



**NEW  
GENERATION  
IDEATION  
CONTEST 2023**



## HPCL

Hindustan Petroleum Corporation Limited (HPCL) is a Maharatna CPSE Company with Annual Gross Sales of about US\$ 46 Billion during FY 2022-23. HPCL has a strong presence in the Refining & Marketing of Petroleum Products in the country. HPCL owns and operates Refineries at Mumbai & Visakhapatnam with design capacities of 9.5 MMTPA & 8.3 MMTPA respectively. HP Green R&D Centre at Bengaluru is a state-of-the-art research facility for driving innovation in HPCL.

HPCL also owns the largest Lube Refinery in the country at Mumbai for producing Lube Oil Base Stock with a 428 Thousand Metric Tonnes Per Annum (TMTPA) capacity. HMEL & MRPL are JVs of HPCL which add to the refining capacity of HPCL portfolio. HPCL, through its subsidiary Prize Petroleum Company Ltd., owns 7 E&P blocks. Overall, HPCL is a strong player in the field of Refining, Lube marketing, Petrochemical marketing infrastructure, Bitumen emulsions, Biofuels, Natural Gas, etc. HPCL has a vast marketing network consisting of 20361 Retail outlets, 6253 LPG distributorships, 6 Lube blending plants, 33 exclusive lube depots, 42 terminals & TOPS, 53 LPG bottling plants, 52 Aviation Fuel stations, 39 Inland relay depots and 4435 Kms long of the pipeline network. HPCL has a significant presence in CNG & EV charging stations with 1179 CNG outlets & 1101 EV charging stations. In order to strengthen core processes and modernize, HPCL has embarked upon ambitious plans for expansion and diversification, such as Visakh Refinery Modernisation Project (VRMP), HPCL Rajasthan Refinery Ltd. (HRRLL), etc.

HPCL along with its JVs is committed to the nation by transforming the energy landscape with a mission of becoming a “fully integrated company in the hydrocarbons sector of exploration and production, refining and marketing; focusing on enhancement of productivity, quality & profitability, caring for customers and employees, caring for environment protection and cultural heritage. It will also attain scale dimensions by diversifying into other energy-related fields and by taking up transnational operations”.

## HPGRDC

HPCL has set up its world-class research campus 'HP Green R&D Centre' in Bengaluru, India with a mission to make energy & chemicals accessible to everyone through innovation. HPGRDC has a vision to be an energy research centre par excellence, pioneering innovative & sustainable technologies and products globally.

HP Green R&D Centre has laboratories focusing on the areas of FCC / RFCC, Hydroprocessing, Catalysis, Bioprocesses, Crude Evaluation & Fuels Research, Analytical & Chemical Synthesis, Standard Testing, Process Modelling & Simulation and Nano Technology. Recently, several labs have been established to focus on Petrochemicals & Polymers, CoE Lube Research, Resid Upgradation, Engine Testing, Novel Separations, Corrosion Studies and Battery Research. All the labs are built with state-of-the-art research facilities. The R&D centre is recognized by the Department of Scientific and Industrial Research (DSIR) and has collaborations with various research institutes in India and abroad.

The R&D Centre has made major technical accomplishments in terms of developing & commercializing novel technologies/products in refineries, contributing towards meeting the renewable energy demands, which led to significant cost advantages and efficiency improvements in HPCL. HPCL Green R&D believes in nurturing innovation in all employees and has carved out several pathways for incubating innovative culture within the organisation.



**Delivering Happiness**



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## About the NGIC-2023

HP Green R&D Centre embarked on an innovation drive in 2019 with the objective to encourage students in India to come up with new and innovative ideas to address modern world challenges such as rising energy demands, environmental pollution and growing consumerism.

To support this initiative, HPCL is organizing the “New Generation Ideation Contest” providing a golden platform for the students and young researchers to share their innovative solutions for the upcoming challenges.

The fourth edition of the contest was launched in 2022. Three entries were selected as winners in the Undergraduate Category, and six entries in the Open Category; five ideas were awarded commendation prizes. In 2023, HP Green R&D Centre is all set to launch the fifth edition of the innovation drive - New Generation Ideation Contest 2023.

In this edition also, various innovative ideas are welcomed from researchers, postgraduate scholars and undergraduate scholars from across the country in the 6 Themes: Circular Economy, Digitalisation, Hydrogen, CO<sub>2</sub> capture & Conversion, Petroleum Refining, Advanced Functional materials.





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## THEMES FOR IDEAS NGIC 2023

### THEME 1: CIRCULAR ECONOMY

Today, pollution and resource scarcity are the biggest concern in a world that is changing quickly. A circular economy is an economic system that utilizes multiple uses and recycling of products to address global issues including climate change, biodiversity loss, waste, and pollution. Hence ideas are invited under the following themes of circular economy

- E-waste and Plastic waste management
- Refining spent catalyst utilization
- Biomass utilization for fuels and chemicals (emphasis on lignin conversion)
- Waste Water Treatment and Waste Water Recycling Technologies
- Bio-degradation of plastics
- Enhancers for higher protein secretion by mycelial fungi, yeast cells

### THEME 2: DIGITALIZATION

All aspects of science are changing as a result of digitalization, including agenda-setting, experimentation, knowledge exchange, and public engagement. AI/ML is concerned with building smart machines capable of performing tasks that typically require human intelligence. It's important to recognize that AI is a constantly moving target. Machine learning, image recognition, natural language processing, real-time analytics tools, and various connected systems within the Internet of Things (IoT) all tap AI in order to deliver more advanced features and capabilities. Hence ideas are invited under the following themes of Digitalization

- Digital twin for process optimization in Refinery
- Advanced Corrosion Monitoring Devices
- AI-based process intensification
- 3D Printing of Catalyst Materials
- AI in energy transition
- Machine Learning for New Material Development



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## THEMES FOR IDEAS NGIC 2023

### THEME 3: HYDROGEN

Hydrogen is today enjoying unprecedented momentum. The world's efforts are striving to make hydrogen an important part of a clean and secure energy future. The pragmatic and actionable recommendations for the industries will make it possible to take full advantage of this increasing momentum. Hence ideas are invited under the following core themes of Hydrogen.

- a. H<sub>2</sub> fuel cell
- b. Hydrogen carriers
- c. Green Hydrogen
- d. Design improvements for Hydrogen based engines

### THEME 4: CO<sub>2</sub> CAPTURE & CONVERSION

The majority of the world's electricity is still produced using fossil fuels, and the energy sector's main source of carbon emissions is power generation. Despite the rapid expansion of renewable energy generation, the sheer scale of current power sector emissions and the vital role of electrification means that countries must urgently tackle their emissions from power to meet these global climate goals. In effect, the power sector has to dramatically reduce its carbon intensity. Hence ideas are invited under the following core themes of CO<sub>2</sub> capture & conversion.

- a. Conversion of CO<sub>2</sub> to ethanol
- b. Membrane development for CO<sub>2</sub> separation
- c. Conversion of CO<sub>2</sub> to fuels and Chemicals



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## THEMES FOR IDEAS NGIC 2023

### THEME 5: PETROLEUM REFINING

Petroleum and petrochemicals are this century's most productive and active industries. Each year, people use more than 2,500 million tonnes of oil. This clearly illustrates the size, importance, and economic foundation of the industry. Over the years, a significant transition has taken place from the crudest method of petroleum extraction and refinement, giving rise to the contemporary refinery. This is because refinery operations have incorporated scientific and technological developments at the appropriate time. One must stay current with these developments because information is growing and there are numerous advancements. Hence ideas are invited under the following core themes of Petroleum Refining.

- Process Intensification in the Refining industry
- Re-refining of used lubricating oil
- Novel strategies/chemicals for CO<sub>2</sub> and H<sub>2</sub>S absorption
- Advanced Materials and Catalyst for Petroleum Refining (cost-effective and time-saving synthesis of large pore zeolites, nano-based zeolites)

### THEME 6: ADVANCED FUNCTIONAL MATERIALS

Advanced functional materials and interfaces are a naturally interdisciplinary field with chemistry playing a central role. Functional materials are widely used in various fields because of their excellent properties, such as magnetism, catalysis, electrical and optical properties, high specific surface area, and good mechanical properties. Hence ideas are invited under the following core themes of Advanced Functional Materials.

- Polyolefin composite materials for adhesives, self-reinforced polymer, and thermal conductive plastics; Polymeric Resins
- Battery Materials and Supercapacitors



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## ARCHIVES

### 2022



Award Ceremony – NGI Contest 2022



Award Ceremony – NGI Contest 2022



Award Ceremony – NGI Contest 2022



Award Ceremony – NGI Contest 2022

### 2021



Award Ceremony – NGI Contest 2021



Award Ceremony – NGI Contest 2021



Award Ceremony – NGI Contest 2021



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## ARCHIVES

### 2020



Award Ceremony – NGI Contest 2020



Award Ceremony – NGI Contest 2020

### 2019



Award Ceremony – NGI Contest 2019



Award Ceremony – NGI Contest 2019



Award Ceremony – NGI Contest 2019



Poster Session – NGI Contest 2019



Poster Session – NGI Contest 2019



Poster Session – NGI Contest 2019



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## RESULTS 2022

### UNDER GRADUATE CATEGORY

| Position           | Title of Idea  | Name of Participant   | Name of Institute                                       |
|--------------------|--|---|---|
| 1 <sup>st</sup>    | Recovery of Lithium by Electrodialysis for Battery Applications  | Srishti Sridhar, Aarti Atkar, Bukke Vani, M. Madhumala      | CSIR-Indian Institute of Chemical Technology, Hyderabad |
| 2 <sup>nd</sup>    | Development of Lightweight High entropy alloys through incorporation of Magnesium as a novel hydrogen carrier material | Dev Raj, Alok Kumar Dr Shweta                               | Rajiv Gandhi Institute of Petroleum Technology, Amethi  |
| 3 <sup>rd</sup>    | Bi-layered Ceramic Membrane Single Separator-Photo-Reactor for Capture and Conversion of CO <sub>2</sub> to Methane    | Rajneesh Anand, Mrinal Kanti Mandal & Rajib Ghosh Chaudhuri | NIT Durgapur  |
| Commendation Prize | Biopolymer-based Gel Electrolytes: Sustainable and Ecofriendly Battery Materials                                       | Ram S Iyer, Vishal Raj, Shivam Raj, Ashutosh Tripathi       | Rajiv Gandhi Institute of Petroleum Technology, Amethi  |
|                    | Fabrication of PLLA/MPU/nHA nanocomposite fibers as Biosensors   | Archana G S , Aparna Suresh                                 | NIT Calicut   |

### OPEN CATEGORY

| Position           | Title of Idea  | Name of Participant  | Name of Institute                                       |
|--------------------|--|--|---|
| 1 <sup>st</sup>    | Reductive Catalytic Fractionation of Ultrasound Pre-treated Biomass: Development of an Effective Lignin Removal Process          | Vallabh Sudhir Prabhudesai, Subhan Kumar Pal, R Vinu   | IIT Madras  |
| 2 <sup>nd</sup>    | Anode-free batteries: next generation batteries for electrification and aviation applications                                    | Amol Bhairuba Ikhe   | Sunchon National University                             |
|                    | Microgelated amine-functionalized nanofluids for efficient CO <sub>2</sub> capture from large-scale industrial flue gases.       | Prerna Yogeshwar, Yogendra Kumar, Rohit Agrawal, Jitendra Sangwai                            | IIT Madras  |
| 3 <sup>rd</sup>    | Transforming CO <sub>2</sub> and Sea Water to Green HYDROGEN & Green CEMENT Using Magnesium Scrap                                | Vivek Polshettiwar, Rajesh Belgamwar   | Tata Institute of Fundamental Research, Mumbai          |
|                    | Synthesis and Characterization of a Novel Blend Membrane of PVDF and Sulfonated Polyphenyl Sulfone for PEM Fuel Cell Application | Dr. Premanath Murge, Dr. Sundergopal Sridhar, Dr. Shaik Nazia, Mannem Hymavathi, Aarti Atkar | CSIR-Indian Institute of Chemical Technology, Hyderabad |
|                    | Recycled zinc-carbon batteries feeding rechargeable Zn-air battery development   | Nivedha LK ,M Raja and R Kothandaraman   | IIT Madras  |
| Commendation Prize | Affordable Multilayered Antimicrobial "SaanS" Facemask Based on Waste to Wealth Concept  | Dr. Sai Kishore Butti, Sundergopal Sridhar, Chandra Sekhar Nivedita Manideep                 | CSIR-Indian Institute of Chemical Technology, Hyderabad |
|                    | Tertiary material handling and one pot regeneration: Two novel approaches for circular economy of spent catalyst valorisation    | Barsha Dash  | CSIR-IMMT   |
|                    | Wastewater treatment technology for reduction of oil content from oil water emulsion wastewater feed                             | Jyotiraman De, Dharmveer Yadav, Dr Sumit Saxena, Dr Shobha Shukla                            | IIT-Bombay  |

### BEST INSTITUTE AWARD

Rajiv Gandhi Institute of Petroleum Technology (RGPT), Amethi  
for submission of maximum number of shortlisted ideas



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**Touching Lives... Every Day... In Every Way...**

### **Who should participate?**

Competition seeks participation from under graduate students, post graduate students & research scholars from different Institutes, Universities and Colleges, and also from any individuals across India.

### **How to submit the ideas ?**

Participants should submit the ideas on or before **31st October 2023**

Please visit <https://ngic.hindustanpetroleum.com/> for submission of ideas

### **Instructions**

- The write-up on Idea should be limited to 1000 words.
- One participant can submit multiple entries through multiple submissions.
- Write-up should be original. Plagiarism is strictly prohibited.
- Ideas will be evaluated based on its Novelty, Applicability, Clarity, Scalability and Integration Potential.
- Shortlisted ideas will be qualified for the next round. The details of next round will be disclosed subsequently.



Prizes will be awarded under two categories:

**A) Open Category**

**B) Under Graduate Category**

**PRIZES  
FOR THE  
WINNERS**

**1<sup>st</sup> PRIZES WORTH INR 1,00,000/-**

**2<sup>nd</sup> PRIZES WORTH INR 50,000/-**

**3<sup>rd</sup> PRIZES WORTH INR 25,000/-**

**COMMENDATION PRIZES WORTH INR 10,000/-**

**“Best Institute Award for - NGIC-2023” for  
contributing maximum number of  
Shortlisted Ideas in NGIC-2023**

### **CONTACT DETAILS**

For any queries / clarifications, please write to us in the following email id:

[ngi@mail.hpcl.co.in](mailto:ngi@mail.hpcl.co.in)

**HP Green R&D Centre**

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