India Initiatives in Clean Energy Innovation

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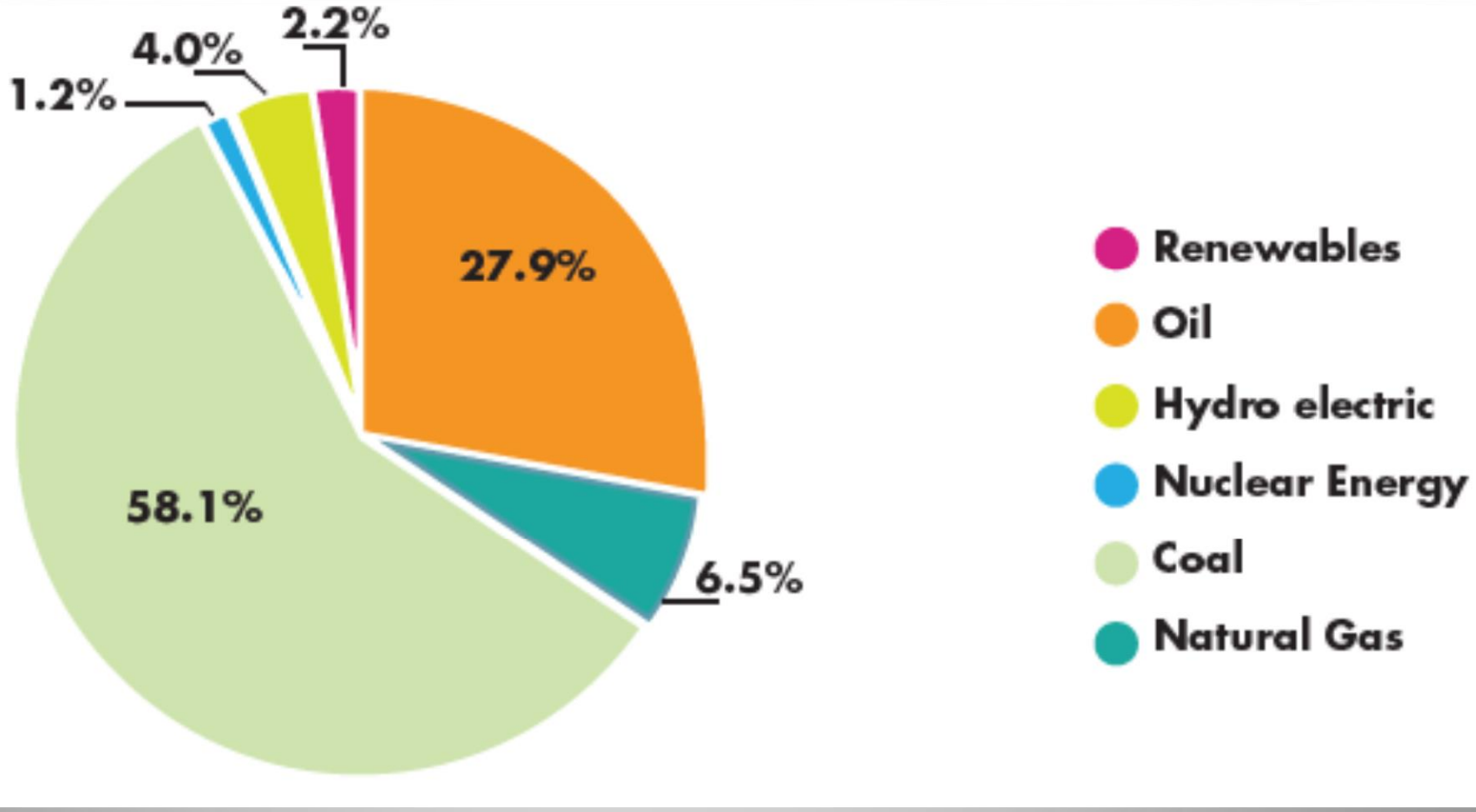
Energy Mix of India



Report Energizing India NITI Aayog

Renewable share in Total energy mix in India

Peak Electricity Demand 159 GW

Total Installed capacity 310 GW (Thermal (69.4%), Hydro (13.9%), Renewables (14.8%), Nuclear (1.9%)

Enhanced penetration of Renewable energy **45.9 GW**

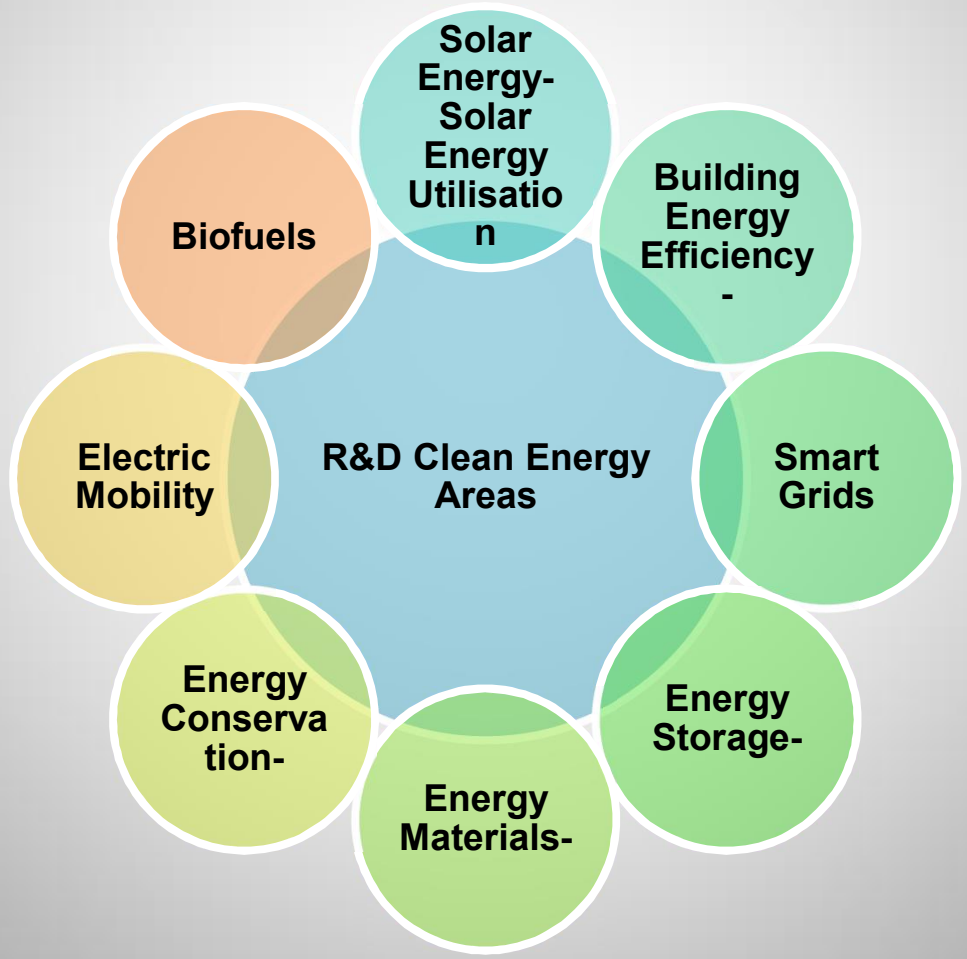
Target of 175 GW by 2022 (Solar, Wind, Biomass, Hydro)

The key Energy Objectives

-Increasing energy security
-Reducing Energy Poverty
-Improving Energy Sustainability

Report Energizing India NITI Aayog

R&D Clean energy Areas



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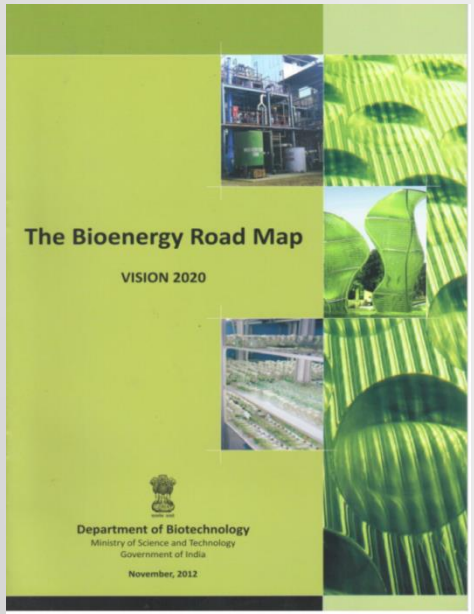
DBT's Bioenergy Roadmap-Vision 2020

DBT Mandate: To promote R&D and Innovation
And develop economically viable biofuel production technologies
The National Biofuel Policy-2018

Vision 2020 -Bioenergy Road Map for R&D

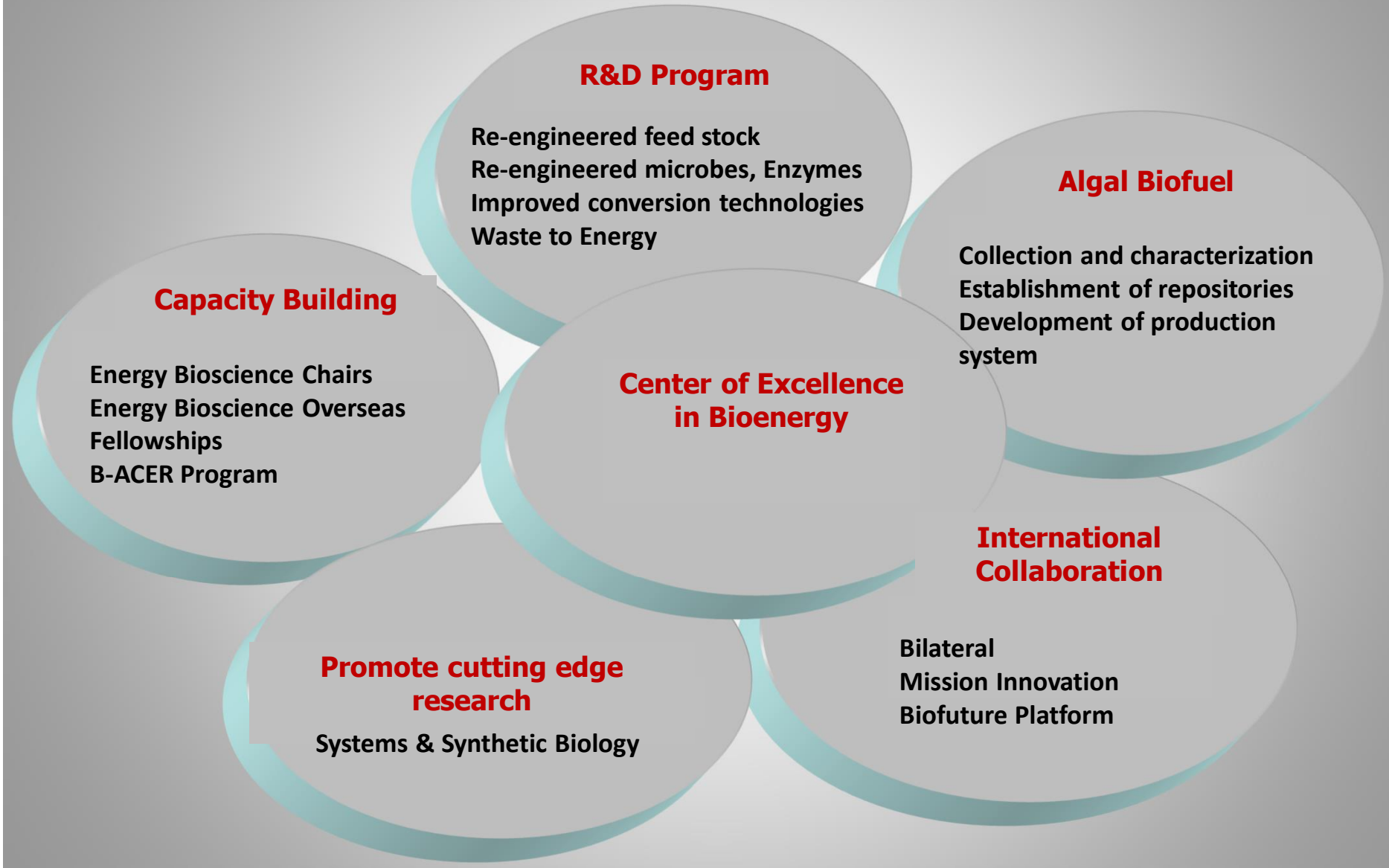
Promote cutting edge R&D and Innovation



Areas of Focus

Feedstock development, Technology improvement for 2G Ethanol, Biodiesel, Biobutanol, Hydrogen, Bio-CNG, Drop-in fuels, Waste to Energy

Various Schemes for Implementation in Biofuel R&D



Center of Excellence in Bioenergy

1. DBT-ICT Center for Bioenergy, Mumbai

2. DBT-IOC Center for Advance Biofuel Research, Faridabad

3. DBT-ICGEB Center for Bioenergy, New Delhi

4. DBT-Pan IIT Center for Bioenergy (Virtual Center of 5 institutes)

5. DBT-TERI Center of Excellence for Biofuel and Bio-commodities

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2G Ethanol Pilot Plant
based on DBT-ICT Technology

Continuous Steam Explosion Pilot Plant (DBT-IOC Centre, Faridabad)

CO_2 to high value Lipids Pilot Plant (at DBT-IOC Centre)

100 Litre continuous fermenter

Algae used sewage water treatment

Demonstration Projects in partnership with stakeholders

Demonstration Plant to convert
1-10 TPD MSW into Energy (By DBT-ICT at BPCL Colon

Rapid Anaerobic Digestion Technology (Mumbai)

High rate Bio-Methanation of organic fraction of MSW (Hyderabad)

Co-Fermentation of Kitchen Waste and Fecal Sludge-
(BITs Goa with Village Panchayat

Capacity Building in Clean Energy

Fellowship / Awards/ Training programs for PhD Students
Young Scientist –short term visits
Conferences /Seminars
Clean Energy Areas
Bioenergy Awards for Cutting Edge Research
Bhaskara Advanced Solar Energy Fellowship Program
Early Career Research Awards
Start up –Research Grant
Post Doctoral Research -Overseas Fellowship (Re-entry program)

International Cooperation in Clean Energy

US – India Joint Clean Energy Research and Development Centre

Dutch- India LOTUS Project on Cleaning Barapullah Drain

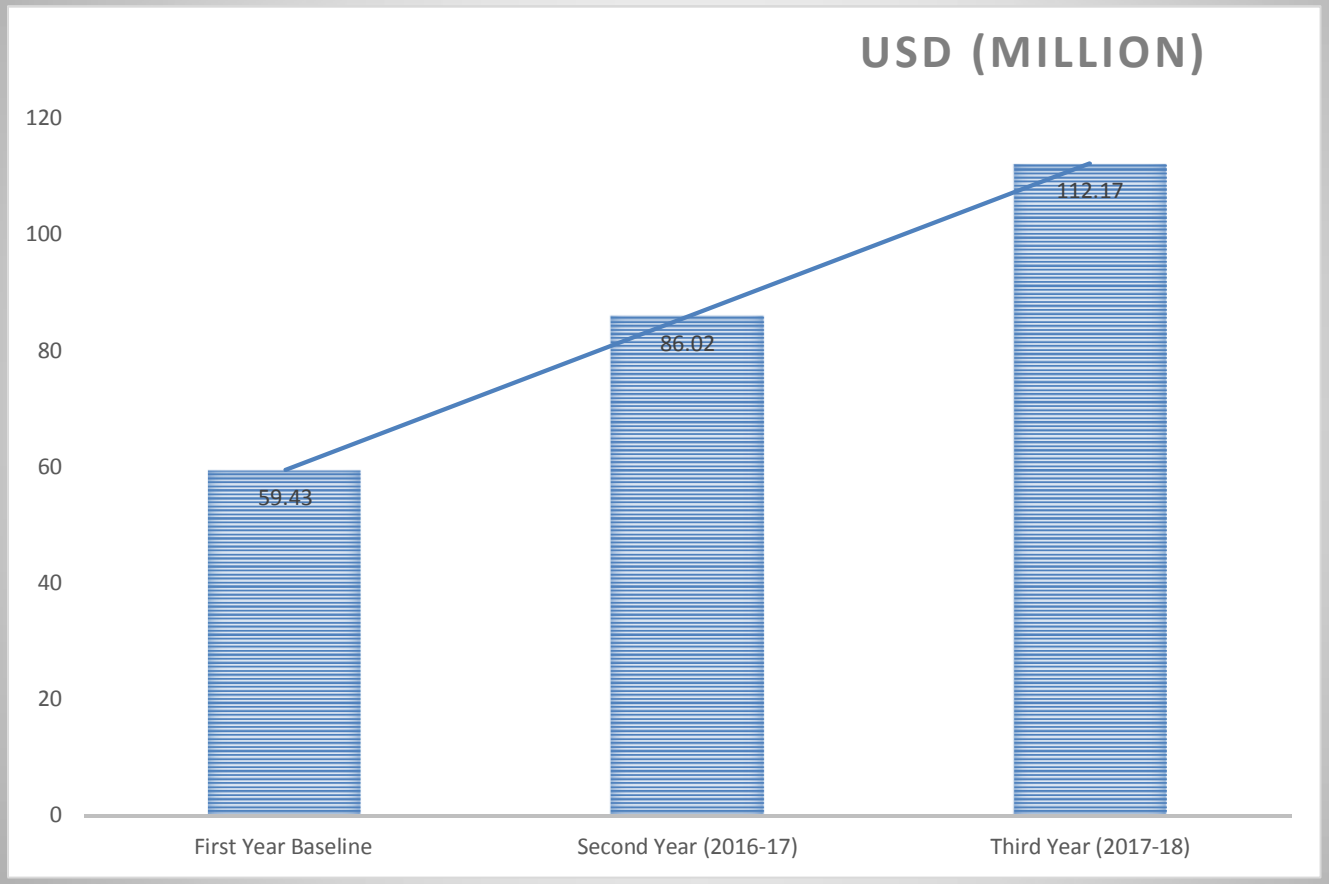
Brazil–India Biofuel projects

UK-India Joint Virtual Clean Energy Centre

US-India Catalytic Solar Finance Program Clean Energy Finance Initiative

UK-India Cooperation Programme on Energy demand reduction in the built environment

Clean Energy RD&D Spending



Mission Innovation:
Clean Energy Innovation challenges

India is founder and active member of Mission Innovation and Co-lead of Analysis and Joint Research

Co-lead
Smart Grid, Off- Grid access to Electricity and Sustainable Biofuel

Strengthen and expand collaboration between key partners government-government, researcher-researcher, public-private etc

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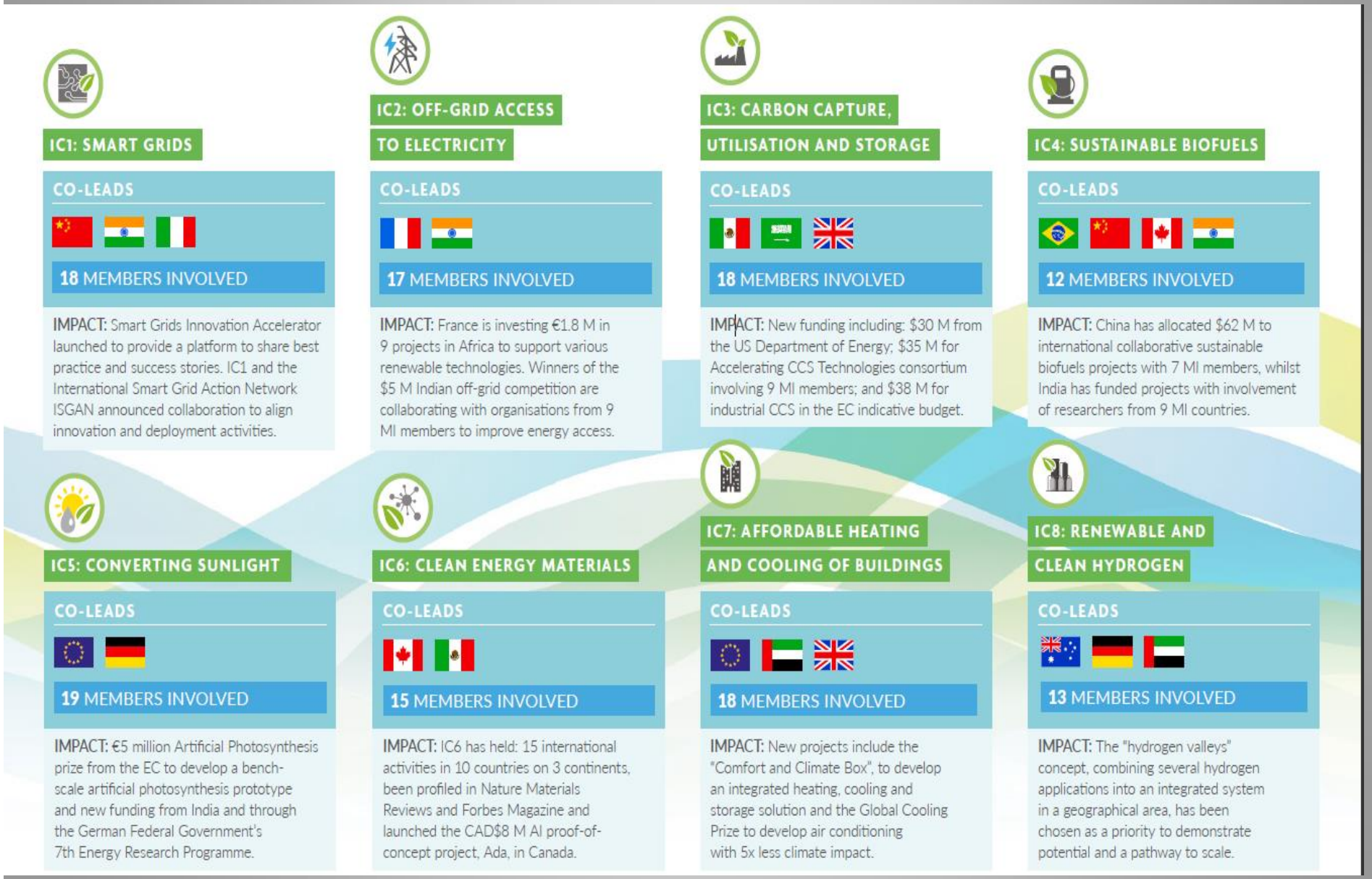
Mission Innovation: Analysis and Joint Research Innovation Challenges



Innovation Challenges: India's progress

IC1 Smart Grids

- 17 Collaborative RD&D Programmes and 3 virtual centers at an investment of USD 60 million.
- Network of 27 Indian 39 institutes from MI countries along with 45 industries / utilities.

IC2 Off Grids

- 9 off Grid Research led solutions for remote communities in diverse geographic location at an investment of 5 million US $
- Network of 30 Indian and 16 institutes from MI countries.

IC3 Carbon Capture, Utilisation and Storage

- 21 Collaborative research programmes with an investment of US 6 million.

IC4 Sustainable Biofuel

- 14 Collaborative Research Projects with an investment of US $ 5 million.

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Innovation Challenges: India's progress

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IC 5 Converting Sunlight

- 13 projects at an investment of US $ 6 million.

IC6 Clean Energy Materials

- 4 Multi institutional technology platforms and 29 Research Programs at an investment of US $ 10 million.

IC7 Affordable Heating and Cooling of Buildings

- Partnership in Global Cooling Prize
- 3 collaborative Research Intiatives with MI Countries.

IC8 Renewable and Clean Hydrogen

- 31 Research Programmes at an investment of US $ 10 million.

Events : 16 **Reports :** 11 **MI Projects Supported:** 73

Bilateral Collaboration : 11

Multilateral Collaboration: 18

Investments : US $ 102 million **Centre :** *3*

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International incubator in Clean Energy
Public –Private Partnership

Joint initiative of Tata Trusts and Government of India

CEIIC Designed to offer complete “lab-to-market” incubation support to clean energy enterprises, both Indian and International,

Incubated 9 start ups (2 international)

Collaboration with Sweden under Avoided Emission Framework

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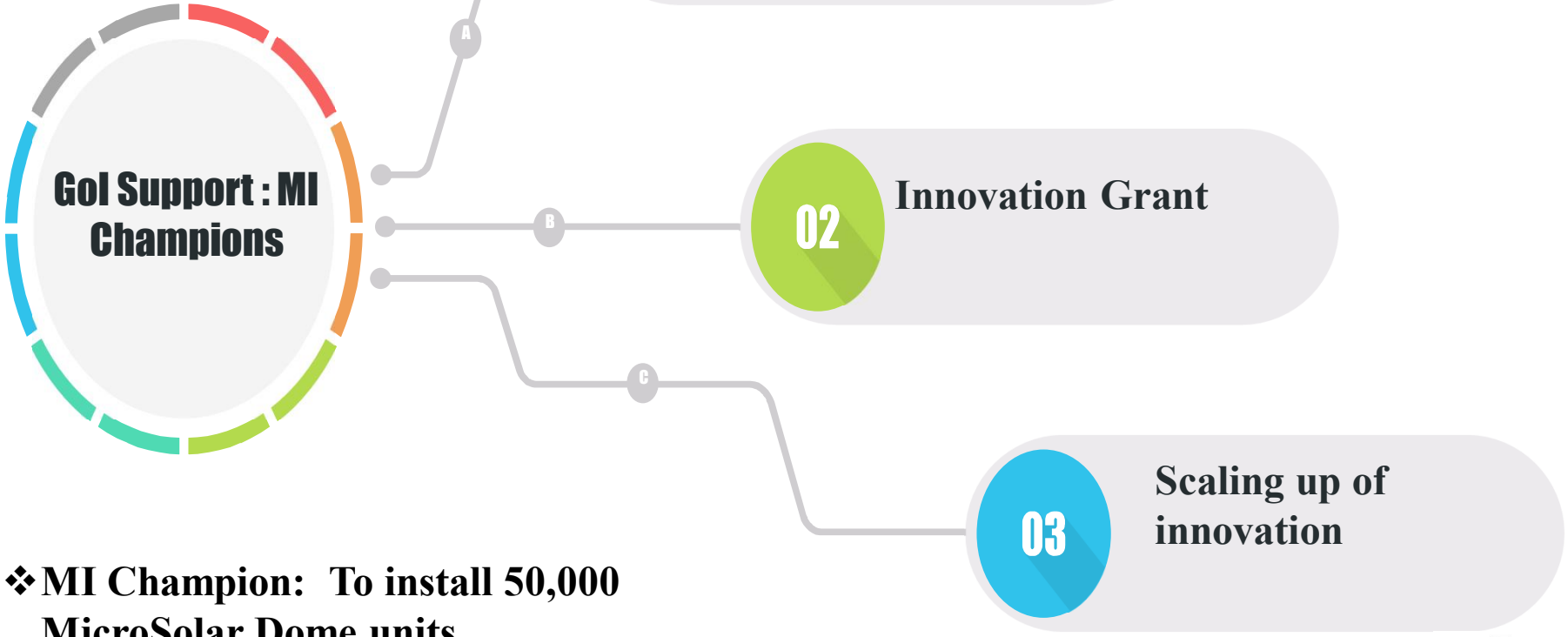
Maximizing Impact by supporting Innovators in Clean Energy



❖**MI Champion: To install 50,000 MicroSolar Dome units**

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Mapping investment data and Innovation Analysis

MoU Signed on 30 August 2018 on Enhancing Innovation for the Clean Energy Transition.

Areas of co-operation

sharing of analysis and policy recommendations related to energy RD&D;

exchanging experiences and best practices of mapping, tracking and/or estimating public funding

developing a methodology for mapping and estimating private sector investment in energy RD&D in India

Innovation analysis for policy environments that will facilitate and catalyze RD&D

jointly identifying possible priority areas for accelerating energy innovation,

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Enhancing Innovation for Clean Energy Transition

- Accelerating innovation by new and flexible funding instruments
- Encourage public –private partnership demonstration
- Viability Gap Funding to de-risk large investment projects
- Connect technology providers to concerned stakeholders
- Increased investments in R,D& D
- Enable innovators to scale innovations from lab to market

For details visit websites
DBT - http://www.dbtindia.gov.in/
Mission Innovation India http://missioninnovation-india.net/
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