**Day 4: Executive Panel Discussion #7: How IoT, Big data & Analytics, Sensors and smart metering are transforming the EE landscape.**

Chairs: Dr Rahul Tongia of the Brookings Institute and Dr Shivkumar Kalyanaraman, IBM, India.

Dr Rahul Tongia introduced the panel saying that incentives for EE were a problem worldwide but technology-based solutions even though they existed were not as popular or widespread as they ought to have been perhaps on account of market issues, standards or policy. He asked the members to give insights into returns and business models.

Dr Shivkumar Kalyanaraman, IBM, India, said that a compelling theme had to be found for EE in business cases. Data was obtainable from devices but such as air-conditioners but it was a challenge to make it useful on a day-to-day basis.

Mr Amarjeet Singh, CEO, Zenatix, India, cited the example of uber, airbnb, whatsapp and dropbox saying that they were disruptive technologies that used connectivity. Could IoT and data similarly bring about disruptions leading to $ 100 billion EE enterprises? Would ESCOs drive data-driven opportunities? He asked if the financing models for installing IoT hardware could be created, even though its cost would be far lower than retrofitting equipment for EE.

Mr Balachandar Jayaraman, Siemens, Singapore, set the context by saying that 40% of global energy consumption was by commercial buildings and that 'action' was the key word, with data providing the ability to act. Data combined with goals and application would transform the scenario, but data alone would not serve the purpose, with the winning combination consisting of people, technology and services.

Mr Rudy Vielvoye, Engie, France, described the function of his organization, and the use made of IoT and smart metering in the b-2-b arena such as energy saving performance contracts, private finance initiatives, digitally operated EE platforms. He said that information obtained from IoT had to be 'digested' to become useful and that savings would grow from year to year. In his experience such an automated set-up allowed intervention by the company even before the client could contact it.

Prof Kirthi Ramaamrtitham, IIT Bombay, said that optimal automation would be needed but that soft sensors were better than physical ones. To convince humans of the need and importance of EE, the message had to go out loud and clear, but the same purpose could be performed by automation which would also collect data and information.

Mr Punit Desai, Infosys Limited, India, described the data collected by Infosys in its offices and the use made of that information in improving the general level of happiness of its staff, transparency and accountability, more time available for resolving problems (than spent in identifying them), etc.

Mr Umesh Bhutoria, EnergyTech Ventures, India, found that analytics was not an engineering decision but one of business transformation and was of the opinion that policy had not role to play with only need driving industry to move towards EE. His observations suggested that SMEs were not high on the maturity curve but that DIY tools would help them to set up something meaningful in terms of EE.

Main points from Q &A session:

1. Markets are not yet ready for energy analytics, yet opportunities for it are growing.
2. No global-level EE player whose success can be cited.
3. IoT /connectivity should tie closely with supply chains.
4. Understanding *what* data to collect and *when* is key – work with data collectors to drive key performance indicators.
5. Companies providing IoT + data + analytics could work with ESCO.
6. Government should mandate doubling of energy productivity by Indian industry – that will spur move to EE.
7. EE must be made part of a larger solution so that business models can evolve and broaden.
8. Although AI and data have an important role to play in generating information in buildings, the human interface is still important.

**Special session hosted by MoEFCC: Energy Efficiency at the heart of the National Cooling Action Plan**

Addressing the national imperative of developing a sustainable and smart cooling action plan that looks at the topic holistically and seeks ideas on a stakeholder engagement model and the scope of the effort.

Anil Jain, Additional Secretary, MoEFCCC

Mr Jain introduced the National Cooling Action Plan, announced in July 2017, saying that it was far-reaching from several points of view. The question was how to provide thermal comfort to citizens taking into account poverty and power supply issues.

Refrigeration was important in the automobile industry, commercial and residential establishments and also to maintain cold chains in health, agricultural food chains (to reduce wastage). India will be leading, by helping 20 countries prepare their cooling action plans.

Cooling requirements are huge and the electricity needed to power these will be massive, too, with unmanaged cooling demand leading to strain on the grid, urban heat islands; new opportunities in this area for industry and research organizations/universities are, increasing the EE of appliances/devices and developing new refrigerants. A small expert group has been created for a multi-year plan with a strategy looking at outlay, technology, and involving all stakeholders to get integrated solution.

EE in India is embedded in the Climate Action Plan, Ozone Layer and GWP considerations. When the Kigali Agreement is implemented, in India, some air-conditioners will have to go off the market. The NCAP will also provide a roadmap for India to meet commitments internationally.

There is a need to look at ECBCs, cooling equipment and the BEE and EESL have a huge charter needing support which will come from NCAP. There is need for an evidence-based action strategy, and to study the financial implications on the air-conditioner industry, consumers, and manufacturers of refrigerants.

Dr Vaibhav Chaturvedi of the CEEW spoke about appliance efficiency pointing out that after it was sold, the service sector and maintenance would be weak links with little training provided to technicians. This resulted in huge leakages to the atmosphere during use and servicing. Consumer awareness would have to be raised because trained technicians would raise the cost of servicing, too.

R&D was critical here and the question to be asked was what are the technologies that maximize benefits? EE + GWP both should be achieved. Public-private partnerships would help in this.

Dr Sanjay Bajpai, of the Department of Science and Technology said that Indian R&D could feed into NCAP. The patent regime and migration from HFCs to HFOs would have to be examined because at present, the technology was with select manufacturers.

Mr Saurabh Diddi, BEE, suggested that the approach to reducing cooling demand was two-pronged: 1. reduce demand 2. increase EE. Regulations and rules recently notified were neutral in terms of technology, so that all manufacturers can take part. Where reducing demand is concerned, building codes will include thermal comfort considerations.

Dr Amol Phadke, Lawrence Berkeley Laboratories, USA, spoke of the scale at which air-conditioning would take place in India and lauded India's ambitious, long-term policy, saying that such policies have delivered, worldwide. There were great opportunities for India to show leadership; there were exciting happenings in technology, which would be helped by relevant policy.

IoT etc., could be applied perfectly to air-conditioning especially in cases where over-cooling was common and this would also support integration of renewables with the grid.

Mr Narender Gandhi spoke of the next generation of refrigerants, and said that different applications needed different refrigerants. He pointed out ODP, GWP and EE as being the three criteria on which to base the selection of a refrigerant.

Mr Amit Love, MoEFCC said that India had had support from African and Middle-Eastern countries in its initiative to introduce EE as an agreed finance solution while phasing out HFCs.

Dr Satish Kumar, AEEE, made two points: 1. India has introduced EE in the cooling debate and seems to have led the charge, 2. The Sustainable and Smart Space Cooling Coalition, ISHRAE and CEPT together with some other agencies had all come together to state that cooling could not be equated with air-conditioning. With the right set of incentives, Indian companies could drive the move to EE in equipment and refrigerants.

Importantly, he pointed out that adaptive thermal comfort meant that India did not need to achieve 100% penetration of ACs for cooling. Here, the importance of design was very important. This path is different from the one the rest of the world is treading and India has the opportunity to lead.

Some points made during the Q&A session:

* It would be good to have an overarching, stated goal and align the efforts of different organizations in endeavours such as cool roofs, etc. Build-in resilience into the NCAP because cooling causes heating.
* Good design practices should be encourage because they can reduce load by 80-90%. Prescribe norms with glazing, etc., becoming part of the definition. Involve the utilities and use levers.
* There is no need to look at cooling entire spaces, as is found in the West. Q Fund tension bet designs and insulation?
* Look into perception that air-conditioning is aspirational: can this be changed?
* Look at ceiling fan efficiency since this is the appliance at the entry point.
* Eco-labelling should be looked at for alternative cooling to provide credibility.
* Use smart tech to help show that decent comfort can be created without cooling to 20 or 21 degrees.
* Look at innovation from the point of view of business models and not just technology.
* Make DISCOMs part of the discussion since peak loads are under consideration.
* Add green networks and green grids and passive cooling methods to the NCAP.
* Include national priorities in plan – since context of cooling is always SDGs which get donw anyway (most compressors are imported).