India Initiatives in Clean Energy Innovation

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Department of Biotechnology - MoS&T, GOI
Energy Mix of India

- Renewables: 27.9%
- Oil: 58.1%
- Hydro electric: 6.5%
- Nuclear Energy: 4.0%
- Coal: 2.2%
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
R&D Clean energy Areas

- Solar Energy - Solar Energy Utilisation
- Building Energy Efficiency
- Electric Mobility
- Energy Conservation
- Energy Materials
- Energy Storage
- Smart Grids
- Biofuels

R&D Clean Energy Areas
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

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Various Schemes for Implementation in Biofuel R&D

R&D Program
- Re-engineered feed stock
- Re-engineered microbes, Enzymes
- Improved conversion technologies
- Waste to Energy

Algal Biofuel
- Collection and characterization
- Establishment of repositories
- Development of production system

Center of Excellence in Bioenergy

Capacity Building
- Energy Bioscience Chairs
- Energy Bioscience Overseas Fellowships
- B-ACER Program

Promote cutting edge research
- Systems & Synthetic Biology

International Collaboration
- Bilateral
- Mission Innovation
- Biofuture Platform

Department of Biotechnology- MoS&T
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
2G Ethanol Pilot Plant based on DBT-ICT Technology
Continuous Steam Explosion Pilot Plant
(DBT-IOC Centre, Faridabad)

Capacity 300 kg/day
CO₂ 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 Colony, Mumbai)

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)

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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

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Clean Energy RD&D Spending

USD (MILLION)

- First Year Baseline: $59.43
- Second Year (2016-17): $86.02
- Third Year (2017-18): $112.17

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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
Mission Innovation: Analysis and Joint Research

Innovation Challenges

IC1: SMART GRIDS
CO-LEADS: [Flags of participating countries]
18 MEMBERS INVOLVED
IMPACT: Smart Grids Innovation Accelerator launched to provide a platform to share best practice and success stories. IC1 and the International Smart Grid Action Network (ISGAN) announced collaboration to align innovation and deployment activities.

IC2: OFF-GRID ACCESS TO ELECTRICITY
CO-LEADS: [Flags of participating countries]
17 MEMBERS INVOLVED
IMPACT: France is investing €1.8 M in 9 projects in Africa to support various renewable technologies. Winners of the $5 M Indian off-grid competition are collaborating with organisations from 9 MI members to improve energy access.

IC3: CARBON CAPTURE, UTILISATION AND STORAGE
CO-LEADS: [Flags of participating countries]
18 MEMBERS INVOLVED
IMPACT: New funding including $30 M from the US Department of Energy, $35 M for Accelerating CCS Technologies consortium involving 9 MI members, and $38 M for Industrial CCS in the EC indicative budget.

IC4: SUSTAINABLE BIOFUELS
CO-LEADS: [Flags of participating countries]
12 MEMBERS INVOLVED
IMPACT: China has allocated $62 M to international collaborative sustainable biofuels projects with 7 MI members, whilst India has funded projects with involvement of researchers from 9 MI countries.

IC5: CONVERTING SUNLIGHT
CO-LEADS: [Flags of participating countries]
19 MEMBERS INVOLVED
IMPACT: €5 million Artificial Photosynthesis prize from the EC to develop a bench-scale artificial photosynthesis prototype and new funding from India and through the German Federal Government’s 7th Energy Research Programme.

IC6: CLEAN ENERGY MATERIALS
CO-LEADS: [Flags of participating countries]
15 MEMBERS INVOLVED
IMPACT: IC6 has held 15 international activities in 10 countries on 3 continents, been profiled in Nature Materials Reviews and Forbes Magazine and launched the CAD$8 M AI proof-of-concept project, Ada, in Canada.

IC7: AFFORDABLE HEATING AND COOLING OF BUILDINGS
CO-LEADS: [Flags of participating countries]
18 MEMBERS INVOLVED
IMPACT: New projects include the "Comfort and Climate Box", to develop an integrated heating, cooling and storage solution and the Global Cooling Prize to develop air conditioning with 5x less climate impact.

IC8: RENEWABLE AND CLEAN HYDROGEN
CO-LEADS: [Flags of participating countries]
13 MEMBERS INVOLVED
IMPACT: The "hydrogen valley" concept, combining several hydrogen applications into an integrated system in a geographical area, has been chosen as a priority to demonstrate potential and a pathway to scale.
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 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.
Innovation Challenges: India’s progress

IC 5 Converting Sunlight

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

IC 6 Clean Energy Materials

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

IC 7 Affordable Heating and Cooling of Buildings

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

IC 8 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
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
Maximizing Impact by supporting Innovators in Clean Energy

- Supporting MI Champion and 4 National Innovators
- Innovation Grant
- Scaling up of innovation

- MI Champion: To install 50,000 MicroSolar Dome units
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,
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/
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