# Expression of Interest (EOI) for Participation in the Grand Challenge

***CSIR- Central Glass & Ceramic Research Institute***

*Date*: 30/04/2025 *EOI Reference Number: CIMESGC01*

---

## 1. Introduction

The CSIR-Central Glass & Ceramic Research Institute (CGCRI) is pleased to invite Expressions of Interest (EOI) from qualified and experienced firms, research institutions, and individual developers to participate in the Grand Challenge initiative. This initiative is focused on developing innovative solutions for the 'Centre of Innovation & Manufacturing Ecosystem for Sensors (CIMES) in Industrial IoT,' aimed at fostering an ecosystem for advancing and producing fiber optic sensor technologies.

## 2. Objective of the Grand Challenge

The primary objective of this Grand Challenge is to establish a collaborative framework that will be mutually beneficial to both the CIMES project and the participating entities. This initiative seeks to leverage the expertise and talent within the local ecosystem to develop state-of-the-art solutions that address critical industrial challenges. Participants will gain valuable experience and confidence by engaging in real-time projects. Ultimately, this Grand Challenge aims to promote innovation, drive collaboration, and contribute to the development of impactful, cutting-edge technologies.

## 3. Scope of Work

The Grand Challenge is planned to be floated for the following work packages:

**work package I**:
A tunable Filter based FBG interrogator needs to be developed using a Xylinx Zynq family FPGA evaluation board interfaced with a high speed 4 channel ADC card and high speed 4 channel DAC card. The VHDL/Verilog based implementation of Programming logic needs to be done as per the algorithm provided by CGCRI and the front end GUI implementation for controlling the FPGA parameters as well as data saving and representation needs to be done in LabView/ C#.

**work package II**:
Design and development of a prototype wire wear monitoring system using components available at CGCRI and as per requirement specification provided by CGCRI.

Details of the work to be done for each work package are illustrated in **Annexure I** of this document.

Participants in the Grand Challenge will be expected to:

i. Develop a solution that aligns with the specific objectives and requirements of the challenge.
ii. Conduct comprehensive testing and validation of the proposed solution.
iii. Demonstrate the functionality and effectiveness of the developed solution.
iv. Provide detailed documentation outlining the development process, methodologies employed, and scalability potential of the solution.

**4. Eligibility Criteria**

To qualify for participation, respondents must meet the following criteria:

i. **Technical Expertise:** Proven technical expertise in relevant domain as per the requirement of each work package. The requirements for technical expertise based eligibility for each work package is detailed in the annexure II of this document.

ii. **Teamwork:** The capacity to collaborate effectively with other team members and stakeholders.
iii. **Communication skills:** The ability to clearly communicate technical concepts and project outcomes.
iv. **Project management skills:** The ability to plan, organize, and execute projects within deadlines.

The Grand Challenge aims to identify the most suitable firms/teams/individuals for carrying out development-related work in CIMES. Upon selection through the Grand Challenge, each chosen firm/ team/individual will receive a separate work order for the procurement of development-related services in accordance with CSIR-CGCRI regulations.

As such, there is no intension to impose any additional restrictions or grant further relaxations regarding the eligibility of Indian firms/teams/individuals to receive a work order. Any Indian firm/team/individual that is legally eligible for service procurement by CSIR-CGCRI through a work order may participate in the Grand Challenge. These firms/teams/individuals are required to possess only the necessary documents (such as PAN, GST, citizenship related etc.) that CSIR-CGCRI mandates for service procurement through work orders. If any individual/team/individual does not possess the required documents for receiving a work order from CSIR-CGCRI, they may participate through their institution/organization/firm which possesses the required documents.

However, since the objective of the CIMES project is to establish an indigenous ecosystem for sensor development and manufacturing in India, foreign firms/teams will not be eligible to participate.

## 5. Submission Requirements

Interested entities are invited to submit their EOIs, which should include the following components:

i. **Cover Letter:** A brief introduction to the organization or individual, including contact details.
ii. **Technical Expertise:** A summary of relevant expertise and experience, particularly in areas related to the Grand Challenge.
iii. **Project Approach:** A preliminary outline of the proposed approach to address the challenge, including the technologies and methodologies to be employed.
iv. **Previous Work:** Examples of past projects that demonstrate capabilities in the relevant areas.
v. **Team Composition:** Details of the proposed team, including qualifications and roles.
vi. **References:** Contact information for at least two professional references.

**The following points may be noted:**

regarding legal papers:

For proof of citizenship, GST/PAN, or similar documentation, any document deemed acceptable by CSIR-CGCRI under current regulations is considered valid for submission.

regarding qualifications, background and technical expertise:

Regarding technical expertise, details of all relevant qualifications of the firm's technical team, including degree and diploma certificates, as well as certifications from both short-term and long-term courses, may be accepted. To assess the firm's domain expertise, past purchase orders and work orders for similar projects is also required. Additionally, the firm/team/individual is permitted to submit supplementary documents such as certificates of appreciation, awards, recognitions, prizes, patents, research papers, copyrights and media reports etc. that highlight its technical expertise in the relevant field.

regarding NDA declaration:

The firm/team/individual must also submit a declaration or No Objection Certificate (NOC) on its letterhead, stating that if shortlisted for the pre-bid meeting, it agrees to sign a Non-Disclosure Agreement (NDA) before attending the meeting with CSIR-CGCRI.

regarding financial liability:

CSIR-CGCRI will not bear any expenditure for travel, accommodation of the firm. All such expenses will have to be borne by the firm itself.

regarding budget/financial grant:

The financial grant or budget for each work order under the Grand Challenge is capped at INR 10 Lakhs. The grant amount will be disbursed from the 'Grand Challenge' fund under the CIMES project. However, a budgetary quotation will be requested from each firm (or team/individual as per case) for the specified 'work package.'

In the selection process for awarding the work order, some preference will be given to firms/teams/individuals that quote a lower amount for the work. The exact weightage and formula for this preference are outlined in detail later in this document. This preference is intended to incentivize firms to submit their most competitive (lowest) price for the work.

regarding risk of potential damage of CGCRI facilities by the firm:

If a firm/team/individual is selected for the issuance of a work order, it will be required to deposit INR 2 Lakhs as a bank guarantee or in the form of a demand draft as caution money.

This amount may be utilized to cover the cost of repairing CSIR-CGCRI equipment or facilities in the event of any damage caused by the firm during the development work. However, for government institutions (including autonomous bodies/PSUs), this requirement may be relaxed or waived off.

regarding IPR:

If any intellectual property is developed during the process, credit will be shared between CSIR-CGCRI and the firm/team/individual. However, the primary ownership of the IP and responsibility for the expenditure related to filing the IPR will be determined on a case-by-case basis, as per the direction of the PRC and this will be reviewed at the time of filing of the IPR. The applicant of the IPR will retain the exclusive financial rights of the IPR.

## 6. Evaluation Process

The EOIs will be assessed based on the following criteria:

i. **Relevance of Experience:** The relevance of the respondent's prior work to the specific research and development objectives of the Grand Challenge.
ii. **Innovation Potential:** The originality and potential impact of the proposed approach.
iii. **Technical Capability:** The respondent's technical expertise and the availability of resources to successfully execute the project.
iv. **Feasibility and Scalability:** The practicality of the proposed solution and its potential for scalability in industrial applications.
v. **Collaborative Potential:** Willingness and ability to collaborate effectively with other participants and stakeholders.

Note: The details of selection process, is explained in detail in **Annexure II** of this document.

## 7. Submission Deadline

All EOIs must be submitted by _30th May 2025_ to email ids ***nabarun@cgcri.res.in*** and ***fosterfopd@gmail.com***. Submissions received after this deadline will not be considered.

## 8. Contact Information

For any inquiries or additional information regarding this EOI, please contact:


- **Contact Person Name: Nabarun Polley**
- **Position: Sr. Scientist and Convener**
- **CSIR- Central Glass & Ceramic Research Institute**
- **Address: 196 Raja S.C Mullick Road, Jadavpur, Kolkata-32**
- **Phone Number: 9477482143**
- **Email Address: *nabarun@cgcri.res.in*, *fosterfopd@gmail.com***


## 9. Important Notes

i. Submission of an EOI does not guarantee selection for participation in the Grand Challenge.
ii. Shortlisted participants will be invited to submit a comprehensive proposal and may be required to attend an interview or presentation.
iii. CSIR-CGCRI reserves the right to make all final decisions regarding the selection of participants for this initiative.

# Annexure I

# Work Package: I

## 1.1 Background

CSIR-Central Glass and Ceramic Research Institute has a FPGA code development facility Using this facility, FPGA codes needs to be developed in hardware description languages like Verilog and VHDL as per the algorithms provided by CGCRI. These codes may be used for data acquisition and signal processing for various experiments to be conducted in Fiber Optics and Photonics Division for CIMES project.

## 1.2 Problem statement

Based on algorithms provided by CGCRI, VHDL/Verilog codes have to be developed for Zynq UltraScale+ XCZU9EG-2FFVB1156E MPSoC based FPGA board for driving tunable optical devices through DAC and simultaneous synchronous multichannel data acquisition from photodetector using four channel ADCs. The data from the FPGA board needs to be processed in FPGA and interfaced with front end GUI console application on visual C#/ LabView/ Python. This front end GUI will also control the FPGA board.

The following items will be provided by CGCRI for the development work.

- Optical Circuit required for the development
- Zynq UltraScale+ XCZU9EG-2FFVB1156E MPSoC based FPGA board
- 4 channel ADC with sampling rate ≥ 125 Msps per channel, ADC resolution ≥ 14 bit
- 2 channel DAC with update rate ≥ 125 Msps per channel, DAC resolution ≥ 14 bit
- Computer/Workstation with Core i7 or better processor (12th generation or later) with ≥ 32 GB RAM and ≥ 250 GB SSD storage, OS Windows 11 pro or better

The following demonstrations have to be done on the development platform.

Acceptance and Demonstration

Acceptance test experiment will consist of the following steps:

- A working prototype of the data acquisition and signal processing system needs to be demonstrated.
- The design resource of FPGA consumed for this code should not exceed 60% of available resources.
- All the firmware and relevant source files and all source codes for the above need to be provided along with the project file.
- The modularity of the FPGA code needs to be demonstrated as such that a custom code can be later inserted for processing the ADC date before sending it to the front end GUI through Ethernet.
- The modularity of the GUI code needs to be demonstrated as such that further GUI development can be done over the given code considering it as black box.

## 1.3 Technical Eligibility

The participating team/firm should have proven competency for FPGA code development on Xilinx (AMD) platform and front end GUI development. The team/firm needs to prove that they have successfully completed similar projects earlier.

## 1.4 Mode of work

The major part of the work is expected to be done in CSIR-CGCRI premises using the facilities of Fiber Optics and Photonics Division of the institute. However, some portions of the work may be done outside the institute but no equipment/component belonging to CGCRI can be taken outside for doing this work.

## 1.5 Evaluation parameter

The parameter for evaluation for the work is as follows

| sl no. | Parameter | Description |
|---|---|---|
| 1. | Features and User Friendliness | This means how easily and intuitively, the FPGA code and software development can be done on this platform. It includes how easily debugging and simulation of code can be done and how easily the developed code can be downloaded in their respective devices and implemented. This also includes how lucidly the documentation and user manual are prepared. |
| 2. | Efficiency and scope of further development | This means how much resources are kept free for the user to develop the custom code. |
| 3. | Modularity and Ease of Integration | This means how easily the different components of the platform like ADC, DAC, FPGA, Front end software etc. can be accessed by the user in modular fashion. This includes the completeness of the library functions that is provided to control the components and their ease of use in the context. |
| 4. | Performance | This refers to the reliability, repeatability, testability, smoothness of operability and richness of features. |
| 5. | Flexibility | This means the upgradability, and compatibility of the platform with other hardware, firmware and software tools available |

# Work Package: II

## 2.1 Background

CSIR-Central Glass and Ceramic Research Institute has machine vision area scan colour camera and a laser illuminator. It gives GigE output which can be captured on a computer. GUI softwares for data acquisition from camera and image processing need to be developed in LabView, Python, Visual C# as per the algorithms provided by CGCRI. These codes may be used for data acquisition and image processing for various experiments to be conducted in Fiber Optics and Photonics Division for CIMES project.

## 2.2 Problem statement

Based on algorithms provided by CGCRI, LabView, Python and Visual C# codes and executable files have to be developed for their execution on a SBC/PC. The executable files will run a GUI for controlling the camera and acquiring and processing the image data from it.

The following items will be provided by CGCRI for the development work.

- Optical set-up required for the development
- Camera and Illumination devices
- Single board computer/ desktop or laptop computer
- Required software licenses

The following demonstrations have to be done on the development platform.

Acceptance and Demonstration

Acceptance test experiment will consist of the following steps:

- A working prototype GUI for image acquisition and image processing system on SBC/PC needs to be demonstrated.
- All the relevant source files and all source codes for the above need to be provided along with the project file.
- The modularity of the GUI code needs to be demonstrated as such that further GUI development can be done over the given code considering it as black box.

## 2.3 Technical Eligibility

The participating team/firm should have proven competency for LabView, Python and Visual C# code development for console application and front end GUI development. The team/firm needs to prove that they have successfully completed similar projects with involving image acquisition and image processing earlier.

## 2.4 Mode of work

The major part of the work is expected to be done in CSIR-CGCRI premises using the facilities of Fiber Optics and Photonics Division of the institute. However, some portions of the work may be done outside the institute but no equipment/component belonging to CGCRI can be taken outside for doing this work.

## 2.5 Evaluation parameter

The parameter for evaluation for the work is as follows

| sl no. | Parameter | Description |
|---|---|---|
| 1. | Features and User Friendliness | This means how easily and intuitively, the software development can be done on this platform. It includes how easily debugging and simulation of code can be done and how easily the developed code can be interfaced and implemented. This also includes how lucidly the documentation and user manual are prepared. |
| 2. | Efficiency and scope of further development | This means how much resources are kept free for the user to develop the custom code. |
| 3. | Modularity and Ease of Integration | This means how easily the different components of the software can be accessed by the user in modular fashion. This includes the completeness of the library functions that is provided to control the components and their ease of use in the context. |
| 4. | Performance | This refers to the reliability, repeatability, testability, smoothness of operability and richness of features. |
| 5. | Flexibility | This means the upgradability, and compatibility of the platform with other hardware, firmware and software tools available |

# Annexure II

## Selection Process is explained as follows

*STEP 1*

In response to the 'Call for Expression of Interest (EOI)' advertisement for the Grand Challenge that will be published in the CIMES Portal as well as CGCRI website, interested firms may submit their biodata/credentials, including details of past work experience, team members' qualifications, technical expertise, legal status, and contact information. Submissions should be sent to the Grand Challenge coordinator at ***nabarun@cgcri.res.in*** and ***fosterfopd@gmail.com***, clearly specifying the work packages they are interested in.

In this stage the firms (or teams/individuals as per case) must also submit a declaration on their official letterhead stating that, if shortlisted for the pre-bid meeting, they agree to sign a Non-Disclosure Agreement (NDA) with CSIR-CGCRI. Additionally, they must provide a separate declaration confirming their willingness to deposit INR 2 Lakhs as a bank guarantee or demand draft as caution money if awarded the work order.

*STEP 2*

Following the submission of biodata/credentials, an initial screening process will be conducted, and shortlisted firms (or teams/individuals as per case) may be requested to sign the NDA. In this stage CGCRI may ask the firms (or teams/individuals as per case) for some clarifications regarding the submitted documents if required.

*STEP 3*

Once the NDA is signed, shortlisted firms (or teams/individuals as per case) may be invited to a pre-bid meeting, where the details of the problem statement for the work package will be explained in depth.

*STEP 4*

After the pre-bid meeting, firms (or teams/individuals as per case) will be given approximately 3 weeks to prepare a PowerPoint presentation showcasing their domain expertise, past work experience, approach, concept design, and proposed model for the work. This presentation will be evaluated by an External Review Panel, which will assess the firms (or teams/individuals as per case) based on ten criteria and assign a score out of 80 points. Based on the marks of the ERP, one or more firms may be qualified for each work package.

The first five of the ten criteria are as follows:

1. Relevance of Experience: The relevance of the respondent's prior work to the specific research and development objectives of the Grand Challenge.
2. Innovation Potential: The originality and potential impact of the proposed approach.

3. Technical Capability: The respondent's technical expertise and the availability of resources to successfully execute the project.
4. Feasibility and Scalability: The practicality of the proposed solution and its potential for scalability in industrial applications.
5. Collaborative Potential: Willingness and ability to collaborate effectively with other participants and stakeholders.

The next five of the ten criteria are as package dependent.

For work package 1 these are as follows:

| sl no. | Parameter | Description |
|---|---|---|
| 1. | Features and User Friendliness | This means how easily and intuitively, the FPGA code and software development can be done on this platform. It includes how easily debugging and simulation of code can be done and how easily the developed code can be downloaded in their respective devices and implemented. This also includes how lucidly the documentation and user manual are prepared. |
| 2. | Efficiency and scope of further development | This means how much resources are kept free for the user to develop the custom code. |
| 3. | Modularity and Ease of Integration | This means how easily the different components of the platform like ADC, DAC, FPGA, Front end software etc. can be accessed by the user in modular fashion. This includes the completeness of the library functions that is provided to control the components and their ease of use in the context. |
| 4. | Performance | This refers to the reliability, repeatability, testability, smoothness of operability and richness of features. |
| 5. | Flexibility | This means the upgradability, and compatibility of the platform with other hardware, firmware and software tools available |

For work package 2 these are as follows:

| sl no. | Parameter | Description |
|---|---|---|
| 1. | Features and User Friendliness | This means how easily and intuitively, the software development can be done on this platform. It includes how easily debugging and simulation of code can be done and how easily the developed code can be interfaced and implemented. This also includes how lucidly the documentation and user manual are prepared. |
| 2. | Efficiency and scope of further development | This means how much resources are kept free for the user to develop the custom code. |

| | | |
|---|---|---|
| 3. | Modularity and Ease of Integration | This means how easily the different components of the software can be accessed by the user in modular fashion. This includes the completeness of the library functions that is provided to control the components and their ease of use in the context. |
| 4. | Performance | This refers to the reliability, repeatability, testability, smoothness of operability and richness of features. |
| 5. | Flexibility | This means the upgradability, and compatibility of the platform with other hardware, firmware and software tools available |

*STEP 5*

Each qualified firm (or team/individual as per case) (based on marks given by ERP) will be asked to submit their quotation in a sealed envelope. Depending on the quotation amount the firms (or teams/individuals as per case) may be awarded marks out of 20. The formula to calculate this formula is as following.

20x[1-Q/1000000], where Q is the all-inclusive quoted price in INR.

Based on the total marks (i.e. out of 80 judged by ERP and out of 20 as computed from the quoted price), the firms/teams/individuals will be ranked in order. The highest scoring firm/team/individual will be invited to receive the work order. If the highest scoring firm/team/individual refuses to receive work order at this stage, the next ranking one will be called and so on.

*STEP 6*

The fund will be disbursed after successful implementation of the design and completion of the project by the firm (or teams/individuals as per case).

## Regarding TA-DA

In case the parties are invited to give presentation/discussion, they will have to bear the expenditure themselves. CGCRI will not provide any financial assistance towards this.