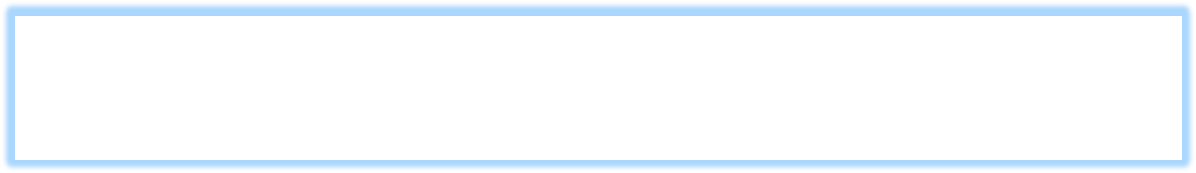
## Department of Science & Technology Call for Proposals



**Methane Monitoring and Mitigation Technologies (M3T)**

**General Information & Formats for Submission of Project Proposal for Financial Assistance**

****



**Last Date of Submission: 31stMarch 2025**

**ONLINE MODE ONLY (https://onlinedst.gov.in/Login.aspx) NO HARDCOPY**

**Government of India Ministry of Science & Technology**

**Department of Science & Technology**

**Climate, Energy, and Sustainable Technology (CEST) Division**

**Technology Bhavan, New Mehrauli Road New Delhi – 110016**

# Call for Proposals on Methane, Monitoring and Mitigation Technologies (M3T)

1. **Background and Relevance of the Call**

Methane is the second most abundant anthropogenic greenhouse gas (GHG) after carbon dioxide (CO2), and constitutes approximately 20 percent of global emissions. It is classified as a “short-term climate forcer,” with a relatively shorter lifespan in the atmosphere of approximately 12 years. Despite its shorter duration and lower emission levels compared to CO2, methane's global warming potential surpasses that of carbon dioxide by nearly 28 times over a century horizon. It is an exceptionally potent greenhouse gas being ~ 86 times more powerful than CO2 in its first two decades.

Eliminating Methane emissions can yield significant benefits in the race to mitigate global temperature rise. The urgency of tackling methane emissions is highlighted in the Paris Agreement, which seeks to limit global temperature rise to well below 2℃ above pre-industrial levels. Looking its significant global warming potential, reducing methane emissions is recognized as one of the most effective strategies for achieving short-term climate objectives, making it a key focus in global efforts to combat climate change.

As part of India’s climate commitments, reducing methane emissions is a crucial element of its climate strategy. Addressing these emissions requires a multi-faceted approach that incorporates technological innovation, robust policy measures, and international cooperation etc. Targeting methane emissions from major sectors such as oil and natural gas, coal mining, landfills, and wastewater can significantly lower overall greenhouse gas emissions. For instance, the oil and gas sector alone contribute nearly 25% of global methane emissions, while landfills account for about 11%.

**Global Methane Emission**

8%

5%

23%

Oil and Natiral Gas

Landfill and Wastewater Coal Mining

32%

Livestoke and Manure

20%

Rice Cultivation

12%

Others

Figure 1: Global Methane Emission by Source (Ref: 2021. [Global Methane Assessment.](https://www.ccacoalition.org/resources/global-methane-assessment-full-report))

Methane mitigation is essential for achieving net-zero targets by addressing one of the most potent and short-lived climate pollutants. For example, the oil & gas industry alone accounts for nearly 25% of global methane emissions, while landfills contribute around 11%. Effective methane management in these Sectors is vital to accelerating progress toward a sustainable and climate-resilient future.

1. **Sectors Contributing to Methane Emissions include in the Proposed Call:**
2. Oil & Natural Gas
3. Coal Mines,
4. Landfills
5. Wastewater



(a)

(b)

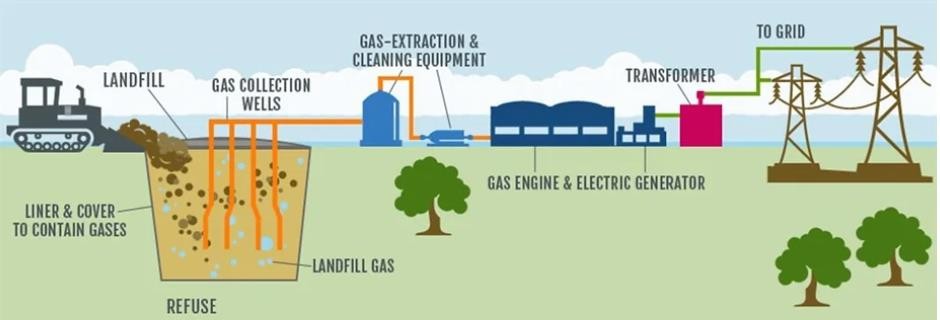
(c)

(d)

1. **Oil & Natural Gas:** Methane emissions in the oil and gas sector pose a significant environmental challenge. While burning natural gas emits 50% less carbon dioxide than coal, this climate benefit is undermined by methane leaks. These leaks, from sources like malfunctioning equipment and intentional venting or flaring, require advanced detection technologies. Even a small methane leakage rate of 0.2% can negate the climate advantage of natural gas over coal. Addressing methane emissions is crucial for reducing the sector's environmental impact and advancing a more sustainable energy future.

Methane emissions in the oil and gas sector present a significant environmental challenge. Although burning natural gas produces 50% less carbon dioxide than coal, its climate benefits are often offset by methane leaks. These leaks, which arise from sources such as malfunctioning equipment, intentional venting, and flaring, necessitate the use of advanced detection technologies. Even a minimal methane leakage rate of 0.2% can nullify the climate advantage of natural gas over coal. Effectively addressing methane emissions is essential to reducing the sector's environmental impact and fostering a more sustainable energy future. In 2024, two advanced methane-detecting satellites were launched, with nearly 10 additional launches planned by 2026, marking the beginning of a new era in space-based methane detection.

1. **Coal Mines:** Methane is generated during coalification, with a portion remaining trapped under pressure within coal seams and surrounding rock strata. During mining, this methane is released as Coal Mine Methane (CMM). Emission sources include seepage from exposed seams in surface or open pit mines, drainage systems, ventilation systems, post-mining activities like processing and transport, and abandoned mines. Fugitive methane, emitted from coalmines around the world, represents approximately 8% of the world's anthropogenic methane emissions that constitute a 17% contribution to total anthropogenic greenhouse gas emissions. Coal mine methane is a general description for all methane released prior to, during and after mining operations. Ventilation air methane is the primary CMM source in underground mines, while drainage systems are significant in surface mines. Methane emissions are typically higher in underground mines due to the greater methane content in deeper coal seams. Emissions from coal mining could be reduced by pre-mine degasification and recovery of methane during coal mining.
2. **Landfills:** Methane is produced during the decomposition of organic waste in anaerobic conditions, typically found in landfills and dumpsites. Initially, waste undergoes aerobic decomposition with minimal methane generation, however within a year, anaerobic conditions develop, leading to significant methane production. Methane emissions from landfills pose serious risks, particularly to nearby low-income communities, due to potential health hazards and the threat of spontaneous combustion, which can cause fires and toxic fumes. The risk of landfill fires increases due to methane's flammability and adverse meteorological conditions. These emissions can be mitigated through innovative technologies, such as waste-to-energy plants, improved waste management facility efficiency, and efforts to reduce food waste etc.



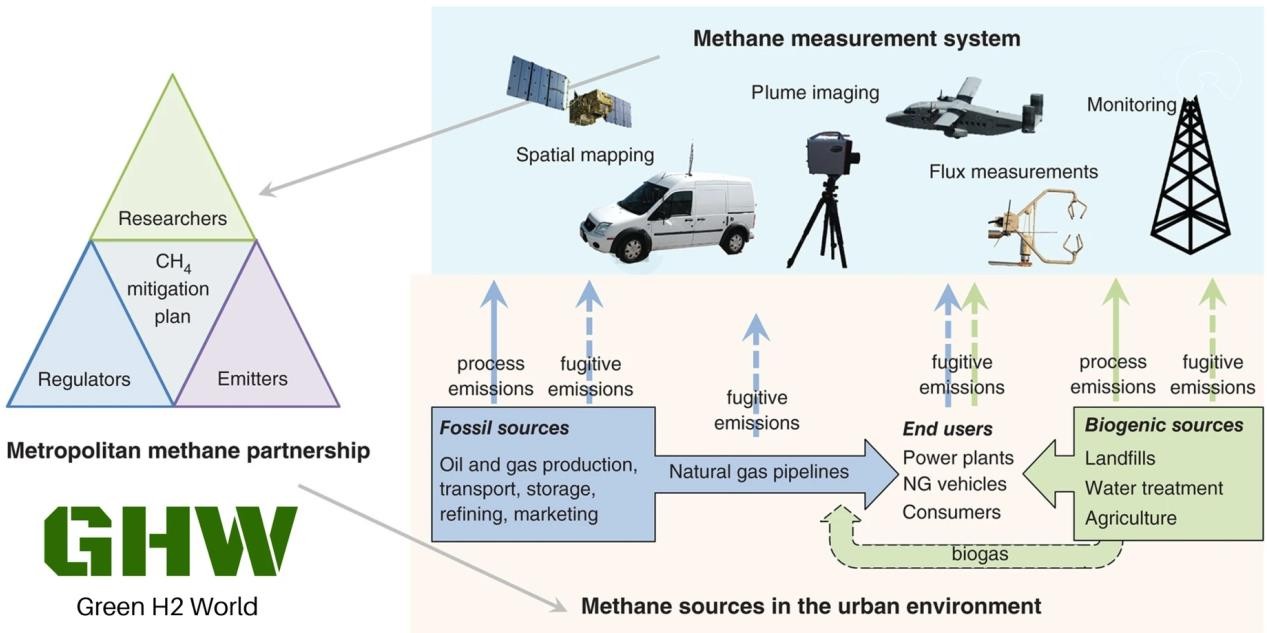
**Fig 2.** Methane: Transforming Landfills Emissions

1. **Wastewater:** Methane emissions from wastewater occurs primarily when municipal and industrial wastewater along with sludge, are handled under anaerobic conditions. Methane is also released when biogas is flared instead of being captured and utilized, contributing to global warming. To mitigate these emissions, advanced wastewater treatment technologies that reduce treatment time, as well as the adoption of anaerobic gas infrastructure and improved monitoring technologies, are essential. These initiatives help to achieve net-zero goals by addressing methane emissions from wastewater facilities and other similar sources.

**"In this context, the Department of Science and Technology (DST) announces a call for proposals focused on research and development (R&D) and technology assessment to identify and prioritize breakthrough Methane Monitoring and Mitigation Technologies (M3T) in the areas proposed above."**

* 1. **Objectives and Expected Deliverables:**

The Methane, Monitoring and Mitigation Technologies (M3T) Program envisages to develop a variety of technologies for identifying, measuring, monitoring, and eliminating methane emissions. Research and Development (R&D) in methane mitigation focuses on multiple areas to effectively reduce emissions across different sectors.



**Fig. 3** Methane Emissions and Monitoring Technologies

The call emphasizes on following Technical thematic under different sectors mentioned below:

* 1. **Oil and Natural Gas:**
     + **Advanced Monitoring and Detection:** Utilization of satellite, aerial, and beam sensor systems, along with Optical Gas Imaging (OGI) and sniffer surveys, for effective methane detection and comprehensive leak detection strategies.
     + **Continuous Monitoring and Data Integration:** Implementation of permanent sensors and digitized processes for real-time monitoring, enhanced by AI analytics for improved data analysis and responsiveness.
     + **Remote Sensing and Satellite Monitoring:** Developing high-resolution satellites and remote sensing technologies to accurately detect and quantify methane emissions globally.
     + Developing integrated methane measurement and monitoring platforms to improve the accuracy of methane emissions estimates;
     + **Methane Capture from Oil and Gas Operations:** Enhancing technologies for capturing methane from venting and flaring processes and developing systems to utilize captured methane as a resource.
     + **Transmission and Distribution Losses Reduction**: Development of advanced and Innovative technologies to eliminate or reduce methane leakage from oil and gas infrastructure by making it as leak-tight as possible;

**Table 1: Key Technologies, Challenges and Research Requirement in Oil and Natural Gas Sector and Targeted TRL under this Call are as below:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Area of Interest** | **Key Technologies** | **Description** | **Technical Challenges** | **Research Requirement** |
| Methane Emissions Reduction from Existing Wells and Infrastructure | Cost-effective sensors and Leak Detection Systems | * Solutions for methane detection and control * Machine Learning (ML) systems to analyze data for   leak detection. | * Small operators lack affordable, localized solutions * Requires high-quality data and computing resources. * Limited field validation |  Development of cost- effective methane sensors   Development of AI- Based detection system   Validate performance |
| Methane Capture Technologies | Engine and Compressor Methane Reduction Technologies | * Researching and validating early- stage designs for methane reduction technologies. | * Limited scalability. * High operational temperature requirements. |  Explore novel catalytic systems to oxidize methane in low- concentration emissions.   Validate performance in controlled lab setups. |
|  | Biological Methane Capture | Microbial systems to capture and oxidize methane. | * Slow reaction rates. * Sensitivity to environmental   conditions | Development of Biofilters with high capture rate |
|  | Vapor Recovery Units (VRUs) | * Captures vapors during product transfer to reduce emissions and generate energy. | * High installation costs and ongoing maintenance required. * In-efficiencies in capturing low-pressure emissions |  Improve efficiency to capture low emissions (< 1%)   Validate performance in controlled lab setups. |
|  | Flaring | Burning off natural gas instead of capturing it for productive use. | * High capital and operational costs. * Limited infrastructure in remote areas. |  Technology to reduce methane flaring by alternative methods   Development of Gas-to- Liquid conversion   Reinjection |
| Methane Monitoring Technologies | Optical Gas Imaging (OGI) | * Real-time monitoring capability. * Highly effective for visual leak detection. * Efficiency Up to 90% for large leaks. | * Limited sensitivity to small leaks * High initial cost * Need for skilled operators. * High variability in emission sources and limited access to advanced lab setups. |  Developed lab-scale systems to demonstrate sensitivity and reliability in lab conditions for small leaks .   Establish proof of concept. |

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| Continuous Emission Monitoring Systems (CEMS) | * Provides real-time data on emissions for regulatory compliance. * Immediate detection. * Ensures 90% or higher accuracy. | * High operational costs * Complex installation requirements. |  Establish proof of concept for monitoring technologies at lab scale. |
| Infrared Spectroscopy | * Accurate measurement of methane levels across various conditions. * Provide 95% or higher accuracy. Ensure high   precision in measurements. | * Expensive equipment * Require calibration and skilled operators. |  Establish proof of concept.   Demonstrate reliability in lab conditions. |
| Basic IoT integration for data transfer | Designing frameworks for methane data collection and sharing | * Lack of methane monitoring frameworks hinders inclusive mitigation efforts. |  Create community-led prototypes.   Test in localized settings |

* 1. **Coal Mining Sector:**

Methane research in the coal mining sector is essential to address safety, environmental, and economic challenges associated with methane emissions. Below are key research areas:

* + - **Data Collection and Analysis:** Systematically acquiring and analyzing methane concentration data in coal and shale formations during drilling operations, while establishing statistically significant correlations between methane concentrations and drilling depths.
    - **Predictive Methodologies and Emission Assessment:** Formulating advanced predictive models for estimating methane emissions, quantifying emission rates specific to distinct coalfields, and evaluating fugitive emissions associated with drilling activities

**Table 2: Key Technologies, Challenges and Research Requirement in Coal Mining sector are as below:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Key technologies** | **Description** | **Technical Challenges** | **Research Requirement** |
| Enhanced coal mine methane drainage | Extraction of methane from coal seams before, during, or after mining using advanced drilling and drainage methods. | Limited understanding of site-specific coal seam properties hinders methane extraction research and optimization. |  Explore novel drilling fluids or membranes.   Better materials for corrosion resistance in pipelines   Validate methods for efficient drainage in lab conditions. |
| Methane Sensors | * Effective for early detection in mines. * 80-90% detection rate | Limited range, requiring regular calibration for accurate measurements. |  Develop accurate, real-time detection systems.   Increase methane detection rates. |
| Ventilation Air Methane Capture (VAMCAP) and  Mitigation (VAMMIT) | VAMCAP role is to collect and separate methane from the ventilated air, employing state-of-the-  art carbon composites. | Challenges in capturing low concentration methane and lack of cost-effective materials. |  Validate capture efficiency in controlled environments.   Explore novel adsorbent materials. |
|  | VAMMIT technology contributes to the reduction of fugitive gas in a sustainable manner. | Early-stage catalyst research, high energy consumption, and operational challenges in varying mine conditions. |  Test catalytic materials for methane oxidation.   Development of low concentration oxidation technologies (eg. Regenerative thermal oxidizers)   Development of non-combustion pathways   Improve energy efficiency (>90%) |
| Methane Abetment through Catalytic and Non-Catalytic Technologies | Reduction of methane emissions through catalytic oxidation or other chemical processes. | * Challenges in scalability, efficiency under real- world conditions, * Catalyst deactivation during integration with mine systems. |  Development of robust, contaminant-tolerant catalysts.   Exploration of photochemical or plasma-based abatement methods.   Validate methane oxidation efficiency of novel catalysts.   Reduce energy inputs in lab conditions. |

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| Advanced Monitoring and Control Systems | Digital systems using IoT, AI, and remote sensing to monitor and optimize methane management. | * High cost of deploying real-time sensors in underground environments. * Reliability of systems under extreme conditions (e.g., dust, humidity). * Data security and integration issues. |  Development of ruggedized, wireless sensor networks.   AI-driven predictive analytics for early risk identification.   Blockchain for secure data sharing across stakeholders. |
| Methane-to-Value Technologies | Converting captured methane into higher- value products, such as methanol or hydrogen. | * Economic viability of conversion processes at varying methane scales. * Complex process chemistry requiring pure methane streams. |  Development of compact, modular conversion process for mine sites.   Catalysts tailored for low- concentration methane streams.   Hybrid approaches integrating methane capture and conversion. |

* 1. **Landfills**
     + **Carbon Sequestration:** Exploring methods to sequester carbon dioxide produced from methane oxidation, reducing the overall carbon footprint of landfill gas emissions.
     + **Emission Modelling:** Developing advanced models to predict methane emissions based on waste composition, climate conditions, and landfill operations.
     + **Lifecycle Analysis:** Conducting lifecycle assessments to evaluate the overall environmental impact of different methane mitigation strategies in landfills.
     + **Feasibility Studies and Innovations:** Conducting techno-economic feasibility studies to implement methane mitigation strategies, alongside exploring advanced waste management technologies.
     + **Tailored Solutions and Economic Impact:** Developing customized solutions for waste management and promoting biogas conversion to Renewable Natural Gas (RNG) to enhance rural economies and establish effective methane reduction strategies.

**Table 3: Key Technologies, Challenges and Research Requirement in Landfills sector are as below:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Key Technologies** | **Description** | **Technical Challenges** | **Research Requirement** |
| Landfill Gas Monitoring Systems | * Effective for tracking landfill gas emissions. * 80-90% accuracy. * Ensure regulatory compliance. | * High costs of sensor deployment and maintenance. * Difficulty in ensuring sensor accuracy in harsh landfill environments. |  Development of low-cost, ruggedized sensors for landfill conditions.   AI-driven analytics for optimizing gas collection and mitigation strategies.   Wireless networks system for remote monitoring and control. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | * Data integration challenges in older systems. |  Validate technologies at lab scale. |
| Gas Collection Systems | * Capture methane and other gases generated by anaerobic decomposition * Gases are typically collected using wells, piping networks, and vacuum pumps. * Efficiently captures methane for energy. * Up to 90% recovery. Reduce odors and emissions. | Requires significant infrastructure investment and ongoing  maintenance. |  Explore and validate advanced collection mechanisms in controlled environments.   Low-cost retrofitting techniques for older landfills. |
| Low-cost retrofitting techniques for older landfills. | Engineered landfill caps containing microbial layers designed to convert methane to CO₂. | * Low oxidation rates in extreme weather conditions. * High costs of constructing engineered caps. * Lack of standardization in cap design. |  Development of low-cost materials for methane oxidation.   Integration of methane oxidation layers with vegetation for dual benefits.   Enhanced microbial consortia for higher  oxidation efficiency. |
| Leachate Management and Gas Recovery | Systems that manage landfill leachate while capturing methane dissolved in the liquid phase | * High variability in leachate composition makes treatment complex. * Difficulty in recovering gas cost- effectively from leachate. * Corrosion and fouling of equipment. |  Technologies for simultaneous leachate treatment and gas recovery.   Exploration of membrane-based separation methods.   Studies on the economic feasibility of integrated systems. |
| Natural Gas (NG) Production | Upgrades landfill gas to pipeline-quality methane by removing CO₂, water, and impurities. | * High costs of upgrading and compression systems. * Siloxane and sulfur compound removal remain technically challenging. Infrastructure gaps for NG distribution |  Development of low-cost gas upgrading technologies.   Modular RNG systems for distributed landfill applications.   Exploration of alternative uses for byproducts like  CO₂. |

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| Waste-to-Hydrogen Systems | Converts landfill gas into hydrogen through reforming processes or advanced gasification. | * High energy requirements for reforming. * Dependence on consistent methane quality. * Limited commercial- scale demonstrations. |  Development of efficient catalysts for methane reforming.   Feasibility studies for combining hydrogen production with carbon capture. |

**2.3 Wastewater:**

* **Anaerobic Digestion Optimization:** Enhancing anaerobic digestion processes to maximize methane capture and reduce emissions from wastewater treatment.
* **Innovative Sludge Management:** Developing better methods for managing sludge to minimize methane release during processing and storage.

**Table 4: Key Technologies, Challenges and Research Requirement in Wastewater Sector**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Area of Interest** | **Key Technologies** | **Description** | **Technical Challenges** | **Research Requirement** |
| Technologies for Methane Production | Anaerobic Digestion (AD) | * Converts organic matter in wastewater into biogas * Produces biogas for energy recovery, reducing dependence on fossil fuels. | * High sensitivity to operational conditions * Limited efficiency in dilute wastewater streams. * Inhibition by toxic compounds in industrial wastewater. |  Enhanced  microbial consortia for diverse feedstocks.   Development of low-cost, high- efficiency digester designs.   Strategies for managing inhibitory compounds. |
| Methane Recovery and Utilization | * Biogas upgrading systems * Combined heat and power (CHP) systems * Direct biogas use for heating or electricity | Methane in biogas is separated, purified, and used as natural gas (NG) or in CHP systems for energy generation. | * High cost of biogas upgrading and infrastructure. * Regulatory barriers for RNG grid injection. * Variability in biogas quality and quantity. |  Cost-effective biogas upgrading technologies.   Modular and scalable systems for small and medium facilities.   Lifecycle  assessments to optimize economic and environmental impacts. |

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| Methane Emission Mitigation and Monitoring | * Covers and liners for anaerobic lagoons * Oxidation technologies * Leak detection and monitoring systems | Reduces fugitive methane emissions from wastewater treatment plants (WWTPs) and lagoons. | * Difficulty in quantifying emissions from diffuse sources. * Maintenance and durability of covers and liners. * Costs associated with continuous monitoring systems. |  Advanced sensors for real-time methane monitoring.   Low-cost, long- lasting materials for emissions control.   Models to predict and mitigate emissions under varying conditions. |
| Emerging Methane Capture Technologies | * Electromethanogenesis (microbial electrochemical systems for methane production) * Photocatalytic methane conversion (light-driven systems for biogas upgrading) * Gas-phase biofilm reactors | Innovative methods for direct methane capture and conversion, offering efficiency and environmental benefits. | * High capital and operational costs for emerging technologies. * Limited scalability and field testing. * Integration with existing wastewater treatment processes. |  Lab-scale  demonstrations to assess feasibility.   Materials research to improve efficiency and reduce costs.   Understanding of long-term operational performance. |

1. **Streams**
   1. **Applied Research Stream**: Leading to Establishment of Proof-of Concept.
      * **Concept:** The proposal should explore innovative and breakthrough ideas with a view to showcase the unique advantages of the idea over existing alternatives and to demonstrate that their innovative idea has the ability to address a significant end-user need. This has to be substantiated by a clear articulation of need supported by a quantitative performance statement from the participating user.
      * **Eligibility:** The proposals are to be led by faculties/ scientists working in regular positions in recognized Academic Organizations/Public funded R&D Institutions/Laboratories, Central and state government autonomous organizations state S & T councils.
      * **Project Cost:** Not exceeding 1 crore (indicative) where equipment cost is not expected to exceed 30% of the project cost. Overheads are admissible as per DST norms above these costs.
      * **Duration:** 36 Months
   2. **Technology Assessment Stream**: For translational R&D and validation of the developed technology in laboratory or relevant environment at TRLs 4-5, with a mandatory requirement to include life-cycle (LCA) and techno-economic (TEA), Socio-economic (SEA) assessments.
      * **Concept:** The stream includes grants to Academic/R&D Institute(s), for setting up of a test bed, provided the partnering user demonstrates a willingness to validate the technology by providing tangible inputs to the project.
      * **Eligibility:** The proposals are to be led by faculties/ scientists working in a regular position in recognized Academic institutions, Public-funded R&D Institutions/ Laboratories in partnership with other academic, R&D organizations, DSIR-recognized R&D organizations, industries, and Users (Utility, Panchayat, Municipal Corporation, Urban Development Authority, etc). Participation of industries, users, start-ups, and industry associations is strongly recommended and essential.
      * **Project cost:** Not exceeding ₹ 2 crores (indicative) where equipment cost is not expected to exceed 30% of the project cost. Overheads are admissible as per DST norms above these costs Project
      * **Duration:** 36 Months
2. **Call Dates:**

**Call Opening Date: 13.01.2025 Call Closing Date: 31.03. 2025**

1. **Proposal Formulation:**

The call has been formulated and evolved through phase-wise consultation with stakeholders to identify current and emerging Methane Monitoring and Mitigation Technology. Thematic identified under the call are in line with the National Net Zero Commitments and global Climate goals. The relevance of the work proposed should be based on the identified thematic of the call. The applicants are advised to indicate TRL level of the technology proposed at the onset and end of the project. The below given Call Formulation guidance is not exhaustive but is designed to help interested organizations to develop proposals.

* Proposed work should necessarily be in line with the National Net Zero Commitments and Climate goals. The proposed work should be truly innovative and transformational and should be relevant to the Technical thematic of the call. Proposals should make clear how they are adding value and not duplicating an existing solution; multiple forms of innovation are eligible and will be considered. Proposals should also clearly illustrate how the work proposes to overcome technical barriers of the current issues in methane mitigation.
* Proposed work should be for Applied Research establishing the proof-of-concept in the early stages of development and Technology Assessment for Translational R&D, defined broadly as the critical transition phase of idea/concept to development thus making support from this grant most impactful.
* The maximum duration of the project should not be more than 36 months. Each project is subject to review at key milestones to ensure continued funding.
* The grant places strong emphasis on evidence-based results. Proposals must clearly define the indicators of success in the proposed work to be also exhibited as quantified tangible benchmarks within target timelines during the project lifecycle. Intellectual Property (IP) Generation should be one of the focused deliverables of the proposed work. The grant also places a strong emphasis on sharing the results more widely.
* Project implementing organizations will be required to maintain an Open Access Policy.

1. **Criteria for evaluation:**

The proposals would generally be evaluated based on the following criteria. However, weightage of each of these criterions will vary depending upon the anticipated output of the stream:

1. Relevance of the proposal with the Call
2. Demand or need of proposed work
3. Credibility Track Record and commitment of the Project Team
4. Novelty, feasibility, and scientific merit of proposed work
5. Superiority of proposed work over existing alternatives. (not applicable for applied research stream)
6. Proposal formulation should bring out clearly expected outcomes with defined and tangible benchmarks within target timelines, Details of Technology to be developed /assessed or deployed, why it is important, what are the expected impacts of the proposed work, clear articulation of methodology and delineation of roles and responsibilities of various partners and collaborators.
7. Technical, environmental and economic viability of the proposed work.

DST at the behest of the Expert Panel may introduce any other criteria considered to be critical for successful implementation of the project. Proposal Formats and Submission: Proposals may be submitted at e-PMS (<https://onlinedst.gov.in/Login.aspx>) in prescribed format of Individual proposal before the closing date of the call.

**Contact Persons:**

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Phone: 011- 26590270

# Proposal for Support Under

**Call on Methane Monitoring and Mitigation Technologies (M3T)**

The Project Proposal could be submitted in the enclosed format through **ONLINE MODE ONLY (**[**https://onlinedst.gov.in/Login.aspx**](https://onlinedst.gov.in/Login.aspx)**) NO HARDCOPY** of the project proposal should be submitted.

**PROJECT TITLE**

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| **S. No.** | **ITEMS** | **Page No(s)** |
| I. | Proposal Summary |  |
| II. | Core Proposal |  |
| III. | Budget |  |
| IV. | Bio-Data of PI and Co-PI |  |
| V. | DST Policy on Conflict of Interest for Applicant |  |
| VI. | Undertaking from the Investigator |  |
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| **Annexures** | | |
| 1. | Budgetary Quotes for Equipment’s/consumables |  |

**Application received without the above documents with incomplete information will not be entertained.**

* + 1. **Proposal Summary *(To be limited to singleA-4 page)***

|  |  |  |
| --- | --- | --- |
| **Stream** | **Sectors** | **Tick the most appropriate one (**✔ **)** |
| **Applied Research** | Oil & Natural Gas |  |
| Coal Mines |  |
| Landfills |  |
| Wastewater |  |
| **Technology Assessment** | Oil & Natural Gas |  |
| Coal Mines |  |
| Landfills |  |
| Wastewater |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **I** | **Project Title** |  | | | | | |
| **II** | **Project cost *(Amount in lakhs)*** | **DST:** Rs. Lakhs | | | **Industry Partner:** Rs. Lakhs | | |
| **III** | **Duration *(in months)*** |  | | | | | |
| **III** | **PI Name** | Name | Gender | Date of Birth | | Category  (General/SC/ST/Others etc.) |  |
|  |  |  | |  |
|  | | | | | |
| **IV** | **Co-PI Name** | Name | Gender | Date of Birth | | Category  (General/SC/ST/Others etc.) |  |
|  |  |  | |  |
|  | | | | | |
| **V** | **Lead Organizations** |  | | | | | |
| **VI** | **Lead Organization Status** |  | | | | | |
| **VII** | **Industry Partner Name(s)** |  | | | | | |
| **VIII** | **Industry Partner Status** |  | | | | | |
| **IX** | **Objectives** |  | | | | | |
| **X** | **Methodology** |  | | | | | |
| **XI** | **Deliverables** |  | | | | | |

## Budget Details:

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | **Project Manpower (Post & Nos)**  **(*As per DST OM No. 33/(14)/PFC-***  ***II/2018 dated 21.06.2023***  ***And DST OM. No. SR/S9/Z- 05/2019 dated 10.07.2020*)** | **DST:** | **Industry:** |
| **B.** | **List of Equipments required** | **DST:** | **Industry:** |
| **C.** | **Details of Fabricated Plant**  **/prototype, if any** | **DST:** | **Industry:** |
| **D.** | **Nature of Contribution from Collaborator/ stakeholder** | **In Cash & Kind *(Please elaborate): Rs….Lakhs*** | |

**Budget Estimate**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S.**  **No.** | **Item Head** | **1st Year** | | **2nd Year** | | **3rd Year** | | **Total (Rs. Lakhs)** |
|  |  | **DST**  **Share** | **Industry Share (if**  **any)** | **DST**  **Share** | **Industry Share (if**  **any)** | **DST**  **Sh are** | **Industry Share (if any)** |  |
| **A** | **Non-recurring (Capital Items)** | | | | | | | |
| **1** | **Permanent Equipments (details of**  **Indigenous/Foreign items separately)** |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ***A’*** | ***Sub total (Capital items*#*)*** |  |  |  |  |  |  |  |
| **B** | **Recurring Items (General)** | | | | | | | |
| **1.** | **Manpower\* (*As per DST OM No. 33/(14)/PFC-II/2018***  ***Dated 21.06.2023 and DST OM. No.***  ***SR/S9/Z- 05/2019***  ***dated 10.07.2020*)** |  |  |  |  |  |  |  |
| **2.** | **Consumables** |  |  |  |  |  |  |  |
| **3.** | **Contingencies** |  |  |  |  |  |  |  |
| **4.** | **Travel** |  |  |  |  |  |  |  |
| **5.** | **Other Miscellaneous Cost (Fabricated systems/ demonstration models and Civil,**  **E&C etc.)** |  |  |  |  |  |  |  |
| **6.** | **Overhead (as per DST norms*,***  ***OM. NO. SR/S9/Z-11/2013 dated 24.02.2015*)** |  |  |  |  |  |  |  |
| ***B’*** | ***Sub-total (General)*** |  |  |  |  |  |  |  |
| **C** | **Total cost of the project (A’+B’)** |  |  |  |  |  |  |  |

**\* The manpower recruited for the project should be paid as per the rules of the institute and guidelines of the Government of India (*As per DST OM No. 33/(14)/PFC-II/2018 dated 21.06.2023 and SR/S9/Z-05/2019 dated 10.07.2020*). The posts which are not covered under the guidelines but permissible under projects at the host institute are also permitted. The temporary staff employed for the project by the organization is not treated as employees of the Government of India and the deployment of such staff at the time of termination of the project will not be the concern/responsibility of the Government of India.**

**# *Capital cost is not expected to exceed 30% of the total project cost.***

**Total DST Share:**

**Total Industry Share (*if any*): Total Project Cost:**

## CORE PROPOSAL

1. **Project Title**
2. **Principal Investigator (PI)**

Name:

Designation:

Complete Address *(with city pin code)*:

Telephone & Mobile No.:

E-mail:

1. **Co-Principal Investigator (Co-PI)**

Name:

Designation:

Complete Address *(with city pin code)*:

Telephone & Mobile No.:

E-mail:

1. **Collaborating Industry *(If any)***

*if applicable, and what skills and experience they will contribute to the implementation and scale of the project.*

1. **Objectives of the Proposal**

***(Precise and quantified, use bullet form)***

1. **Critical Review of Status Identifying Gaps (include references & IPR survey)**
   1. National Status Review
   2. International Status Review
2. **Outline of the Project *(with schematics, where possible)***

**(*Define the problems and give technical details and uniqueness in approach)***

* 1. Abstract of the current project
  2. Rationale and need of the proposed work

1. **Methodology *(Please highlight how success in the project execution will be ensured)***
2. **Gantt chart indicating Target activities vis-a-vis Stipulated timelines**
3. **Deliverables of the project *(brief description)***
4. *New/Upscaled Process or Technologies*
5. *Acceleration of the Technology to higher TRLs.*
6. *New/ Upgraded System*
7. *Techno-Economic Analysis (TEA), Socio-Economic Analysis (SEA) or Life Cycle Analysis (LCA), as applicable*
8. *List specific results and Indicators you will use to measure success of this project towards achievement of impacts and outcomes. You may develop indicators as needed that best reflect goals and performance.*
9. **Expected outcomes and Impacts of the work**
10. **Work Plan**
11. **Names of 5 Experts/Agencies/ Institutions working in the similar area**

***(Please give complete Name, Designation, Address with pin code, telephone numbers & e-mail)***

1. **Any other information relevant to the Project proposal/ execution of the project**

***(Group strength, site details, economic analysis, company details etc.)***

## Details of Itemized Budget

***(Ensure to mention the detailed justification)***

1. **Non-recurring**

**A1. Equipment\*(Capital Items)**

**Budget for Permanent Equipment (To be borne by DST)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Description of** | **Unit Price (Rs. in lakh)** | | **Nos. of** | **Total** | **Quotation at** | **Justifications** |
| **Equipment** |  | | **Equipment** | **Rupees** | **Annexure- / page** |  |
|  |  | |  | **(Rs. in** | **no\* indicating total** |  |
|  |  | |  | **lakh)** | **cost of equipment** |  |
| Foreign ( including CIF+ Custom Duty/ Taxes + others charges etc.) | Indian (Including GST) |
|  |  |  | **in Indian rupees.** |  |
|  |  |  | **(Non-Availablity** |  |
|  |  |  | **Report from GeM)** |  |
|  |  |  |  |  |  |  |
|  |  |  | **Gross total =** | | |  |

***\*Sheet indicating the total landed cost in Indian rupees (mention currency conversion rate considered including freight, taxes, GST, spares, special installation, etc.)***

**\**Capital cost is not expected to exceed 30% of the total project cost.***

1. **Recurring Items (General) B1. Manpower**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Designation** | **Educational**  **Qualification** | **Salary per**  **month** | **No. of**  **Persons** | **Amount Rupees**  **in Lakh** | **Justification** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Note: The manpower recruited for the project should be paid as per the rules of the institute and guidelines of the Government of India (*OM. No. DST/PCPM/Z-06/2022 dated 26.06.2023 and SR/S9/Z-05/2019 dated 10.07.2020*). The posts which are not covered under the guidelines but permissible under projects at the host institute are also permitted. The temporary staff employed for the project by the organization is not treated as employees of the Government of India and the deployment of**

**such staff at the time of termination of the project will not be the concern/responsibility of the Government of India.**

**\*Refer Latest guidelines at DST website:** [**http://dst.gov.in/whatsnew/main-new.htm**](http://dst.gov.in/whatsnew/main-new.htm) **(Guidelines for Research fellow, Scientist and Assistant)**

**Manpower Budget Details (year-wise) \***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Designation** | **Total Emoluments (in Rupees lakhs)** | | | | **No. of persons** | **Total Amount (Rs.**  **Lakhs)** |
| **1st Year** | **2nd Year** | **3rd Year** | **Total** |
|  |  |  |  |  |  |  |
|  | Gross amount required for manpower budget head = | | | | |  |

**Research Fellows allowances per month i.e. HRA (Rate …….%) etc. If applicable *Mention HRA % applicable to Manpower in your Organisation and the classification category of your city/town: (Please ensure to fill in all the above details otherwise it shall be considered as NIL)***

**B2. Consumables**

**Budget for Consumable Materials (To be borne by DST)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1st Year** | **2nd Year** | **3rd Year** | **Total (Rs. in lakh)** | **Justification including basis of cost estimates/ quotations** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**B3. Contingencies:**

**Budget for Contingencies (To be borne by DST)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1st Year** | **2nd Year** | **3rd Year** | **Total** | **Justification including basis of**  **cost estimates/quotations** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**B4. Domestic Travel**

**Budget for Domestic Travel (To be borne by DST)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1st Year** | **2nd Year** | **3rd Year** | **Total Amount** | **Detailed Justification *(In case of extensive field visits needed in the project indicating breakup of cost***  ***w.r.t. to journeys, mode and class of transport***  ***needed)*** |
|  |  |  |  |  |
|  |  |  |  |  |

**B5. Other Costs, if applicable**

**Budget for Other Costs (To be borne by DST)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **1st Year** | **2nd Year** | **3rd Year** | **Total** | **Justification including basis of cost estimates/quotations at Annexure- / page no\*** |
| Outsourcing |  |  |  |  |  |
| Fabrication |  |  |  |  |  |
| Testing |  |  |  |  |  |
| Patenting |  |  |  |  |  |
| Others |  |  |  |  |  |

**Organization details:**

* 1. **Whether Beneficiary organization registered with Govt. of India Central Plan Scheme Monitoring System\* (CPSMS):** Yes/ No

\*(refer website: <https://pfms.nic.in/Users/LoginDetails/NewLayoutLogin.aspx>)

* 1. **If not get it registered at website (to receive the grant from GoI), If yes, inform Agency code registered at CPSMS**

**Website:**

**Proforma for Bio-Data of Principal Investigator (PI)/ Co-Principal Investigator (Co-PI)**

1. Name :
2. Gender :
3. Category :
4. Date of Birth :
5. E-mail ID and Mobile No. :
6. Qualifications:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.  No. | Degree | Institution | Year | Division/Class |
|  |  |  |  |  |

1. Employment Experience

|  |  |  |  |
| --- | --- | --- | --- |
| S.  No. | Position & Organisation | Nature of Job | Period |
|  |  |  |  |

1. List of Publications *(For last 5 years only) (Only journal publications with impact factor)*

Journals/Book Chapters

1. Patents filed/Granted with details:
2. (a) Sponsored Research Projects:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S. No | Title | Sponsoring Agency and Officer  Concerned | Period | Amount | Achievements |
|  |  |  |  |  |  |

* 1. Consultancy Projects

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S. No | Title | Sponsoring Agency | Period | Amount |
|  |  |  |  |  |

* 1. Sponsored Research/Consultancy Projects submitted for approval

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | Title | Agency to whom submitted | Duration | Amount |
|  |  |  |  |  |

***Note: Separate Bio-Data for PI and all Co-PI to be submitted***

1. **DEPARTMENT OF SCIENCE AND TECHNOLOGY (POLICY ON CONFLICT OF INTEREST)**

**FOR APPLICANT**

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R&D scenario. The following policy about general aspects of Conflicts of Interest and code of ethics are objective measures that are intended to protect the integrity of the decision-making processes and minimize bias. The policy aims to sustain transparency, increase accountability in funding mechanisms, and provide assurance to the general public that processes followed in the award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of biases by following a system that is fair, transparent, and free from all influence/ unprejudiced dealings, before, during, and after the currency of the program is entered into to enable the public to abstain from bribing or any corrupt practice to secure the award by assuring them that their competitors will also refrain from bribing and other corrupt practice and the decision makers will commit to preventing corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision-making process adopted by DST.

**Definition of Conflict of Interest**:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision-making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention of the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

* + 1. **Coverage of the Policy**:

1. The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal, and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also apply to all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in the evaluation of proposals and subsequent decision-making process.
2. This policy aims to minimize aspects that may constitute actual Conflicts of Interest, apparent Conflicts of Interest, and potential Conflicts of Interest in the funding mechanisms that are presently being operated by DST. The policy also aims to cover, although not limited to, Conflicts of interest that are Financial (gains from the outcomes of the proposal or award), Personal (association of relative / Family members), and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as Ph.D. supervisor, etc.)
   * 1. **Specifications as to what constitutes a Conflict of Interest**.

Any of the following specifications (non-exhaustive list) imply a Conflict of Interest if,

1. Due to any reason by which the Reviewer/Committee Member cannot deliver a fair and objective assessment of the proposal.
2. The applicant is a direct relative or family member (including but not limited to a spouse, child, sibling, or parent) or personal friend of the individual involved in the decision- making process or if any relative of an Officer directly involved in any decision-making process / has influenced interest/ stake in the applicant’s form etc. The applicant for the grant/award is an employee or employer of an individual involved in the process as a Reviewer or Committee Member; or if the applicant to the grant/award has had an employer-employee relationship in the past three years with that individual.
3. The applicant to the grant/award belongs to the same Department as that of the Reviewer/Committee Member.
4. The Reviewer/Committee Member is the Head of an Organization from where the applicant is employed.
5. The Reviewer /Committee Member is or was, associated with the professional career of the applicant (such as Ph.D. supervisor, Mentor, present Collaborator, etc.)
6. The Reviewer/Committee Member is involved in the preparation of the research proposal submitted by the applicant.
7. The applicant has joint research publications with the Reviewer/Committee Member in the last three years.
8. The applicant/Reviewer/Committee Member, in contravention to the accepted norms and ethics followed in scientific research has a direct/indirect financial interest in the outcomes of the proposal.
9. The Reviewer/Committee Member stands to gain personally should the submitted proposal be accepted or rejected.
10. The Term “Relative” for this purpose would be referred to in section 6 of the Companies Act, 1956.
    * 1. **Regulation**:

The DST shall strive to avoid conflict of interest in its funding mechanisms to the maximum extent possible. Self-regulatory mode is however recommended for stakeholders involved in scientific research and research management, on issues about Conflict of Interest and Scientific Ethics. Any disclosure about the same must be made voluntarily by the applicant/Reviewer/Committee Member.

* + 1. **Confidentiality**:

The Reviewers and the Members of the Committee shall safeguard the confidentiality of all discussions and decisions taken during the process and shall refrain from discussing the same with any applicant or a third party unless the Committee recommends otherwise and records for doing so.

* + 1. **Code of Conduct**
       1. **To be followed by Reviewers/Committee Members**:

1. All reviewers shall submit a conflict of interest statement, declaring the presence or absence of any form of conflict of interest.
2. The reviewers shall refrain from evaluating the proposals if the conflict of interest is established or if it is apparent.
3. All discussions and decisions about conflict of interest shall be recorded in the minutes of the meeting.
4. The Chairman of the Committee shall decide on all aspects of the conflict of interests.
5. The Chairman of the Committee shall request that all members disclose if they have any conflict of interest in the items of the agenda scheduled for discussion.
6. The Committee Members shall refrain from participating in the decision-making process and leave the room concerning the specific item where the conflict of interest is established or is apparent.
7. If the Chairman himself/herself has a conflict of interest, the Committee may choose a Chairman from among the remaining members, and the decision shall be made in consultation with Member Secretary of the Committee.
8. It is expected that a Committee member including the Chairperson will not seek funding from a Committee in which he/she is a member. If any member applies for a grant, such proposals will be evaluated separately outside the Committee in which he/she is a member.
   * + 1. **To be followed by the Applicant to the Grant/Award:**
9. The applicant must refrain from suggesting referees with potential Conflict of Interest that may arise due to the factors mentioned in the specifications described above in Point No.2.
10. The applicant may mention the names of individuals to whom the submitted proposal should not be sent for refereeing, clearly indicating the reasons for the same.
    * + 1. **To be followed by the Officers dealing with Programs in DST:**

While it is mandatory for the program officers to maintain confidentiality as detailed in point no. 6 above, they should declare, in advance, if they are dealing with grant applications of a relative or family member (including but not limited to a spouse, child, sibling, parent) or thesis/ post- doctoral mentor or stands to benefit financially if the applicant proposal is funded. In such cases, DST will allot the grant applications to the other program officer.

* + 1. **Sanction for violation**
       1. **For a) Reviewers / Committee Members and b) Applicant**

Any breach of the code of conduct will invite action as decided by the Committee.

* + - 1. **For Officers dealing with Program in DST**

Any breach of the code of conduct will invite action under the present provision of CCS (Conduct Rules), 1964.

* + 1. **Final Appellate authority:**

Secretary, DST shall be the appellate authority in issues about conflict of interest and issues concerning the decision-making process. The decision of the Secretary, DST in these issues shall be final and binding.

* + 1. **Declaration**

**I have read the above “Policy on Conflict of Interest” of the DST applicable to the ~~Reviewer/ Committee Member/~~ Applicant/ ~~DST Scheme or Program Officer~~# and agree to abide by provisions thereof.**

I hereby declare that I have no conflict of interest of any form about the proposed grant\* I hereby declare that I have a conflict of interest of any form about the proposed grant\*

\* & # (Tick whichever is applicable)

**Name of the Applicant**

*(****Strike out whichever is not applicable****)*

(**Signature with date**)

1. **UNDERTAKING FROM THE INVESTIGATOR(S)**

**Project Title:**

1. I/We have carefully read the terms and conditions of the Clean Energy Research Initiative (CERI) Programme and I/We agree to abide by them.
2. I/We have not submitted this or a similar Project proposal elsewhere for financial support.
3. I/We have explored and ensured that the equipment and the basic facilities described in the Research Proposal, will actually be available as and when required for the purpose of the Project. I/We shall not request financial support under this project, for procurement of these items.
4. I/We undertake that spare or idle capacity of the permanent equipment procured under the Project will be made available to other legitimate users from parent and other organizations.

**I/We have enclosed the following:**

* 1. Endorsement from the Head of the Institution (on letter head)
  2. Undertaking from the Collaborator(s)
  3. Complete Project Proposal with all enclosures (1 soft copy as .doc file/pdf)

1. **ENDORSEMENT FROM THE HEAD OF THE ORGANISATION**

*(To be typed on the letter-head of the organization)*

**Project Title**

1. Certified that the organization welcomes the participation of Dr/Mr/Mrs

..................................................................................................................................................

as

the PI and Dr/Mr/Mrs as the Co-PI for the project and that in the unforeseen and

legitimate event of discontinuation by the PI, the Co-PI will assume full responsibility for completion of the project. Information to this effect, endorsed by me, will be promptly sent to the DST

1. Certified that the equipment, other basic facilities and other administrative facilities as per the terms and conditions of the award of the Project, will be extended to the investigator(s) throughout the duration of the project
2. The Organization shall ensure that financial and purchase procedures are followed as per the prevailing norms of the organization, within the allocated budget.
3. The Organisation shall provide timely the Statement of Expenditure and the Utilisation Certificate of the grant as required by the DST in the prescribed format.

**(Head of the Institute)**

**Seal/Stamp**

**Date: Place:**

1. **ENDORSEMENT FROM COLLABORATING INDUSTRY/ AGENCY**

**(*if an*y)**

*(On the official letter head)*

I have gone through the Project proposal entitled………….. submitted by *(Name of*

*Collaborator )* …of… *(Name of the Institute)* for DST funding and noted the obligations and responsibilities indicated in our name which are as below :

1. Contribution in financial terms *(mention amount in Rs.)*
2. Contribution in Kind *(list activities)*

I hereby affirm that organization/industry is committed to participate in the Project to the full extent as indicated including financial liabilities accruing therefrom as detailed above. A brief profile of my organization is summarised below:

Name of Organisation:

Line of Business:

No. of employees:

Annual Turnover:

**(Head of the Institute)**

**Seal/Stamp**

**Date:**

**Place:**

**Annexure-1 Budgetary quotes**