





R&D Conclave on Renewable Energy

Date: 11-12 April 2023, 10 AM – 5:30 PM *Venue:* MNRE Auditorium, Atal Akshay Urja Bhavan, CGO Complex, Lodhi Road, New Delhi-110003

Background

Research and Development in the Renewable Energy (RE) sector have been primarily pursued by various leading academic institutions in India. Normally, it is presumed that the primary responsibility of the same should be borne by academic and research institutions, however, successful R&D models throughout the world show a consistent trend of the close-knit industry–academia – finance-government collaboration.

Objective

Against this backdrop, the MNRE is organizing the R&D Conclave to bring together a diverse set of stakeholders representing academia, research institutions, industry, funding agencies, start-ups, as well as policymakers to discuss catalyzing the RE ecosystem in the country, highlight the latest R&D developments, scale up adoption of industry-ready technologies, and collaborative R&D efforts between different stakeholders.







Session- I

Advanced R&D on Solar PV in India

Indian solar PV sector is set to play a key role in achieving country's ambitious NDC & Net Zero targets. Research and development (R&D) shall be a critical factor in increasing the contribution of efficient SPV technologies. India is collaborating with several countries to advance solar PV technology. Some of the key areas of focus in R&D on solar PV in India include developing efficient solar cells, exploring new materials for solar panels, and improving the overall efficiency of solar power generation. The discussion will focus on the following aspects:

- R&D measures that aim towards enhancing cell efficiency, use of novel materials, besides leveraging cutting-edge technologies
- Requirement of a strong R&D network to develop globally competitive products and technologies
- Key Challenges in R&D including inadequate resource allocation, limited industryacademia collaboration etc.
- Impact of large-scale import of modules on R&D Activity in India
- Discussing solutions/recommendations for MNRE to enhance industryacademia collaboration, innovative fiscal instruments, IPR transfer policies, availability of testing facilities, strategies for deploying pilots, and creating an incubation ecosystem for start-ups

With a growing demand for energy and a commitment towards sustainable development, India's R&D efforts in solar PV are expected to yield significant results in the years to come. The ultimate objective of the discussion shall be to position India as a global leader in Solar PV R&D space.







Session- II

Developing Green Cold Chains

India is a significant producer of horticulture, milk and floriculture produce, however, inadequate cold storage and transportation facilities results in wastage of produce at all stages. Cold chains and storages, especially at the first mile, can reduce postharvest loss, improve shelf life of product, ensuring, a steady supply of fresh produce to consumers. Recently, there has been a significant push towards renewable energy powered cold storages and sustainable refrigerant systems. Few industry and academic institutions have developed cutting edge technologies in this sector which needs to be scaled up. The discussion will focus on the following aspects:

- New and improved technologies, advanced refrigeration systems, IoT-based temperature monitoring systems, and automation developed through R&D efforts and ready for commercialization
- Collaboration amongst stakeholders in the value chain
- Key barriers in R&D, for instance, inadequate funding, lack of skilled personnel and expertise in design, implementation and operation of cold chains and storages
- Possible solutions like attracting private sector investment in the R&D set up, specialized courses cum training programs for skilling of workforce and synergies between stakeholders







Session- III

Role of Solar Energy in Clean Cooking and Process Heat Applications

Clean Cooking

As a country with a large rural population, India has a significant need for clean cooking solutions, as traditional cooking methods contribute to indoor air pollution and have adverse health effects. Hon'ble Prime Ministers' vision also highlights the penetration of solar based affordable cooking systems. Although a few organizations have developed the technology, but it is yet to be fully user friendly and affordable. The discussion will focus on the following aspects:

- R&D focus on designing affordable solar-powered industrial cookstoves and ovens, solar cookers and solar induction cookstoves which have application in industrial and residential setting
- Exploring innovative business models and financing mechanisms to make solarpowered cooking solutions accessible to households and MSMEs.
- Discussion on barriers like adaptation (user behaviour) and integration

Process Heat Applications

Process heat is a critical energy input for a range of industrial sectors. Traditional sources of process heat, such as fossil fuels, have adverse environmental impacts, including GHG emissions. Solar thermal based process heat applications has tremendous potential in low to medium temperature industries requiring both hot water, air and steam. The technologies are ready but needs to be commercially scaled up. The discussion will focus on the following aspects:

- R&D efforts' focus on innovative solar thermal technologies that can meet the process heat demands of various low to medium temperature industries.
- Identification and addressing barriers to the adoption of solar thermal systems, such as high initial cost of installation, O&M, adoption limitations, awareness etc.

By investing in R&D for solar energy in applications like process heat, industrial cooking and residential cooking, India can reduce its carbon footprint, improve energy security, and support sustainable economic growth.







Session- IV

Upcoming RE Technologies – Powering Clean Energy Transition

As the world becomes increasingly aware of the need to transition to cleaner forms of energy, several exciting new renewable energy (RE) technologies are emerging like geothermal energy, green hydrogen, and ocean related energy generation. The discussion will focus on the following aspects:

Geothermal energy

- Understanding the technology and its quality for providing firm power, 365X24X7 supply
- Efforts required to harness advanced geothermal energy in India through either indigenization of the technology or technology transfer mechanisms
- Discussing barriers like lack of exhaustive resource assessment, technological challenges, limited engineering capabilities etc

Green hydrogen

- A sustainable fuel for the future which is versatile in usage industrial feedstock, transport fuel, storage for RE and high application potential in hard-to-abate sectors like steel, fertilizers and petrochemicals
- Bring forward already developed technologies for green hydrogen production, storage and transportation
- Role of National Green Hydrogen Mission towards R&D efforts required for developing cost-effective technologies across the value chain

Ocean technologies

- Understanding OTEC, Wave and Tidal potential
- R&D efforts by National Institute of Ocean Technology (NIOT)
- Challenges including high capital cost, and limited technology providers as well as system integrators
- Pathways for possible industry collaboration in the emerging field

Overall, there is enormous R&D potential, with a focus on improving the efficiency, scalability, and cost-effectiveness of these emerging technologies.







Session-V

Energy Storage Systems – Towards RTC & Grid Balancing

In recent years, there has been a significant push towards developing energy storage solutions in India that can support round the clock (RTC) power supply and grid balancing. With the increasing integration of intermittent renewable energy sources into the Indian grid, such as wind and solar, there is a growing need for reliable energy storage systems that can provide power during periods of low renewable energy generation. To this end, the Indian government has initiated several policies and programs to promote the adoption of energy storage systems, particularly for RTC power supply. A number of domestic companies and research organizations are also actively investing in R&D to develop advanced energy storage technologies that can support RTC power supply and grid balancing. These include battery storage systems, pumped hydro storage, etc. The discussion will focus on the following aspects:

- Understanding role of energy storage in grid integration of variable RE by separating energy consumption from the time of its production
- Technologies ready for commercialization esp in next-generation battery technologies - lithium-ion, lithium-sulfur, sodium-sulfur, solid-state batteries, advanced lead-acid, vanadium redox flow battery, zinc-bromine, zinc-air and pumped energy storage
- R&D's role in development of globally competitive technologies

With the increasing emphasis on energy security and sustainability, R&D efforts in Indian energy storage systems are likely to continue growing, positioning the country as a significant player in the global energy storage market.







Session-VI

Advanced R&D in Bio-methanation and Bio CNG

Bio-methanation and Bio CNG technologies have gained significant attention in India in recent years due to the increasing demand for renewable energy sources and the need to reduce greenhouse gas emissions. The National Biogas and Manure Management Programme (NBMMP) is a major initiative of the Indian government aimed at promoting the use of bio-methanation and bio CNG technology for energy generation and organic manure production. The discussion will focus on following aspects:

- Immense opportunity to harness biomass resources in the form of CBG which is a highly versatile and sustainable fuel and the role of Bio - methanation and Bio CNG in rural development
- Support from industry organizations (like OMCs) in development of ready to scale up technologies in the bio methanation and bio CNG segment under the SATAT Scheme
- Discussion on challenges like feedstock availability, low calorific value, waste segregation, scrubbing/ cleaning and integration with gas grid
- R&D efforts required to catalyse the sector

These advancements are expected to play a significant role in the growth of the bioenergy sector in India in the coming years.







Session-VII

Enabling Ecosystem for Upscaling Clean Tech Innovations

India has a huge potential for clean tech innovation, particularly in the areas of renewable energy, energy efficiency, and sustainable transportation. However, in order to scale up these innovations, a supportive ecosystem is required. The discussion will focus on the following aspects:

- Private sector's role in the cleantech innovation investments
- Mechanisms to utilize the innovation budget of the government to the fullest to support new tech development
- Development of a conducive policy framework that supports the development and adoption of clean tech innovations
- Understanding support required by clean tech startups need incubation and acceleration support to help them develop their innovations, build their teams, and access markets.
- Exploring collaboration and partnerships between startups, corporations, and government that can help accelerate the development and adoption of clean tech innovations.

Overall, an enabling ecosystem for upscaling clean tech innovations in India requires a coordinated effort between the government, private sector, and civil society to create the necessary conditions for innovation and growth.