



सत्यमेव जयते
Ministry of Science and Technology
Government of India

Mission Innovation
Stakeholder's meet on Public-Private
Cooperation for Clean Energy
Innovation 2017

Mission Innovation India – Stakeholder's meet on Public-Private Cooperation for Clean Energy Innovation 2017

Workshop Date: December 20th, 2017

Venue: India Habitat Centre, New Delhi.

Conference Report

A stakeholder's meet on Public-Private Cooperation for Clean Energy Innovation was held on 20th December, 2017 at India Habitat Centre, New Delhi. The stakeholder's meet aimed at bringing together investors, industry, government, and researchers to encourage increased engagement, knowledge sharing, networking and opportunities for new collaborations. The event organized by the Department of Biotechnology (Government of India) and Mission Innovation (MI) - India, was attended by key representatives from Government, Industry, Academia and Investors. The agenda and list of participants for the workshop are attached as annexures. A report on 'National Consultative Workshops on Innovative Challenges for Accelerating Clean Energy Innovations' was released by Dr Sanjay Bajpai (Advisor, Department of Science and Technology), Dr. Renu Swarup, Senior Adviser Department of Biotechnology, Dr. Anjan Ray (Director, CSIR-Indian Institute of Petroleum), Dr. D.K Tuli (DBT-IOC Chair) and Dr. Sangita Kasture (Joint Director -Department of Biotechnology). This report summarized Mission Innovation- India's findings on current R&D status and gap areas across the seven Innovation Challenges.



The stakeholder's meet aimed at forging ahead public-private partnerships critical to fast-track clean energy innovation from early stage design to full scale-up. The key deliverables of the proposed meet were:

1. Improve mutual understanding between public and private sectors around MI co-operation and support initiatives that can significantly accelerate clean energy innovation.
2. Identifying Government and private sector partnership opportunities, funding needs, gap areas and address concerns of investors and industry partners.
3. Industry and private sector interactions to scale-up technologies on commercial level.
4. Define scope of activities, milestones and expected outputs for MI partnership activities.

The expected outcomes of the conference were public-private engagement towards focused and proactive initiatives; and to identify shared experiences from different innovation areas to accelerate innovation for new technologies and solutions.

Dr. Sangita Kasture (Joint Director -Department of Biotechnology) gave a welcome address and provided an overview of Mission Innovation (MI) programs. She provided an update on the workshops held under Mission Innovation, India to identify key priority areas for the seven MI challenges. She stressed on the importance of business participation and increase in investment in RD&D to accelerate innovation in the field of clean energy.

Dr Sanjay Bajpai (Advisor, Department of Science and Technology), gave an overview of Mission India activities towards identifying national priorities and accelerating clean energy R&D. He highlighted the commitment of the Government for funding clean energy projects citing recent examples. The seven global MI challenges were drafted with a global consensus to achieve a significant impact in the least possible time in the clean energy sector.

Dr. Anjan Ray (Director, CSIR-Indian Institute of Petroleum). He re-iterated India's commitment for addressing the seven Mission Innovation Challenges. He highlighted the report on 'National Consultative Workshops on Innovative Challenges for Accelerating Clean Energy Innovations' which is a compilation of the status of technology and R&D gap areas. This can be a starting point for deciding R&D projects to be taken up and areas which will benefit from collaborations under a public private partnership model.



Dr. Renu Swarup, Senior Adviser Department of Biotechnology said that India plays an important role in Mission Innovation as it is a lead for 3 innovation challenges and co-lead country for 4 innovation challenges. The term Mission Innovation was coined by Hon'ble Prime Minister of India, Shri. Narendra Modi and involves the Ministry of Power, Ministry of Science, Ministry of Petroleum, Ministry of Environment and Ministry of New and Renewable Energy. The involvement of the private sector was essential for MI objectives to be successful. For a seamless public private partnership in the clean energy sector, Dr. Swarup suggested the involvement of industry and start-ups as a co-development partner early during development. She recommended participants to suggest few clear recommendations and consider innovative models for investment, models of delivery, models for partnerships with member countries under the realm of mission innovation activities.

Indian Status of the Seven Mission Innovation Challenges

Details of MI workshops indicating country status of all mission innovation challenges were presented by the Lead presenter/ Technical expert for the respective challenge. Presentations on developments in Smart Grid (Dr. J.B.V Reddy & Prof.N.P Padhy), Off Grid (Dr.V Saini), Carbon Capture (Dr. D.K Tuli & Mr. Harish Sikri), Sustainable Biofuels (Dr. D.K Tuli), Converting Sunlight (Dr. Shams Yazdani), Clean Energy Materials (Dr. Ranjith Pai) and Affordable Heating & Cooling of Buildings (Dr. Rajan Rawal).

Investor's perspective on Clean Energy.



After the main talks describing the MI innovation challenges Mr. Kunal Upadhyay (Infuse Ventures), Ms. Riya Saxena (Asha Impact) and Ms. Jayarooma J (Patamar Capital) presented the Investors point of view in Clean Energy. Mr. Kunal Upadhyay described clean energy as a risky sector with low returns on investment. Thus, there is more emphasis on government participation. He stressed on early involvement of entrepreneurs in converting research proposals to business model. As there are no markets in the Cleantech area, it is important that entrepreneurs get a fair share of projects early on. Emphasis on government funding should be to entrepreneurs and industry along with research institutes. Ms. Riya Saxena recommended that significant investments are required in this sector and the time for return of investments is also substantially longer. Ms. Jayarooma J suggested that an infrastructure needs to be created for Clean Energy. As technologically the field is still in a nascent stage,

progression will happen with continuous improvement and refinement. Government subsidies in this area should not be directed at customers as it results in market distortion and discourages entrepreneurs. Government policies should be enabling for entrepreneurs by providing subsidized logistics, infrastructure for manpower etc. Government can create successful partnerships by providing soft skills training to R&D organizations and licensing out technology.

Industry perspective on Clean Energy

The Industry perspective on Clean Energy was represented by Mr. Makrand Phadke (Reliance Industries), Mr. Vishnu Shashidharan (Pluss Advanced Technologies), Ms. Lauren Harmon (Lanzatech) and Mr. Rahul Walawalkar (Customized Energy Solutions).

Mr. Phadke described the Algae to Biofuel project initiated by Reliance Industries which was one of the largest in Asia. He stressed on:

- Improvement of Governance of Industry-Academia partnership for delivery of results.
- A focus on clear-cut results/deliverables in such partnerships.
- Provision of cutting edge research work/technology to be available as a service to the industry from academia.
- Terms of agreement for partnering with academia should be based on royalty sharing model.
- Development of predictable Government policy framework.

Mr. Shashidharan described the current technologies in thermal energy storage. He stressed on differential tariffs for power to conserve energy. Ms. Harmon described the Carbon recycling commercial plants set up by Lanzatech worldwide. She described the recent collaboration with IOC and commented on:

- Presence of a stable Government policy to reduce market risk.
- A technology neutral policy to support public private partnership.
- Public private partnerships should support scale up and technology development; participation should start early from R&D, to pilot and commercial set up

Mr. Rahul Walawalkar made the following recommendations:

- For transformative (versus incremental projects) cost should not be the sole deciding factor. As per the mandate of Mission Innovation, breakthrough technologies should be judged as per technical excellence, safety, energy density etc.
- To kill non-performing projects early in the life cycle
- Cited example, of the Atal Innovation Mission government funded program.

Interactive Panel Discussion

The panel discussion was moderated by Dr. Anjan Ray (CSIR-IIP) & Dr. Sanjay Bajpai (DST). Panelist included Dr. Ramakumar, (IOC), Mr. Kartik Chandrasekhar (SVC), Mr. Balakumar P (AI), Dr. Satish Kumar (AEEE) & Mr. Vibhav Nuwal (REC-E).



Dr. S.S.V Ramakumar, Director (R&D), IOCL described a 30 Crore revolving fund for entrepreneurs and innovators with no cap set up by IOC. He cited that the time frame to reach an acceptable demonstrable scale can span 11-12 years. IOC is committed to providing ‘hand holding’, intellectual and financial resources to entrepreneurs by following a monitoring and mentoring scheme, with defined deliverables at the end. As an example of public private partnership, he cited Lanzatech and Indian Oil partnership where IOC has shown an initiative by setting up a 35,000-metric ton plant, completely funded by IOC. He suggested for public private partnership to flourish in cleantech innovation:

- Tax incentives to be available to entrepreneurs.
- An appetite for risk taking; breakthrough projects cannot be weighed on regular IRR scales as this will be detrimental for the growth of innovative ideas.

Dr Ramakumar said that IOC will be willing to collaborate and pool resources for projects of national importance in the energy sector. The moderator noted that institutional funds are different from venture capital funds in terms of support and expectations. In Institutional support, the corpus is balanced by a large balance sheet and can accommodate few failures.

Mr. Kartik Chandrasekhar from Sangam Ventures described projects with academia/ government in pre-commercial investments and seed investments.

- He urged government DBT and DST to intervene in Cleantech in early stage as there is higher risk with MI fast-track projects
- Government to invest in commercialization and cover market risk which is relatively high.
- Cash burn is the highest in this sector and thus a caution for start-ups to manage and conserve cash for survival and crossing valley of death.
- In typical venture capital funding scenario, mode of operation of start-ups will be of caution and slow paced contrary to the expectations of MI
- Under the mandate of MI to fast track Cleantech innovations, there must be a safety net to deal with ambiguity and failure.
- Venture capital funds are typically cautious of government funding and stated that subsidies create vicious working capital cycles.

He highlighted some medium and long term loan programs from DST and SIDBI that might be useful for the Cleantech innovator.

Mr. Balakumar P (AI) commented that public private partnerships in the energy sector exist and are moving in the right direction. A proper environment is required to support these partnerships, prove their working models and encourage entrepreneurs. Government needs to support and incubate start-ups for risk coverage.

Dr. Satish Kumar (AEEE) described existing Government funding to academia and industry to spur private -public partnerships. He recommended:

- A role for philanthropic organizations to bridge the research gaps and direct technologies towards commercialization
- To reduce credibility gap and the conviction that private sector has with the quality of research in academia needs to be addressed.
- Academia should be better aligned with future strategies of companies with respect to their sales and marketing direction.

Mr. Vibhav Nuwal (REC-E) cited irregularities in the electricity market. He highlighted that electricity distribution is run by Government owned companies and subsidies provided by local distribution companies result in market distortion. He stressed that markets should be available for start-ups and entrepreneurs. Market distortions caused by subsidies, crowd out innovative start-ups, and make markets unavailable to innovators.

Other Suggestions

Mr Sunil Singhal commented that MI should consider on making procurement procedures in academic institutions quicker and streamlined. This is a major bottle neck for many researchers despite having adequate funding and commitment. Research projects of national importance should not have to deal with procedural delays. He stressed on the retention of manpower and continuity of project to be with the head of the project.

Dr Rajan Rawal mentioned that the credibility of research institutes needs to be established and Government should consider funding private institutes. MI calls for proposal must incorporate R&D and D, as demonstration must be an integral part of the proposal.

Mr Arun Bhatia said that companies as United Technologies have Corporate Social Responsibility (CSR) funds which can fund innovative projects in clean energy. However, the funding cannot be provided to technological areas related to the main business of the company. Dr. Nelson Vadassery (Sea6 Energy) said that the quantum of funding for MI challenges should be larger given the fact that a pilot plant must be established. This funding can be allotted in a phased manner.

Concluding Session

Dr. D.K Tuli presented the brief summary and main highlights of workshop.

Dr. Renu Swarup mentioned that MI calls for proposal will follow with start-up investment from the Government. The proposals can be of national or multilateral level. She said that Mission Innovation can be a good platform to promote clean energy technologies through active participation of private sector.

Prof. K. VijayRaghavan, Secretary, Department of Biotechnology delivered the concluding address. He mentioned that the progress in civilisation has resulted in the increase of carbon dioxide levels and since this is a man-made phenomenon, its solution also lies with us. He expressed the view that the new technology initiatives on clean energy under mission innovation could provide a lasting solution. However, the speed of development must match with the mammoth scale of the problem. Reacting to the comments & sentiments expressed in conference by industry and investors regarding need to develop technologies at reasonable pilot scale he suggested creating a base paper to seek Governmental funding for this purpose. He complimented Mission Innovation for organising a much-needed interaction between investors, industry and Government funding agencies and expressed that the recommendations of this workshop should be followed in a time bound manner.

Annexure I



Encouraging Private Investment in Transforming Clean Energy

Mission Innovation India- Stakeholders Meet on Public- Private Cooperation for Clean Energy Innovation 2017

Program

Date: 20 th December 2017	
Venue: Juniper Hall, India Habitat Center, New Delhi	
Time	
9: 30 - 10:00	Registration
10:00 - 11:00	Opening Session: 10:00-10:15: Welcome & Brief about Mission Innovation (MI)- Dr. Sangita Kasture, Joint Director, Department of Biotechnology 10:15-10:30: Indian Activities of MI- Dr. Sanjay Bajpai, Advisor, Department of Science & Technology 10:30-10:40: Public & Private Engagement in context of MI-India- Dr. Renu Swarup, Sr. Advisor, Department of Biotechnology 10:40-11:00: Inaugural address by Prof. K. VijayRaghavan, Secretary, Department of Biotechnology, Ministry of Science & Technology, Govt. of India
11:00 – 11:30	Coffee Break
11:30 – 12:45	<u>Indian Status of Seven Mission Innovation Challenges</u> Details of MI workshops indicating areas ready for commercialization, under advanced R&D and areas under exploratory-phase Each MI Country lead contacts of all challenges will present the outcomes of the Country Conferences
12:45 – 13:45	<u>Investor Point of View (5-7 minutes each):</u> Mr. Kunal Upadhyay: Infuse Ventures Ms. Riya Saxena: Asha Impact

	<p>Ms. Jayarooma J: Patamar Capital</p> <p><u>Industry Point of View (5-7 minutes each):</u></p> <p>Mr. Makrand Phadke: Reliance Industries</p> <p>Mr. Vishnu Shashidharan: Pluss Advanced Technologies</p> <p>Dr. Laurel Harmon: Lanzatech</p> <p>Mr. Rahul Walawalkar: Customized Energy Solutions</p>
13:45 - 14:30	Lunch
14:30 – 16:00	<p>Interactive Panel Discussion</p> <p><u>Panel Moderator:</u> Dr. Anjan Ray (CSIR-IIP) & Dr. Sanjay Bajpai (DST)</p> <p><u>Panelists:</u> Dr. Ramakumar, (IOC), Dr. Debashish Bhattacharjee (TS), Mr. Kartik Chandrasekhar (SVC), Mr. Balakumar P (AI), Dr. Satish Kumar (AEEE) & Mr. Vibhav Nuwal (REC-E).</p> <p><u>Public Private Partnership in the context of MI Challenges</u></p> <p>The session will examine questions specific to Mission Innovation in relation to Public Private co-operation in the context of MI challenges.</p> <p>1. <u>Public-Private Partnership</u></p> <ul style="list-style-type: none"> • How Public-Private partnership can support the start-ups and SMEs. • How can Private Sector partnership contribute to Research and Development? • What can be done for effective coordination between government and private sector to make substantial difference in accelerating clean energy innovation and how? • How alliances, programs and policy design processes can be applicable to Mission Innovation challenges? <p>2. <u>Investment Opportunities</u></p> <ul style="list-style-type: none"> • How can Government investment for Mission Innovation challenges spur private sector investment and commercialization of technologies? • How can large Investors Support Technology Development? <p>3. <u>Key Opportunities:</u></p> <ul style="list-style-type: none"> • Models for Public-Private Partnership for technology development. • Opportunities for Startup, SMEs and Academic Researchers for collaborative R&D.
16:00 – 16:30	<p><u>Summary of Discussion:</u></p> <p>Insights and Ideas: Report back from groups and prioritization of next steps: Dr. D.K. Tuli (MI-India Unit)</p> <p>Closing Remarks: Dr Renu Swarup, Sr. Advisor, Department of Biotechnology</p>

16:30 – 17:00	Networking Coffee
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Innovation Challenges	Lead Presenters
Smart Grid:	Dr. JBV Reddy (DST) & Prof. NP Padhy (IIT-R)
Off-Grid:	Dr. V. Saini (DST)
Carbon Capture:	Dr. D.K.Tuli (MI-India) & Mr. Harish Sikri (MoP)
Sustainable Biofuels:	Dr. D.K.Tuli (MI-India)
Converting Sunlight:	Dr. Shams Yazdani (ICGEB)
Clean Energy Materials:	Dr. Ranjith Pai (DST)
Affordable Heating and Cooling of Buildings:	Dr. JBV Reddy (DST)

Annexure II

Sl No	Name	Organization	Affiliation
Government			
1	Prof. K. VijayRaghavan	DBT, Govt. of India	Secretary
2	Dr. Renu Swarup	DBT, Govt. of India	Sr. Adviser
3	Dr. Sanjay Bajpai	DST, Govt. of India	Adviser
4	Dr. Sangita Kasture	DBT, Govt. of India	Joint Director
5	Dr. Anjan Ray	CSIR-IIP, Dehradun	Director
6	Dr. DK Tuli	DBT, IOC/MI-India	DBT-IOC Chair
7	Dr. Shams Yazdani	ICGEB, New Delhi	Co-PI MI-India
8	Dr. Ranjith K. Pai	DST, Govt. of India	Scientist D
9	Mr. Vineet Saini	DST, Govt. of India	Scientist D
10	Dr. JBV Reddy	DST, Govt. of India	Scientist D
11	Dr. Neelima Alam	DST, Govt. of India	Scientist E
Ministry			
12	Mr. Harish Sikri	Ministry of Power, Govt. of India	AGM(CC)
13	Mr. Y. B. Ramakrishnan	MoPNG, Govt. of India	Chairman Working Group on Biofuels
PSU			
14	Dr. SSV Ramakumar	IOCL	Director (R&D)
15	Mr. S Bhargava	Bharat Petroleum Corporation Limited	Head Corporate Research and Development Centre
16	Dr. Subrata Sarkar	NTPC	AGM (NETRA)
17	Mr. Abhay Bakre	Bureau of Energy efficiency	Director General
18	Mr. A. Sengupta	Bureau of Energy efficiency	Asstt. Energy Economist
19	Mr. Ujjwal Gaur	Bureau of Energy efficiency	Associate
20	Mr. Arun Shukla	GAIL	Executive
21	Mr. Jejerambabu Korsa	GAIL	CH Manager (PC Operations)
Industry			
22	Mr. Balakumar P	Autogrid India, Bangalore	Senior Manager Professional Services
23	Dr. Rahul Walawalkar	Customized Energy Solutions India Pvt. Ltd	Lead Emerging Technologies
24	Dr. Ganesh Das	TATA Power	Head Strategy Business and Collaborations
25	Mr. Rabinder Kant Sikri	Energy and Energy Systems	Group CEO
26	Mr. Sunil Dhingra	Energy and Energy Systems	Consultant
27	Mr. Dhiraj Achal	Jubilant Lifesciences	Vice-President & SBU Head-

	Kumar Asthana		Ethanol & Specialty Gases
28	Dr. Nelson Vadassery	Sea6 Energy	Co-founder & Director of Engineering
29	Dr. Sangeeta Srivastava	Godavari Biorefineries Limited	General Manager – Corporate R&D
30	Mr. Sangeet Jain	Lanzatech	General Manager
31	Dr. Laurel Harmon	Lanzatech	VP Government Relations
32	Mr. Ravi Agrawal	Gencrest	Managing Director
33	Ms. Rashmi Mishra Chowdhary	Gencrest	GM Biotech
34	Mr. Makarand Phadke	Reliance Industries	Sr. Vice President, Innovations at Reliance Industries Limited.
35	Mr. Vishnu Shashidharan	Pluss Advanced Technologies Pvt. Ltd.	Vice President - New Product Initiatives
36	Mr. Sunil Singhal	Sunlight Fuels	Director
37	Mr. Rohit Khaitan	Kuantum Papers Limited	Managing Director
38	Dr. Satish Kumar	Alliance for an Energy Efficient Economy	Interim executive Director
39	Mr. Bimal Tandon	UTC (Climate Control and Security Products)	Director
40	Mr. Arun Bhatia	UTC (Climate Control and Security Products)	Managing Director
41	Mr. Nagahari Krishna L	DANFOSS India	Director Marketing Communication and Industry Affairs
42	Mr. Madhusudhan Rapole	Oorja Energy Engineering Services Pvt Ltd.	CEO
43	Mr. Vinod Raina	ABB	Vice President
44	Mr. Subrahmanyam Pulipaka	Soreva	Co-Founder
45	Mr. Anirudh Ramesh	Soreva	Co-Founder
46	Dr. Rajni Patel	TLA India	Managing Partner
47	Mr. Raj Singh Niranjan	TLA India	Advocate
48	Dr Rajendra Kumar Sharma	SPEL Technologies Pvt Ltd.	CMD
49	Mr. Parikshit Dhingra	Novozymes	Head Public Affairs
50	Mr. Tarun Garg	PWC	Manager Energy Advisory
51	Dr. Senthil Chinnasamy	Aban Infrastructure Ltd.	CTO
Investors			
52	Ms. Jayaroopa J	Patamar Capital	Partner
53	Mr. Kunal Upadhyay	Infuse Ventures	CEO
54	Mr. Karthik Chandrasekhar	Sangam VC	Founder and CEO
55	Ms. Riya Saxena	Asha Impact	Associate
Start-up			

56	Mr Rakesh Kamal	The Climate Reality Project	Clean energy Policy and Programs Consultant
57	Mr. Vibhav Nuwal	REConnect Energy	Director
Research Institute			
58	Mr. Amit Kumar	TERI	Sr. Director
59	Dr. Meeta Lavania	TERI	Fellow
60	Dr SK Dube	TERI	Sr Fellow
61	Dr. Narayan Padhy	IIT Roorkee	Professor
62	Dr. Rajan Rawal	Centre for Advanced Research in Building Science and Energy	Executive Director
63	Dr Anil Odaneth Anamma	ICT Mumbai	Assistant Professor
64	Mr. Gaurav Mishra	SPRERI	Director
65	Mr. Samir Vahora	SPRERI	Scientist
66	Mr Kailash Trivedi	SPRERI	Consultant
67	Dr Thallada Bhaskar	IIP Dehradun	Principal Scientist and Head
68	Dr Srinivas Padala	IIP Dehradun	Senior Scientist
69	Dr PKS Sarma	BIRAC New Delhi	Head Technical
70	Dr. Shilpi Gupta	BIRAC, New Delhi	Sr. Programme Manager
Embassy			
71	Sec. Pedro Ivo Ferraz da Silva	Embassy of Brazil	Adviser
72	Mr. Udit Mathur	British High Commission/FCO	Sr. Adviser
MI India			
73	Dr. Brajesh Barse	ICGEB, New Delhi	Project Manager
74	Dr. Deepika Singh	Mission Innovation India	Programme Manager
75	Dr. Amit Prabhakar	Mission Innovation India	Programme Manager
76	Dr. Ayashaa Ahmad	Mission Innovation India	Research Associate