

## Update - Innovation Community on Affordable Heating and Cooling of Buildings

It's been a few months since we updated you on progress following the workshop we held last year. We summarised our findings in the report sent previously but reattached for your convenience. As stated in the conclusions our next steps were to develop these ideas further and with a view to taking 3 or 4 projects forward.

This newsletter provides an overview of the projects we are considering taking forward plus also some other news items. Please feel free to engage with the project leads listed. One of the "hot" areas of innovation is extreme heat and we hope you will consider potentially getting involved in a project on this subject.

The objective of the Innovation Community (IC) is to build on Innovation Challenge 7 (IC7) and support innovation to help deliver affordable low-carbon heating and cooling everyone. The project ideas and news highlighted in the newsletter are just a small sample of what is going on. We hope you are already involved in some of the activities, but if not, please consider getting in touch with us to find out how you might be able to get involved.

### Your IC Co-Leads



Dr JBV Reddy



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### Supported by



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### CEM/ MI7 Ministerial Meeting

The next Mission Innovation Ministerial will take place on 21-23 September 2022 during the Global Clean Energy Action Forum in Pittsburgh, United States. The organizers will soon announce which side event proposals will take place, including those proposed by the IC. More information can be found on the Ministerial meeting [here](#).

The Mission Innovation Ministerial will host several high-level roundtables, one of which should focus on "buildings and energy efficiency", which is very relevant to the IC. The programme of the Ministerial will be announced soon.

### Extreme heat resilience alliance platform

Together with the IC, the Cool Coalition, Global Covenant of Mayors and RMI, The Adrienne Arsht-Rockefeller Foundation Resilience Center has developed an [online platform](#) providing guidance on reducing the human and economic impacts of extreme heat at the regional or municipal level. The platform builds on IC7's previous collaboration with Cool Coalition, RMI, Global Covenant of Mayors and Clean Cooling Collaborative to prepare a [handbook on sustainable cooling for cities](#) which was launched at COP26 in Glasgow. The platform will be tested using case study cities and will



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provide a prospect to explore innovation opportunities.

If you are interested in finding out more or getting involved please make contact with Graeme.maidment@beis.gov.uk

### Comfort climate box – emerging outcomes

The “Comfort and Climate Box” (CCB) was initially conceptualized during the first IC7 workshop, in Abu Dhabi, in November 2017. The CCB concept provides integrated heating, cooling and energy storage at the same time as working with a smart energy grid. It was conceived to receive multiple energy sources and use these to meet heating, cooling and power demands in the most optimal way (be that lowest carbon, lowest cost or lowest impact on the electricity grid). The CCB fits well with the IC’s objectives and the concept is being progressed in collaboration with the International Energy Agency (IEA), as part of the IEA’s Technology Collaboration Programme (TCP).

The technical challenge is the smart combination of different technologies in one system. Specialists from various fields of technology are required and need to cooperate in order to accelerate product development and market introduction. The goal is to develop nearly market ready systems, including, as a minimum, a heat pump and a storage system.

13 Countries are involved in the CCB including 10 IC Member Countries. Cooperation between specialists from various technology areas are required, given the challenge of combining multiple technologies into one compact system.

CCB solutions have been developed as part of the first phase of this project. A set of four CCB ‘archetypes’ have been developed that should help policy makers to design appropriate support mechanisms to achieve their policy goals within the local market context - ‘Budget CCB’ - ‘Flexible CCB’ - ‘Compact CCB’ - ‘Top quality CCB’.

The Annex was coordinated by The Netherlands and we are currently exploring a new project for CCB solutions with focus on warm and humid climates.

If you would like to participate in the new CCB project please make contact:

Monica Axell - [monica.axell@ri.se](mailto:monica.axell@ri.se)

### Urban Transitions Mission

The IC collaborates with MI’s [Urban Transitions Mission](#). The aim of the Mission is to drive research and innovation for net-zero carbon urban systems and mobilize cities and national governments to develop and test innovative solutions. It cuts across all aspects of modern life in large urban areas – including housing, transport, energy and materials access, production and consumption, and industry. At this stage, the collaboration will focus on applying the extreme heat resilience in the cohort of cities identified by the Mission.

More information on getting involved with the UTM can be found through Graeme.maidment@beis.gov.uk

### Grid-integrated control of buildings

The US DoE’s Grid-Interactive Efficient Buildings Roadmap (2021) found that GEBs could save the US power system USD 100-200 billion through to 2040, and help reduce CO2 emissions by 80 million tonnes/year.

These savings arise from both reduced energy consumption (energy efficiency) and shifting demand away from periods of extreme peak or minimum demand (demand flexibility).

The International Energy Agency’s Net Zero Emissions by 2050 Scenario (2021) requires that 500 GW of demand response be brought to market by 2030, of which around 50% of this demand response capacity is expected to come from buildings. By 2030 all new buildings become



flexible resources for the energy system, using connectivity and automation to manage electricity demand and the operation of energy storage devices, including electric vehicles.

Digitalisation is key for automating participation of buildings in the electricity system – at scale. However, there are a range of barriers to digitalisation. These include (i) lack of interoperability, (ii) the cost of retrofitting IT/connectivity infrastructure, (iii) data management concerns and (iv) perceived complexity and lack of trust in supervisory building controls solutions.

Preparation has begun for a possible IC research priority area aiming to address these barriers and unlock flexible demand resources from buildings. Research could include (but not limited to):-

1. supporting adoption of data management and interoperability codes/standards in buildings
2. developing redeployable software for implementing flexible demand at scale
3. demonstrating and characterising flexible demand capacity in pilot buildings

Please contact Dr Stephen White (stephen.d.white@csiro.au) if interested in participating in preparation meetings for a MI research priority area on this topic.

### Cool Roofs

We have been working over the past few months to scope out this initiative that we first presented in concept at the November workshop, as we dug into the space we felt it important to expand beyond just real world comparative testing of new

innovative nano polymer materials along with traditional reflective materials to how they would both interact with roof mounted solar PV – both traditional and bifacial so as to have definitive answers as to the optimal use of roof space in hot climate zones.

RMI and IC worked together previously to great effect on the Global Cooling Prize and we would be delighted to see another collaboration between Mission Innovation and its members along with RMI and CEPT University.

We are currently exploring funding opportunities and supporting Iain Campbell from RMI who is leading the development of this project. If you would like to be kept involved in these discussions please get in touch with him directly at [icampbell@rmi.org](mailto:icampbell@rmi.org)

### Global Heating Prize

The aim would be to establish a competition which targeted two outcomes, for example:-

- Reduction of cost of heat pump systems by 30% without a degradation of performance.
- Improvement of efficiency by factor of 3 without a change in cost.

Using the UK as context and 20 million homes with heat pumps and a cost of £5k per heat pump the potential benefits of even a 10% reduction in cost is £10billion. An enhanced efficiency of means the demand for installed generation is reduced. An average heat pump requires 10,000 kWh/year. 20 million heat pumps is 200 TWh/year (current UK electricity generation is ~350 TWh/year). If wind power, installation costs would be £60b. Factor of 2 improvement in efficiency is a saving of £30b. Innovation will be key in enhancing the performance and driving down costs. This innovation will come through a detailed analysis of all elements of the heat pump performance and manufacturing, assembly and materials for example via better thermal management, e.g. use of thermal storage, through to innovation in supply chain management. The aim would be to encourage current manufactures of heat pumps and new to market entrants to develop enhanced heat pump products which they can then market as winners of the Zero Carbon Global Heating Prize.



There will be strong opportunities for the innovation community to work collaboratively with industry.

This project is being led by Professor Martin Freer from the University of Birmingham. If you would like to be kept involved in these discussions then please get in touch with Martin. [M.Freer@bham.ac.uk](mailto:M.Freer@bham.ac.uk)

### Hydrogen driven heat pumps

This project plans to develop heat pumps driven by hydrogen for heating and cooling purposes. By combining conventional sorption heat pumps with green hydrogen it's possible to deliver efficient, very low carbon heating and cooling without using electricity and putting pressure on the electrical grid.

The project is still in development stage and more information can be found from Bob Critoph. [R.e.critoph@warwick.ac.uk](mailto:R.e.critoph@warwick.ac.uk).

### Thermal comfort driven controls

The IC is forging partnership for research development and deployment in the area of thermal comfort driven controls. This effort is intended to support/complement the development and demonstration of smart controls with capabilities including comfort regulation, energy demand management, fault detection, diagnostics and prediction. The international survey on R&D priorities conducted by the IC highlighted wider interest for research and collaboration in this field. We are holding consultations. Please reach out to us if you have an ongoing/upcoming program in this area.

More information from Dr JBV Reddy - [jbvreddy@nic.in](mailto:jbvreddy@nic.in)

### Virtual Platform: MI Heating Cooling Wiki

The IC has launched the [MI heating and cooling wiki](#) a virtual platform to map global innovation, research priorities/enablers/barriers and enable collaboration. [Do register yourself here](#) and share your updates in the wiki platform.

### Annual workshop

We plan to run an annual innovation workshop. Would you be interested in joining face to face or remotely. ([View/vote in browser](#))

### How to get involved with IC7?

We welcome involvement from our members in any of the IC priority areas, as well as news items, announcements, etc for inclusion in future newsletters.

If you would like to get more involved and find out more about IC activities, please contact Graeme.

[Graeme.maidment@beis.gov.uk](mailto:Graeme.maidment@beis.gov.uk)

### IC Activities Website

<http://mission-innovation.net/platform/innovation-community-ic7/#:~:text=IC7%20is%20a%20global%20'innovati on,providing%20pathways%20to%20net%20zero>

