

Public-Private Roundtables – Tuesday, May 28, 2019

Scaling and Financing Sustainable Cooling Solutions
Co-Chairs: European Commission and United Arab Emirates

Brief Overview:

The purpose of this roundtable is to explore the non-technical barriers and enablers in scaling and financing sustainable cooling solutions. These will be explored using as case studies global cooling prize and research on different heat sink mediums for cooling systems.

Narrative:

Demographic trends, economic growth, urbanization and increasing average global temperatures due to climate change are widely expected to lead to a greater demand for cooling. With the future demand and impact, the potential for high efficiency, low carbon and sustainable cooling and heating solutions is massive.

Cooling energy use in buildings has already doubled since 2000, from 3,6 EJ to 7 EJ, making it the fastest growing end-use in buildings.¹ Rising demand for cooling is already having a major impact on power systems because most cooling needs are met by electricity-powered systems. In particular, increased air-conditioning loads raise overall electricity demand and increases peak electricity loads.

Furthermore, it has been projected that the use of refrigeration, air-conditioning and heat pump equipment will grow rapidly and significantly, particularly in emerging economies. The number of individual cooling units or systems in use in the residential sector worldwide are expected to grow from about 3,4 billion in 2016 to more than 8 billion in 2050.²

This growth will put a major strain on electricity distribution grids and could lead to a substantial increase in greenhouse gas emissions, unless meaningful improvements of the energy efficiency of the cooling equipment is accomplished. It will also lead to increased greenhouse gas emissions through leakage of high GWP (Global Warming Potential) refrigerants.

Currently the mainstream technology of choice is energy intensive, operating below the possible efficiencies that could be achieved. There are a number of heating and cooling solutions with potential to significantly reduce energy use and carbon emissions, for instance demand side management (including demand response), solar cooling and district cooling. However, existing technology is mature, well established and supported by a generally risk adverse industry, driven by the market focus on lowest first

¹ The Future of Cooling, Opportunities for energy-efficient air conditioning, IEA, 2018.

² Ibidem

cost. For these reasons entering the market and gaining share is challenging for new sustainable heating and cooling solutions.

The MI *Affordable Heating and Cooling Innovation* Challenge (IC7) addresses these shortfalls through its technological priority areas³ to develop sustainable technology which can disrupt the market and displace energy intensive and less sustainable cooling solutions. For example, in the technological priority area *Non-atmospheric Heat Sinks/Sources*, we promote heat pumps not using the ambient air as heat sink or source. This has the potential to significantly improve cooling system efficiency, whilst at the same time reducing potable water use – a scarce resource especially in hot climates. The most promising technologies are indirect evaporative cooling of chiller condenser, ground/sea/aquifer/wastewater sources/sinks interconnected via thermal network and long-wavelength radiation to deep space. With the *Physiological studies for thermal comfort* priority area, we have identified the need to innovate through the Global Cooling Prize⁴ as an innovative way to source the best residential cooling solutions.

In both cases, technological research and development is essential to their commercialisation while further work on a number of non-technological issues is equally critical and required:

- End-use and end-user acceptance
- Bridging the gap between R&D and industry
- Opening up markets
- Skills and training

Since MI-3, countries have been working together on the commitment taken to improve the data sharing on building's performance to reduce the energy lost by poorly performing heating and cooling systems. A joint work plan, with indicative commitments of efforts from the participants, has been developed with the objective of delivering data management protocols and open-data platform specifications that reduce the cost and enhance the quality of data. The next step is the formalisation of the work-plan as an Annex under the International Energy Agency 'Energy in Buildings and Communities' TCP collaboration mechanism. The work will reduce barriers to digital innovation and unlock a new generation of product research in predictive maintenance and control optimization.

Session Structure:

The discussion will focus on the enablers and challenges in scaling and financing sustainable cooling solutions. Financing is a relevant barrier to uptake, especially at the residential level and participants will be invited to present and discuss the most effective financing models (i.e. cooling as a service?).

Table leads could guide participants towards a discussion on the demand side to identify viable markets for innovative solutions. For example, enabling users to make more informed investment decisions and overcome carbon lock-in by increasing transparency on energy bills and aggregating savings without passing on high transaction costs to the end user. This discussion aims to identify what works and what

³ The areas are: Non-atmospheric Heat Sinks/Sources, Physiological studies for thermal comfort, Thermal Energy Storage, Heat Pumps and Predictive Maintenance and Control Optimization

⁴ Global Cooling Prize, see <https://globalcoolingprize.org/>

impedes these developments based on concrete examples and experiences from a variety of stakeholders around the table.

During the roundtable discussion, the Chair would explore reactions from participants to the topic as outlined above and would stimulate further discussion with questions/issues such as:

- Why haven't we tried this before?
- Market failures
- Approaches to overcome them
- What to learn from other industries/ business sectors

Desired Outcomes:

- Agreement that this line of work is relevant and will be supported by all stakeholders around the table;
- Challenge MI members and the private sector to share best ideas and cooperate towards sustainable financing of cooling solutions, including:
 - Capture case studies ideas for later follow up
 - Identification of organisations to engage with, that are already developing these ideas
- Commitment to tangible actions, to move the initiative forward;
- Agreement on the importance of financial and technical support for pilot projects:
 - CEOs prepared to put company resources behind the initiative;
 - Follow-up meeting involving working level experts;
 - Commitment from IC7 to support the development of this research area

Guiding Questions:

1. What technical, policy, and/or financing barriers are hindering the scaling up of sustainable cooling solutions and the interest of investors?
2. Are existing instruments and platforms for cooperation sufficient to deliver on the sustainable cooling solutions in a timely manner?
3. What are examples of new business models or transformations that could accelerate the progressive uptake of sustainable cooling solutions?