status

Currently, the manually operated Rocker switches are provided on the dashboard to perform lighting action. Based on the requirement, operators actuate the switches to Headlamps/fog lamps based on ambient light condition.

Issues in Current Solution

The existing system is manually triggered and reactive. The concept is a new development on BEML equipment to bring automation in the lighting system while operating equipment without operator's intervention.

7.0 Technical Requirements

- The system is to be cost-effective, easy to retrofit on equipment and shall be an add-on module to existing manual lighting system so that based on specific circumstances if required, the operator shall be able to switch over to manual mode.
- The proposed system has to work on 24VDC battery.
- The proposed system shall be suitable for various conditions including Foggy/Dusty environment. In a Foggy/Dusty environment, Fog lamps may have to be turned on. Hence system shall be AI based to detect and validate fog/mist/dust in the environment

- The proposed system shall be rugged, vibration proof and suitable for mining application.
- Automatically dipper should be applied when a machine comes in front (50m away). The other vehicle may or may not have sensors in place hence the system should work independently
- The system should be able to respond as fast as possible to changes in lighting conditions
- When the machine reverses automatically the system should switch on the lights automatically
- Using radars or similar technology to detect incoming vehicles from the front. System shall use fool proof method to differentiate between stationary and moving machines
- Using cameras to detect environmental conditions
- Modular design with various sensors interfacing on a CAN bus. Can interface with other CAN protocols e.g. CANopen.
- System shall have the provision for connecting multiple sensors (even cameras)
- Operator inputs to be given preference
- Both the operator and the sensor data shall be recorded at regular intervals to train the AI model
- Voltage rating: 12-32V DC

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 Startup 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. Should have demonstrable experience of developing/customizing AI based Lighting system (Head Lamps / Fog Lamps) on MHE/ HEMM.
- d. The firm shall be an OEM or a IT company having track record in Artificial Intelligence based products/Technology. Only the OEM needs to respond to this EOI. Dealers/distributors/agents/representatives need not respond.

- e. The firm shall be willing to modify the equipment to the customer's need and coproduce the equipment in BEML's plant in India.
- f. The firm shall transfer the technology to BEML to locally produce the parts/assemblies as per '*Buy & Make (Indian)*' category.
- g. BEML will have the sole right to market the product in India for 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.

lightai@beml.co.in

For any technical queries contact following official

Shri. Sunil R Kharad

General Manager (Corporate materials)

Contact Ph: 080-22963253

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|                                                         |                                                                                                                                                                                                                                                          | <b>Annexure-1</b> |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Compliance to point no. 7 (Technical Parameters)</b> |                                                                                                                                                                                                                                                          |                   |
| SI No                                                   | Parameter                                                                                                                                                                                                                                                | Compliance        |
| 1                                                       | The system is to be cost-effective, easy to retrofit on equipment and shall be an add-on module to existing manual lighting system so that based on specific circumstances if required, the operator shall be able to switch over to manual mode.        |                   |
| 2                                                       | The proposed system has to work on 24VDC battery.                                                                                                                                                                                                        |                   |
| 3                                                       | The proposed system shall be suitable for various conditions including Foggy/Dusty environment. In a Foggy/Dusty environment, Fog lamps may have to be turned on. Hence system shall be AI based to detect and validate fog/mist/dust in the environment |                   |
| 4                                                       | The proposed system shall be rugged, vibration proof and suitable for mining application.                                                                                                                                                                |                   |
| 5                                                       | Automatically dipper should be applied when a machine comes in front (50m away). The other vehicle may or may not have sensors in place hence the system should work independently                                                                       |                   |
| 6                                                       | The system should be able to respond as fast as possible to changes in lighting conditions                                                                                                                                                               |                   |
| 7                                                       | When the machine reverses automatically the system should switch on the lights automatically                                                                                                                                                             |                   |
| 8                                                       | Using radars or similar technology to detect incoming vehicles from the front. System shall use fool proof method to differentiate between stationary and moving machines                                                                                |                   |
| 9                                                       | Using cameras to detect environmental conditions                                                                                                                                                                                                         |                   |
| 10                                                      | Modular design with various sensors interfacing on a CAN bus. Can interface with other CAN protocols e.g. CANopen.                                                                                                                                       |                   |
| 11                                                      | System shall have the provision for connecting multiple sensors (even cameras)                                                                                                                                                                           |                   |
| 12                                                      | Operator inputs to be given preference                                                                                                                                                                                                                   |                   |
| 13                                                      | Both the operator and the sensor data shall be recorded at regular intervals to train the AI model                                                                                                                                                       |                   |
| 14                                                      | Voltage rating: 12-32V DC                                                                                                                                                                                                                                |                   |

| <b>Annexure-2</b>                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                 |
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| <b>Compliance to point no. 8 (Qualification criteria)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                 |
| <b>SI No</b>                                              | <b>Parameter</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Compliance (Yes/No)</b>      |
| 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                                                         | Should have demonstrable experience of developing/customizing AI based Lighting system (Head Lamps / Fog Lamps) on MHE/HEMM.                                                                                                                                                                                                                                                                                                                                                                                |                                 |
| 4                                                         | The firm shall be an OEM or a IT company having track record in Artificial Intelligence based products/Technology. Only the OEM needs to respond to this EOI. Dealers/distributors/agents/representatives need not respond.                                                                                                                                                                                                                                                                                 |                                 |
| 5                                                         | The firm shall be willing to modify the equipment to the customer's need and coproduce the equipment in BEML's plant in India.                                                                                                                                                                                                                                                                                                                                                                              |                                 |
| 6                                                         | The firm shall transfer the technology to BEML to locally produce the parts/assemblies as per 'Buy & Make (Indian)' category.                                                                                                                                                                                                                                                                                                                                                                               |                                 |
| 7                                                         | BEML will have the sole right to market the product in India for 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                                                        | <p>The firm / company shall have to confirm their eligibility as per Govt. guidelines mentioned below.</p> <p>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) <b>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</b></p> |                                 |