MISSION INNOVATION
Accelerating the Clean Energy Revolution
INDIA

सत्यमेव जयते
Ministry of Science and Technology
Government of India

Mission Innovation
Smart Grids IC#1
Country Workshop

Mission Innovation Challenge IC# 1 "Smart Grids"

Workshop Date: May 22nd, 2017

Venue: Indian Institute of Technology, Delhi, New Delhi

Conference Report

Workshop on Smart Grids, IC#1 challenge of Mission Innovation was held on 22nd May, 2017 at IIT, Delhi. The event was inaugurated by Prof. Ashutosh Sharma, Secretary-DST. Prof. Bhim Singh, Dean (Academics), IIT-D, presided over the event. Prof. Padhy presented the country status report and R&D priorities. Prof. S.C. Srivastava presented the expected outcome of the meeting. The list of participants is attached (Annexure-I).

Participants of MI-India Workshop on Smart Grids Innovation Challenge

The following points were made:

1. India is committed to MI goal of promoting clean energy research, development and demonstration to accelerate clean energy innovation and MI presents a significant opportunity to meet objective of economic growth as well as INDC (India's Intended Nationally Determined Contribution) goals for climate change.

2. DST has mounted several missions for clean energy, including clean coal, cleaner fuel, energy efficiency and electric mobility. Under MI, DST has committed to double its R&D spend by 2019. However, this budget has already been achieved in 2016-17 (Rs. 147 cr.) and efforts are on for ramping it up exponentially in coming years.

3. MI Innovation challenge are global calls for mobilising global research efforts for reduced GHG, improved access and economic growth. They cover entire spectrum of R&D from need assessment to technology demonstration.

4. The highlights of the country status report were presented by Prof. Padhy based on inputs provided by stakeholders.

5. Innovation challenges on smart grids has larger objective to develop robust realistic future smart grid wholly powered by renewables. It is important for us to identify gaps and not sufficiently addressed through providing opportunities for boosting engagement of challenges addressed through providing opportunity for boosting engagement of researchers, innovators, industries and investors.

6. The expected outcome highlighted identification of R&D gaps, possible areas for collaboration, modalities of collaboration and possible contours of funding opportunity (Annexure-II).

7. This was followed by a detailed discussion in 4 thematic breakout groups as enumerated below.

8. Each group identified its own rapporteur and discussed R&D status in the country, need assessment for R&D and possible areas of collaboration with MI countries. The modalities of collaboration were also discussed. The rapporteur presented the outcomes of their individual groups. The composition of the groups is enclosed at Annexure-III.

9. In the subsequent session, the entire group reassembled and thoroughly discussed the presentation of rapporteurs status report of the country, identified R&D activities and potential areas of collaboration. It was agreed across the board that there was need for a focussed funding opportunity involving MI countries. It was felt that smart grids is one of the top research priority areas in the energy sector specially in the context of higher penetration of renewables and variability associated with. There was a definite need to initiate joint research projects, exposure to advance research facilities, virtual centres for research to meet the growing requirements of research expertise in the country. The R&D areas identified for mounting research offered are enclosed in Annexure IV. The photographs of participants involved in group discussion are enclosed in Annexure V.

10. The event concluded summarising of the outcome of the deliberation and defining and recommending the contours of joint research programme in the area of smart grid leveraging capabilities and competence of participating MI countries. The future steps would involve implementation of identified work programme engaging the stakeholders and measuring success based on cost and performance goals. The synergy of expertise available nationally, bilaterally and multilaterally, amongst all stake holders including government researchers and private sectors was strongly recommended. The Indian status report on research, development and demonstration

of Smart Grids Innovation Challenge as well as scope, objectives and size of funding opportunity announcement (US$ 5 million) to be announced by Hon'ble Minister on 7th June, 2017 during MI Ministerial-2 at Beijing was agreed by the participants.

The participants resolved to commit themselves to the objectives of MI IC#1 on Smart Grid for affordable and accessible clean energy.

Annexure-I: List of Participants

Sl. No	Name	Organisation/ Institute Name
1	Dr. Rajiv Sharma	Department of Science and Technology, New Delhi
2	Shri Rajesh Kumar	Department of Science and Technology, New Delhi
3	Dr. Sanjay Bajpai	Department of Science and Technology, New Delhi
4	Sh. Kamlesh Kumar Mishra	Ministry of Power, New Delhi
5	Shri. Shobhit Srivastava	MNRE, New Delhi
6	Shri Tara Shanker	Ministry of Electronics & IT, New Delhi
7	Prof. Bhim Singh	IIT Delhi, New Delhi
8	Prof. Sukumar Mishra,	IIT Delhi, New Delhi
9	Prof. N. P. Padhy	IIT Roorkee
10	Prof. Abhijit Abhyankar	IIT Delhi, New Delhi
11	Prof. Ashu Verma	IIT Delhi, New Delhi
12	Prof. Bijaya Ketan Panigrahi,	IIT Delhi, New Delhi
13	Prof. G. Bhuvaneswari	IIT Delhi, New Delhi
14	Dr. Nilanjan Senroy	IIT Delhi, New Delhi
15	Dr. Prabodh Bajpai	IIT Kharagpur, West Bengal
16	Prof. A. K. Pradhan	IIT Kharagpur, West Bengal
17	Prof. Rajendra Kumar Pandey	IIT (BHU), Varanasi
18	Dr. S. A. Soman	IIT Bombay, Mumbai
19	Prof. Suryanarayana Doolla	IIT Bombay, Mumbai
20	Prof. S. C Srivastava	IIT Kanpur
21	Dr. Saikat Chakrabarti	IIT Kanpur
22	Dr. Gurunath Gurrala	IISC Bangalore, Karnataka
23	Shri. Hemendra Agarwal	Power Grid Corporation of India, Gurgaon
24	Dr. Arvind Tiwari	GE Global, Bangalore
25	Shri Rajender Kumar Sethiya	TATA Power, New Delhi
26	Mr. Amit Golhani	Larsen & Toubro, Mumbai
27	Mr. Akshay Ahuja	India Smart Grid Forum, New Delhi
28	Dr. Rahul Walawalkar	IESA, Pune
29	Mrs. Kumud Wadhwa	NSGM, Gurgaon
30	Shri Arun Kumar Mishra	NSGM, Gurgaon
31	Asst. Prof. Shri Anandraj	BVBCET, Hubballi
32	Dr. Arun Kumar Verma	MNIT, Jaipur
33	Prof. Devendra Gowda	SGI, Kolhapur
34	Shri. S. K. Soonee	POSOCO, New Delhi
35	Mr. Subrata Sarkar	NETRA, NTPC Ltd., Greater Noida
36	Shri Pourush Garg	Tata Power Delhi Distribution Ltd., Delhi
37	Dr. Vishal Verma	DTU, Delhi
38	Dr. Vineet Saini	DST, New Delhi
39	Dr. J.B.V. Reddy	DST, New Delhi

Annexure-II: Expected Outcomes

1. Identify Challenges
    - Technology Challenges
    - Market/Policy related Challenges
2. Discuss Current Status
3. Identify R&D Gaps
4. Identify Future Activities
    - R&D Efforts-Identify Areas
    - Scientific Drivers for Policy changes
    - Capacity Building
5. Identify Potential Areas of Collaboration

Annexure-III: Composition of Groups

Group-1: Grid Operation, Control and Protection Issues

1. Prof. Abhijit Abhayankar, Department of Electrical Engineering, IIT Delhi
2. Prof. Ashu Verma, Centre For Energy Studies, IIT Delhi
3. Prof. A. K. Pradhan, Department of Electrical Engineering, IIT Kharagpur
4. Dr. Nilanjan Senroy, Department of Electrical Engineering, IIT Delhi
5. Shri Soonee SK, Advisor, POSOCO
6. Dr. S. A. Soman, Department of Electrical Engineering, IIT Bombay
7. Dr. Saikat Chakrabarti, Department of Electrical Engineering, IIT Kanpur

Group-2: Communication and Cyber Security Issues

1. Mr. Amit Golhani AGM, L&T Electrical & Automation
2. Prof. Bijaya Panigrahi Department of Electrical Engineering, IIT Delhi
3. Sh. Kamlesh Kumar Mishra Deputy Secretary (RE), Ministry of Power
4. Mrs. Kumud Wadhwa DGM, National Smart Grid Mission (NSGM)
5. Prof. Sandeep K. Shukla Department of Computer Science and Eng, IIT Kanpur
6. Mr. Tara Shankar Deity and CVO, ERNET India New Delhi

Group-3: Devices & Technology

1. Dr. Arun Kumar Verma, MNIT, Jaipur
2. Dr. Arvind Tiwari, GE Global, Bengaluru
3. Prof. Bhim Singh, Department of Electrical Engineering, IIT Delhi
4. Prof. G. Bhuvaneswari, Department of Electrical Engineering, IIT Delhi
5. Dr. Gurunath Gurrala, Department of Electrical Eng., IISc Bangalore
6. Mr. Rajendra Sethiya, Head, Reliability and Smart Grid, TATA Power
7. Dr. Rahul Walawalkar, Founder and Executive Director, IESA , VP, CES Pune
8. Prof. Santanu Mishra, Department of Electrical Engineering, IIT Kanpur
9. Mr. Subrata Sarkar, NTPC- NETRA, Greater NOIDA
10. Dr. Vishal Verma, Department of Electrical Engineering, DTU, Delhi

Group-4: Distributed Energy Resources, Storage and Deployment Issues

1. Shri. A. K. Mishra Director, National Smart Grid Mission (NPMU)
2. Mr. Akshay Ahuja Sr. Smart Grid Specialist, India Smart Grid Forum
3. Shri Anandraj BVBCET, Hubballi
4. Shri. Pourush Garg Tata Power Delhi Distribution Ltd., Delhi
5. Dr.Prabodh Bajpai Department of Electrical Engineering, IIT, Kharagpur
6. Shri. Shobhit Srivastava MNRE, New Delhi
7. Prof. Suryanarayana Doolla Dept. of Energy Science & Engineering, IIT Bombay

Annexure-IV: Priority Research & Development Areas on Smart Grids

1. Operation, Control & Protection

- Operation and control of large, medium and small scale renewable energy sources (R,D,M,C)
- Protection technologies for AC and DC smart grids (R,D,M)
- Wide area monitoring, protection and control (WAMPC) (R,D,C)
- Energy management techniques (R,D,M,C)
- Supervisory control of network with multiple micro and nano grids (R,D,M,C)
- Network analysis and optimal power flow (R,D)
- Modelling and simulation of large power grids (including cyber systems) (R,D,C)
- Seamless Grid operation involving TSO and DSO (R,D,M,C)
- Forecasting of renewable and loads (R,D,M,C)

2. ICT & Cyber security

- Reliable wired and wireless communication technologies (R,D,M,C)
- Interoperability and ICT architecture (R,D,M,C)
- Audit and validation tools for cyber security features (R,D,M)
- HAN, WAN, and Internet of things (R,D,C)
- Threat models and Cyber security (R,D,M,C)
- Information privacy and handling challenges (R,D,M,C)
- Cloud Computing, data storage and big data analytics (R, D, M, and C).

3. Devices and Technology (Converters)

- Fault ride through enhancement of converter interfaced to renewable energy sources (D, M,C)
- Grid interfacing and islanding issues along with seamless transfer technology (D,M,C)
- Ancillary services participation (R,D,M,C)
- Optimal design of flexible power converters (D,M,C)
- Coordination and control of multiple converters and modular multi-level converters (R,M,C)
- Converter technologies for HVDC and MVDC systems (R,D,C)
- Multi-functional hardware smart grid enablers (D,M,C)
- Smart and unified control of converters (M,C)
- Hot swappable converters for smart grids (R,D,M)
- Standardization of voltage and power levels (R,D,M,C)
- Network voltage regulation and power quality (R,D,M,C)
- Wide band gap devices (GaN, SIC) (R,D,M,C)

4. Distributed Energy Resources, Storage and Deployment Issues

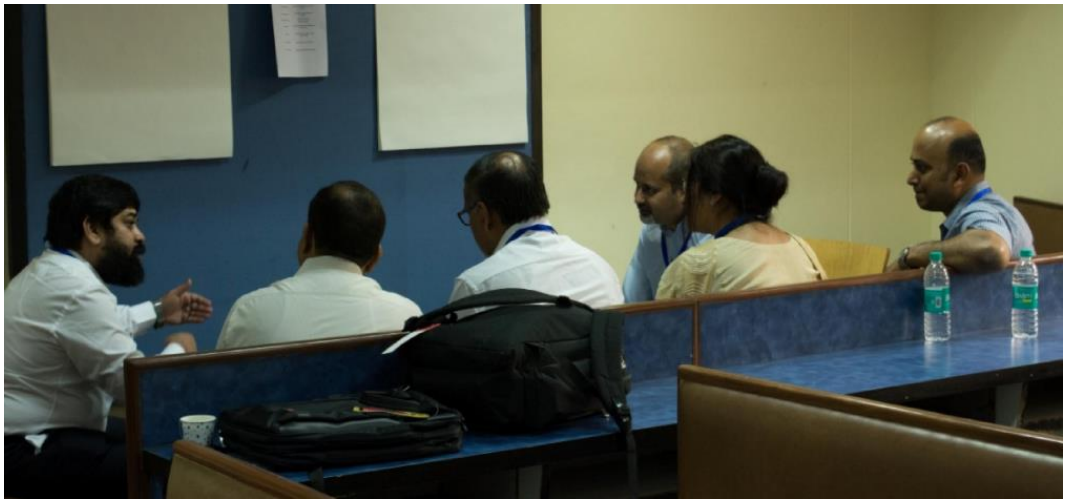
- Policy, regulatory and market design issues (R, D, M, C).
- Demand side management with optimization and forecasting techniques for storage and renewable energy source (RES) (R,D,M,C)
- Inertial issues of renewable energy resources with stochastic behaviour (R,D,M)
- Optimal mix, sitting and sizing of energy storages at various levels of network (R,D, M)

(Note: R – Regional, D – Distribution, M – Micro-grid, C - Cross- Innovation)

Annexure V: Photographs of participants during panel and group discussion

MI-India Smart Grid Workshop Inauguration in presence of Secretary DST, Prof. Ashutosh Sharma

Members of Group 1: Discussion on Grid Operation, Control and Protection issues



Members of Group-2: Discussion on Communication and Cyber Security Issues

Members of Group-3: Discussion on Devices & Technology

Members of Group-4: Discussion on Distributed Energy Resources, Storage and Deployment Issues