

F. No. 353/61/2023 -NT
Ministry of New & Renewable Energy (MNRE)
Government of India

Atal Akshay Urja Bhawan
Lodhi Road, New Delhi-110003
Dated: 15 March 2024

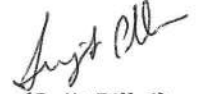
OFFICE MEMORANDUM

Subject: "Call for Proposals" under Research and Development (R&D) Scheme of National Green Hydrogen Mission (NGHM)- regarding

The Ministry of New & Renewable Energy (MNRE) is implementing the R&D Scheme, issued vide Order dated 15.03.2024, for promoting indigenous technology development for wide spread deployment of Green Hydrogen and its derivatives in an efficient and cost-effective manner across the country. The scheme will strengthen research and innovation capacity of the country.

2.0 MNRE hereby invites proposals under R&D Scheme from the eligible entities. The details related to eligibility, financing, application form etc. are given in the **Appendices**. The last date of submission of applications is 12.04.2024.

3.0 The proposals may be submitted online on <https://research.mnre.gov.in>. For any further details, Mr. Sujit Pillai, Scientist-F, MNRE (email: sujit.pillai@gov.in) may be contacted.



(Sujit Pillai)
Scientist-F

Tel: 011 20849083

Email: sujit.pillai@gov.in

To:

1. All Division MNRE
2. All the State Nodal Agencies (SNAs)
3. Chairman, All India Council for Technical Education (AICTE), New Delhi
4. Chairman, University Grants Commission (UGC), New Delhi
5. Director, Indian Institute of Technology (IITs)/National Institute of Technology (NITs).
6. MD, CMD and ED of all the concerned Publics Sector Units.
7. Director Generals, NISE, Gurugram, NIBE, Kapurthala, NIWE, Chennai.

Copy for information to:

1. Joint Secretaries/ Advisers/Scientist-G/Economic Advisers
2. Sr. PPS to Secretary (MNRE)
3. NIC Cell (for publishing on the Ministry's website)

Encl. : As above

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First Call for Proposals Under Research and Development Scheme of the National Green Hydrogen Mission (NGHM)

1. Background

- 1.1. The National Green Hydrogen Mission, hereafter mentioned as the 'Mission', was launched on 4th January 2023 with an outlay of Rs. 19,744 Crore with an aim to make India a Global Hub for production, usage and export of Green Hydrogen and its derivatives. It will contribute to India's goal to become Aatmanirbhar (self-reliant) through clean energy and serve as an inspiration for the global Clean Energy Transition.
- 1.2. Under the Mission, an outlay of Rs. 400 crores have been made for Research and Development activities. As part of the R&D efforts under the Mission, the R&D roadmap was launched on 07.10.2023 and the R&D Scheme for Green Hydrogen was launched on 15.03.2024. The R&D Scheme, aims at scaling up the R&D effort to promote indigenous technology development for wide spread deployment of Green Hydrogen Technology in an efficient and cost-effective manner across the country. The programme will strengthen research and innovation capacity of the country in Green Hydrogen sector.
- 1.3. MNRE hereby invites proposals under R&D Scheme issued vide Order no. 353/61/2023-NT dated 15.03.2024, hereafter mentioned as 'Scheme', from the eligible organizations as specified in Para-3 below.

2. Objectives

- 2.1. The participating organizations shall submit the proposals aligned with the following objectives:
 - (i) To increase the affordability of Green Hydrogen production, storage, transportation, and utilization, and to enhance the efficiency, safety and reliability of the relevant systems and processes.
 - (ii) To build industry-academia-government partnerships to leverage the opportunity to establish an innovation ecosystem for Green Hydrogen technologies.
 - (iii) To facilitate scaling up and commercialization of the technological advancements by providing requisite policy and regulatory support.

3. Eligible Entities

- 3.1. Research and Development project proposals can be submitted for financial support available under the Scheme by the Academic Institutions / R&D Institutions/ Government Institutions / PSUs / Private Research Institutions/ Industries having adequate infrastructure.

4. Evolution Criteria

- 4.1. The proposals will be evaluated based on the following criteria:
- (i) Relevance and quality of the proposal;
 - (ii) Availability of clear statement of quantified objectives and deliverables;
 - (iii) Technical feasibility of the proposal
 - (iv) Technology Readiness Level of the proposed technology.

5. Funding Pattern

- 5.1. Academic Institutions, Universities, Government/Non-profit research organizations would be eligible for financial support up to 100% of the total project cost, subject to a cap as decided by the concerned Sectoral Sub-Committee/ Advisory Group under the Mission. The financial support to the private institutes/research organizations and industries would be limited up to 80% of the total project cost, subject to a cap as decided by the concerned Sectoral Sub-Committee/ Advisory Group under the Mission.
- 5.2. Having focus on applied research, the Ministry will encourage research and development proposals from consortia comprising of academic institutes/R&D labs and industry. The academia/ National R&D lab partner will be provided up to 100% funding of its share of the project, subject to a cap as decided by the concerned Sectoral Sub-Committee/ Advisory Group under the Mission. Industrial partner should contribute to the project with their own contributions.
- 5.3. For details on disbursement of funds and other terms and conditions for release of funds, Para-6 of the R&D Scheme guidelines issued vide Order no. 353/61/2023-NT dated 15.03.2024 may be referred.
- 5.4. Release of funds will be subject to compliance of the provisions mentioned in the Scheme Guidelines dated 15.03.2024. MNRE reserves the right to terminate the project at any stage if it is convinced that the grant has not been properly utilized or sufficient progress has not been reported.

6. Spectrum of Activities Supported

- 6.1. The spectrum of activities encompasses translational research aimed at converting knowledge into practical products or processes. It also includes applied research focused on enhancing existing systems, with a strong emphasis on outlining sustainability strategies for intervention and post-intervention phases. The applicants are urged to specify the Technology Readiness Level (TRL) at the project's initiation and completion. The goal is to maximize efficiency by harnessing existing capabilities and infrastructure. The R&D Roadmap launched under the Mission is available on MNRE website. An indicative list of areas for research is placed at **Appendix-II**.

7. Proposal Submission Guidelines

- 7.1. The eligible organizations may submit the proposals, online on the portal <https://research.mnre.gov.in>. in the format provided. No physical application will be accepted.
- 7.2. The proposals should clearly define the objectives and list the deliverables. It should also be indicated as how the proposed process/ product/system stands at national and international level in terms of technologies/ performance/ cost.
- 7.3. The CVs of the Project Investigators (PI) should be brief and should highlight their competence and experience related to the proposed project area. Consortium may be formed wherever required by clearly explaining the need for forming the consortium and the roles and responsibilities of each partner. The industry partner should have proven standing and R&D capability in the area related to Hydrogen Technologies and should exhibit the potential to commercialize the products / systems expected to be developed under the proposal.
- 7.4. The extent of participation and contribution of the industry partner should be clearly defined. Participating Industry would be required to invest within its own system i.e. production/ test lines and/or develop required infrastructure to adopt research leads and is expected to bring design and engineering capability for the benefit of the project.
- 7.5. Regarding the proposals already received in the Ministry, the PIs are required to re- submit the proposal online for further consideration. In case of any modification/changes in the proposal, the same should be clearly mentioned.

8. Intellectual Property Rights (IPR)

- 4.1. The grantee institution(s) will be responsible to protect the Intellectual Property Rights (IPR) being generated through the research projects under the Scheme as per the provisions given in Scheme dated 15.03.2024, including amendments, if any

9. Important Dates

OPENING DATE FOR SUBMISSION OF PROPOSAL: 16.03.2024

CLOSING DATE FOR RECEIPT: 12.04.2024

10. Contact Information

10.1. For any further clarification and online submission of the proposal, please contact the following:

Mr. Sujit Pillai, Scientist-F at 011 20849083

e-mail: sujit.pillai@gov.in

Problem Statements for R&D Programme under NGHM**Problem Statements: Production**

S. No.	Problem Statement
1	Improvement in efficiency and durability of conventional alkaline and other electrolysis technologies. This may include development of High Performance Electrolyzer membranes or Solid Oxide Electrolysis materials, development of advanced long life-time catalysts with the goal of lowering overpotential significantly and enhancing photovoltaic electrolysis integration efficiency.
2	Development of Sea Water Electrolysis Technology with improved performance parameters.
3	Bio-pathways for green Hydrogen Production: Improvement in equipment design, process efficiency, purification methods and feedstock compatibility.

Problem Statements: Transportation and Storage

S. No.	Problem Statement
1	Demonstration of alternative high-density hydrogen carriers (capacity >4wt%) for hydrogen storage and transportation: Investigation and design of chemical hydrogen carriers capable of efficiently storing and releasing hydrogen, exploration of novel molecules and reaction pathways with the goal of achieving quantifiable advancements in energy density, reversibility, and ease of regeneration.
2	Intelligent Hydrogen Distribution Networks: Development of intelligent distribution networks for hydrogen incorporating real-time monitoring, accurate and faster sensor technologies, and data analytics to optimize transportation routes, minimize energy losses, and achieve quantifiable improvements in overall distribution efficiency.
3	Development of Advanced Hydrogen Compression Technologies, such as novel compressor designs or materials, aiming to achieve quantifiable improvements in efficiency, reliability, and overall energy consumption during compression for transportation.

Problem Statements: Applications

S. No.	Problem Statement
1	Supporting the development of improved hydrogen based Internal Combustion Engines with better efficiency, reliability and combustion stability.

2	Development fuel cell engines for niche green mobility applications such as high endurance drones, hyperlocal passenger/ delivery vehicles, underwater and aerial unmanned surveillance vehicles and benchmarking the techno-economic performance of such applications against global competition.
3	Indigenization of Hydrogen Refueling System components to reduce the capital and maintenance costs.
4	Indigenous development of following components/ processes for Polymer Electrolyte Membrane (PEM) fuel cells <ul style="list-style-type: none"> i. Catalyst coated membranes: Development of R2R (Roll-to-roll) catalyst coating process for CCM (Catalyst Coated Membrane) ii. Durable surface coating for metallic bipolar plates iii. Process technology for producing fuel cell catalyst iv. Process technology for manufacturing gas diffusion layer v. Roll-to-roll process technology for manufacturing proton exchange membranes for fuel cells vi. Adsorbers, humidifiers and deionizers

Problem Statements: Safety, Cross Cutting Analysis and Integration

S. No.	Problem Statement
1	Big data and AI enabled data analytics for analysis and learning from hydrogen accidents globally, evolution of national risk acceptance criteria, comparison with International standards and formulation of risk based and performance based standards
2	Indigenous development of Hydrogen Sensors, leak detectors, pressure relief devices and fire barriers. This may include development of <ul style="list-style-type: none"> i. test, calibration, certification protocols and integration platforms ii. e-labs and digital twins iii. Containerised testing rigs for performance evaluation, risk assessment, safe operational limits, materials compatibility
3	Phenomenological /Physics based models, CFD modelling, structural models (effect on structures) for hydrogen safety and risk assessment, spontaneous combustion behaviour of pressurized hydrogen leaks.

Ministry of New and Renewable Energy

Proforma for Submission of Proposals for R&D Projects

Sl.No.	Item	Details
1.	Project Title:	
2.	Project type	
3.	Objectives	
4.	Summary (About a paragraph)	
5.	Total cost with MNRE share requested	
6.	Duration	
7.	Principal Implementing Organization(s)	
8.	Category of the Implementing Institution(s)	(A) Academic Institutions (B) R&D Institutions (C) Government Institutions and PSUs (D) Private Research Institutions (E) Industry
9.	Collaborating Institution(s), if any	
10.	Principal Investigator (Name and Contact details including telephones, fax and email) (CV to be enclosed)	
11.	Co-Principal Investigator(s) (Name, address and contact details including telephones, fax and email) (CV to be enclosed)	
12.	Share of implementing /Participating Institutions in the total cost	

13.	Need of the Project with proper assessment for viability of the product/ outcome						
14.	Status of Work being done in other National/International Institutions/ Industries (To be properly referenced with citations in peer reviewed scientific Journals wherever possible):						
15.	Details of Research Methodology	Detailed methodology including schematics, diagrams, all relevant technical details and rationale etc. to be provided.					
16.	Proposed cost: (Details of equipment along with justification to be provided separately in the Format as per Annexure I)	Sl. No.	Item	Amount (Rs.)			
				Total Cost	First Year	Second Year	Third Year
		1.	Equipment				
		2.	Manpower				
		3.	Consumables				
		4.	Contingencies/ Other Costs				
		5.	Travel				
		6.	Institutional Overhead charges				
	Total						
17.	Project Deliverables (products/process/papers/IPR)						
18.	Timelines (in terms of Work Plan)						
19.	Potential Users and suggested Plan of action for utilization of expected Project Output with proper analysis for scalability and bankability						

20.	Other information	<p>The following information is to be provided as per Annexures:</p> <ul style="list-style-type: none">• Certificate from the Principal Investigator and Grantee organization. [Annexure-II(A)]• Infrastructural facilities available at the host institution (e.g. telecommunication, Internet, Electrical/ Mechanical Workshop, Laboratory space, power supply including back up arrangement, etc.) [Annexure-II(B)]• Availability of equipment which are relevant for the project. [Annexure-II(C)]• CVs of PI and all co PIs, which would include details of other R&D projects implemented, their cost, status (completed/ under implementation) and sponsors. [Annexure-II(D)]
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Annexure-I

Details of Costs of Various Components and Justification**a) Cost of Equipment:**

Sl. No.	Name of the Equipment along with make & model	Imported/ Indigenous	Estimated Costs (in Foreign Currency also for imported equipment)*	Justification
1.				
2.				
3.				

*Including transport, insurance and installation charges.

b) Manpower Cost

Sl. No.	Designation/ Numbers	Justification	Monthly Emoluments	Amount (Rs.)			
				1st Yr (m. m.*)	2nd Yr (m. m.)	3rd Yr. (m. m.)	Total (m. m.)

*Man months to be given within brackets before the budget amount.

c) Cost of Consumables:

Sl.No.	Item	Quantity & Cost	Amount (Rs.)			
			First year	Second year	Third year	Total
1.		Quantity/ Number				
		Total cost (Rs.)				
		Foreign Exchange Component (US \$)				
2.						
3.						
	Total:	Total Cost: Rs.				
		Foreign Exchange: Component (US \$)				

d) Travel Cost:

Sl. No.	Travel (Domestic/ International)	Justification	Amount (Rs.)			
			First year	Second year	Third year	Total
1.						
2.						
3.						

Certificate from the Principal Investigator (On the letter head of the Organization)

Project Title:

1. I am submitting the above titled project proposal to MNRE for financial support.
2. I agree to abide by the terms and conditions of the MNRE research grant.
3. I have not submitted the project proposal elsewhere for financial support.
4. I have requested for funds for the items, which are not available with the institution for the proposed work and are absolutely essential.
5. I will not proceed on long term/ study leave/ deputation during the period of project implementation, without prior permission from MNRE
6. I have enclosed the following documents/ materials:
 - i) Similar certificate from Investigator(s) from other participating institutions (if any):
 - ii) Name and address of up to five experts/institution interested in the subject/output of the project:

Date:

Place: Name and signature of Principal Investigator

Endorsement by the Head of the Institution

Certified that Project Proposal entitled "-----" is prepared by Dr/Shri/Smt/kum ----- and has not been submitted to any other institution for funding. The institute will provide necessary regular staff and infrastructure facilities for the project work and such facilities have not been requested in the proposal. The institute will ensure compliance of the terms and conditions of the financial grant by MNRE and other conditions of the project.

Place & Date

**Name, Signature and Seal
Head of the Grantee Organization**

ANNEXURE-II(B)**INFRASTRUCTURAL FACILITIES AVAILABLE AT THE HOST INSTITUTION**

ITEM	YES	NO	Not Required
a) Workshop			
b) Water & Electricity			
c) Standby power supply			
d) Laboratory Space & furniture			
e) Air-Conditioned room for equipment			
f) Telecommunication			
g) Transportation			
h) Administrative & Secretarial support			
i) Library facilities			
j) Computational facilities			
k) Any other (Please mention)			

ANNEXURE-II(C)

**Availability of equipment which are relevant for the project
(Including test & measuring, calibration etc. and accessories relevant to the project)**

S.No.	Name of the equipment and accessories	Model and make	Remarks
1.			
2.			
3.			
4.			
5.			

NOTE: Please make sure that the aforementioned facilities and equipment will be available for the project.

BIODATA OF PI/ Co-PIs

- a) Name
- b) Date of Birth
- c) Academic qualifications
- d) Areas of expertise
- e) Experience
- f) Awards received, if any
- g) Publications (Nos.)
 - Books
 - Research papers
 - Patents
- h) List of publications (Papers published during last 10 years)
- i) List of project completed indicating briefly title, sponsoring agency, duration and outcome of project
- j) Details of materials/prototype/device already developed in past

S.No.	Position Held (Designation)	Place of work	Duration	Areas of work
1.				
2.				
3.				
4.				