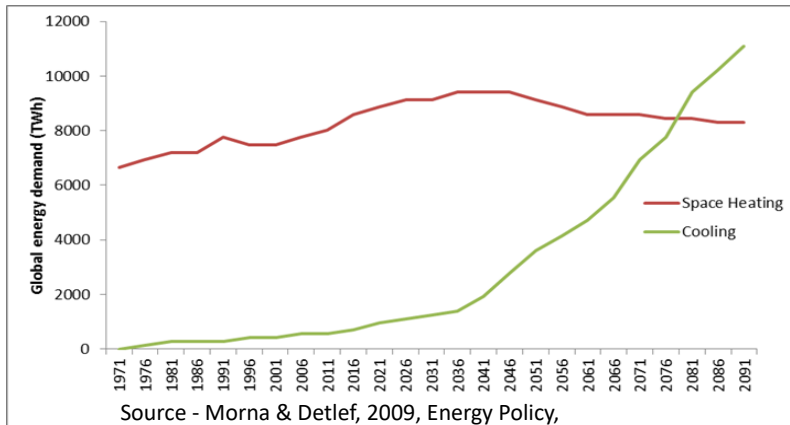


## Welcome to the 4th newsletter for IC7: Affordable Heating and Cooling of Buildings

The objective of Innovation Challenge 7 (IC7) is to make low-carbon heating and cooling affordable for everyone. Globally, buildings account for almost a third of final energy consumption, with space heating and cooling, and the provision of hot water, accounting for approximately half of this consumption.

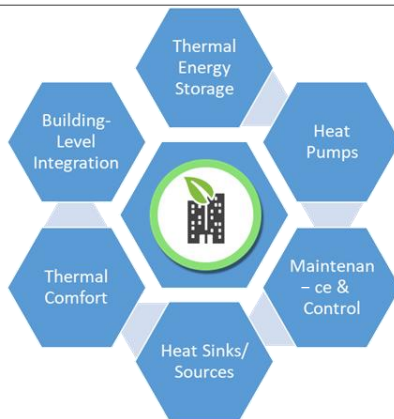


**Cooling demand is expected to:**

- Grow 50x by 2100
- Adding 100 GtCO<sub>2</sub>e to 2050
- Equivalent of 0.5°C of warming

**Buildings account for**

- 40% of final energy consumption of the European Union
- 36% of greenhouse gas emissions



This is the fourth newsletter documenting some of the activities that are being started, contributed to and delivered by colleagues working across IC7. In total, there are 20 MI countries following IC7 activities, and 14 countries plus the European Commission actively involved in project leadership, formation or delivery. IC7 has 23 project themes within 6 priority research areas.

The initiatives covered 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 IC7 Co-Leads



Amal Hamadeh



Pietro Menna



Jon Saltmarsh



Piero De-Bonis

### Thermal Comfort Workshop in Delhi

One of the six priority areas for IC7, Thermal Comfort was progressed at a workshop at the Indian Institute of Technology in Delhi on the 6th November 2019. The purpose of the meeting was to forge international collaboration in Thermal Comfort and other complementing Priority Areas of IC7.

The meeting was opened by Dr. JBV Reddy of India's Department of Science and Technology (DST), chaired by Prof. Sukumar Devotta and Jon Saltmarsh (Co-lead for IC7) and concluded by Dr. Sanjay Bajpai of DST and Dr. Abhay Bakre, Director General, Bureau of Energy Efficiency, India.

Stakeholders from 5 MI member and participant countries, industry leaders, representatives from administrative bodies, policy agencies, academic and research professionals attended the meeting. The workshop was streamed to enable remote attendance.

The main output of the workshop is a strategic roadmap to accelerate research and development in thermal comfort innovation and identifying cross cutting issues and future research needs. This identified three areas of focus in thermal comfort including thermal physiology, systems and technology and operational controls.

The meeting was coordinated by DST, Government of India, which is working closely with Ministry of Power, Bureau of Energy Efficiency, Ministry of Environment Forest & Climate Change.



For more information on getting involved in the research area please contact:-

[Dr. Sanjay Bajpai - sbajpai@nic.in](mailto:sbajpai@nic.in) or

[Dr JBV Reddy – jbvreddy@nic.in](mailto:jbvreddy@nic.in)

### Horizon 2020 Research Announcement

We are pleased to announce a new Horizon 2020, European Union project for research and innovation into thermal energy storage with MI participants from non-EU countries.

The project involves electricity load shifting and specifically development of compact thermal energy storage for this purpose. A new storage concept will take up electricity from the grid at the peak times, to be used for heating, cooling or domestic hot water later.

The new project is called ComBioTES (Compact bio-based thermal energy storage for buildings). The project commenced in November, with a duration of 48 months and a budget of EUR 4 million. The consortium is coordinated by CEA (Commissariat A L'Énergie Atomique Et Aux Énergies Alternatives, France) and includes the Henan Guoan Heating Equipment Co. and the Institute Of Electrical Engineering Chinese Academy Of Sciences.

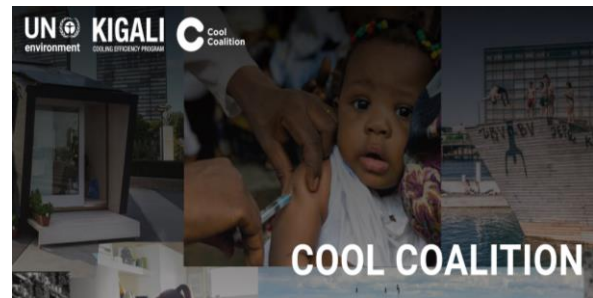
ComBioTES will develop a novel thermal energy storage (TES) systems using natural materials. The concept combines modularity with high utilization rate, high volumetric energy density and compactness. The ComBioTES consortium includes key players in energy storage and management, RTOs for development and testing of infrastructure and SMEs for manufacturing & commercialization of the technology.

Pietro Menna (IC7 Co-lead) from the European Commission said "We are delighted to be able to support this excellent project with large scale impact and fantastic input from MI partners from both inside and outside the EU."

For more information please contact Pietro Menna e-mail address: [Pietro.MENNA@ec.europa.eu](mailto:Pietro.MENNA@ec.europa.eu)

### Endorsing the Cool Coalition

The Cool Coalition is a global multi-stakeholder network that connects a wide range of key actors from government, cities, international organizations, businesses, finance, academia, and civil society groups to facilitate knowledge exchange, advocacy and joint action towards a rapid global transition to efficient and climate-friendly cooling.



Their overall approach is to:

**REDUCE** where possible the need for mechanical cooling through better urban planning and building design, and the use of nature-based solutions.

**SHIFT** cooling to renewables, district cooling approaches, solar powered cold chains, etc.

**IMPROVE** conventional cooling by increasing the efficiency of air conditioning and refrigeration equipment and demand response measures.

**PROTECT** vulnerable people from the effects of extreme heat and consequences of unreliable medical and agricultural cold chains.

**LEVERAGE** cooperation between different actors in cooling to achieve greater collective impact.

The endorsement of the Cool Coalition from IC7 was announced by John Loughhead, Chair of the Mission Innovation Steering Committee at the Climate Action Summit in New York in September.

By joining the Cool Coalition, we recognize that clean and efficient cooling can make a huge difference in the fight against climate change and pollution, sustainably deploy essential cooling to hundreds of millions more people and bring huge financial savings. Mission Innovation's contribution to the Cool Coalition will be led by IC7 with a specific focus on the cooling of cities as part of our collaboration with the Global Covenant of Mayors.

By endorsing this, IC7 aims to raise the profile of the Cool Coalition and MI. We also want to raise the opportunity of IC7 working with developing countries.

The IC7 co-leads have a process in place for endorsement. If there is an event, a topic, a

document that fits well with the aims of MI and IC7 please contact us about how we can help.

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

### Global cooling prize update

The Global Cooling Prize was launched in Delhi in November 2018 by the Department of Science and Technology, Government of India and the Rocky Mountain Institute. The \$3M #GlobalCoolingPrize aims to spur the development of technologies with 5x less climate impact than air conditioners being sold today, a vital innovation needed to help limit global CO<sub>2</sub> emissions. The prize competition is designed to develop solutions for buildings that do not use highly potent refrigerants and consume dramatically less energy yet provide consumers with the cooling that they need.



This November in Delhi, 8 finalists were announced from 139 applications from 31 countries, with video congratulations from global ambassador Richard Branson. Union Minister for Science & Technology, Earth Sciences and Health & Family Welfare, Dr. Harsh Vardhan announced the finalists. Prof. Ashutosh Sharma, Secretary Department of Science and Technology (DST) and Mr. Dominic Asquith, the High Commissioner of the United Kingdom to India, shared the platform. Each finalist received a \$200k award to develop two working prototypes for testing as their final submission for the honour of winning the Global Cooling Prize and its \$1M prize.

To learn more, visit their [website](#) or [MI. https://globalcoolingprize.org/](http://MI.https://globalcoolingprize.org/)

### Accelerating the development of thermal energy storage materials using the “Thermal Energy Storage Materials Acceleration Platform”

Mission Innovation challenges IC6 & IC7 met in Erlangen, Germany, on 11 and 12 November 2019. The aim of the workshop was to define a potential project for a TESMAP (thermal energy storage materials acceleration platform).

Thermal Energy Storage (TES) is one of the six priority areas identified for IC7. TES technology aims to tackle one of the biggest problems faced in low-carbon heating and cooling, the mismatch between supply and demand associated with the utilization of variable renewable energy sources. TES systems are able to take up electricity from the grid at times when production exceeds demand and use this energy later, for heating, cooling or domestic hot water.

The development of novel, advanced, compact TES materials presents a fantastic opportunity for heating and cooling. Barriers remain to wider deployment, including cost, size, weight and complexity of existing solutions in the market.

Material development will be accelerated by adopting the MAP (Material Acceleration Platform) methodology developed in the Mission Innovation, Clean Energy Materials Innovation Challenge, IC6. The MAP methodology combines Artificial Intelligence, Smart Robotics and High-Performance Computing to compose, test, analyse and improve materials in a much faster way than previously possible. The ultimate goal is to accelerate materials discovery and development by more than a factor of 10 in time and cost.

MI countries are encouraged to get involved with this initiative through: -

Piero De-Bonis; [Piero.DE-BONIS@ec.europa.eu](mailto:Piero.DE-BONIS@ec.europa.eu)

Mark Kozdras; [mark.kozdras@canada.ca](mailto:mark.kozdras@canada.ca);

Wim van Helden; [w.vanhelden@aee.at](mailto:w.vanhelden@aee.at)

### Mission Innovation IC1 & IC7 Led by ERANET Funding in Smart Energy Systems.

Mission Innovation colleagues from Austria and Sweden have successfully launched a new call for funding in [Smart Energy Systems. https://www.eranet-smartenergysystems.eu/Calls/SG\\_Plus\\_Calls/SG\\_Joint\\_Call\\_2019](http://Smart_Energy_Systems.https://www.eranet-smartenergysystems.eu/Calls/SG_Plus_Calls/SG_Joint_Call_2019).



This call will support RDD projects that contribute to the development of sustainable, integrated storage solutions for both short- and long-term

storage including electrical, electrochemical, material, thermal and mechanical energy storage.

The call will focus on storage challenge areas in existing energy systems. To find out more about participating in the ERA-NET Smart Energy Project please contact:

Emina Pasic - [emina.Pasic@energimyndigheten.se](mailto:emina.Pasic@energimyndigheten.se)

Michael Huebner - [Michael.HUEBNER@bmvit.gv.at](mailto:Michael.HUEBNER@bmvit.gv.at)

### Opportunity to get involved with Predictive Maintenance and Optimization

The priority area of Predictive Maintenance and Optimization (PMO) focuses on correcting inefficient building operation and control by using knowledge of building physics along with Information and Communications Technologies (ICT) and data science methods to analyse building data and develop methods to improve building operation and energy efficiency.

Following workshops in London (September 2019) Delft (April 2019) and Montreal (September 2018), with input from around 60 experts, IC7 in collaboration with the IEA have launched a joint project.



A JOINT INITIATIVE BETWEEN THE IEA EBC TCP AND MISSION INNOVATION IC7

## Data Driven Smart-Buildings

– Utilising next generation digital technology to drive innovation in advanced building management and energy efficiency.

The new initiative imagines a future world, empowered by access to real-time buildings data, such that digital solutions can rapidly scale, and energy efficiency knowledge can be disseminated through highly accessible software “Applications”. This project aims to accelerate the market development of energy saving Applications, through the promotion of open-data, digital-platforms and open-innovation in smart building services. The project focusses on commercial and institutional buildings.

We invite research organizations and industry to participate. MI countries are encouraged to

participate. If you would like to get involved, please contact Stephen White –

[Stephen.d.white@csiro.au](mailto:Stephen.d.white@csiro.au)

### Exploring a potential new priority in Integrated smart heating and cooling energy systems

A number of MI countries expressed interest in the topic of integrated smart heating and cooling energy systems and suggested a workshop to explore further. So we ran a workshop in Montreal on the 28th August 2019 at the International Congress of Refrigeration. This was in collaboration with the International Institute of Refrigeration and some UK project teams working in this area.

The aim of the workshop was to capture some of the research, development and demonstration initiatives/ projects in this area. Also, to identify those that might be interested in working in this area.



The workshop stimulated a lot of discussion. There were more than 50 participants representing 9 different countries, including the UK, Canada, Korea, Netherland, Sweden, USA, Japan and France and Poland. Speakers included Dr EJ Lee (KIER), Dr Evgueniy Entchev (CANMET), Andrea Voigt (Director General of EPEE) and Dr Akos Revesz (London South Bank University).

The workshop identified some key challenges relating to policy, technology and the integration aspects of smart energy systems and agreed to explore further as a research topic.

To express interest in this topic please contact [Graeme.maidment@beis.gov.uk](mailto:Graeme.maidment@beis.gov.uk)

### Opportunity to get involved with the Comfort and Climate Box

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 inputs of energy sources and using 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 IC7 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).

This project aims to accelerate the market development of Climate and Comfort Box solutions. 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.

vision on how smart heating and cooling could contribute to IC7 in delivering innovation on low carbon buildings and communities.

Recently, the Korean Government pledged to reduce their carbon emission by 37 % by 2030. This is part of a number of national policies, which include "RE3020", 20 % renewable power by 2030 and the zero energy building policy for the public sector by 2020 and the private sector by 2025. Dr Lee believes this opens up significant opportunities for a smart heating and cooling sector by combining innovations in hybrid clean energies and IoT's. He says, "The Korean Government has a renewable energy supply plan and the greenhouse gas reduction plan, which mainly focusses on electric energy. As thermal energy accounts for on average 40 % of energy use in Korean buildings, the use of heat pumps is critical. We are therefore developing solutions focussed on the smart heat pumps and clean renewable energy in buildings. The smart tri-gen connects hybrid energy systems, IoT's in delivering heat and power and is a key foundation of zero energy buildings and communities".

This innovation is supported by the Korea Institute of Energy Technology Evaluation and Planning (KETEP) and the Ministry of Trade, Industry & Energy (MOTIE) of the Republic of Korea as one of the international collaboration with Canadian National Energy Research Institute; CanmetENERGY. More information to Contact: [ejlee@kier.re.kr](mailto:ejlee@kier.re.kr)

**INVITATION**  
TO RESEARCH ORGANISATIONS AND INDUSTRY TO PARTICIPATE

JOINT PROJECT BETWEEN THE HPT AND ECES TCPS AND MISSION INNOVATION

**Comfort and Climate Box**  
– Speeding up market development for smart integrated heating, cooling and energy storage.

We invite research organizations and industry to participate. MI countries are encouraged to participate. If you are interested to join this project, please contact:

Monica Axell - [monica.axell@ri.se](mailto:monica.axell@ri.se)  
Peter Wagener - [wagener@bdho.nl](mailto:wagener@bdho.nl)

**Opportunities for Sharing the Smart Heating and Cooling Vision in Korea**

Dr. Euy-Joon (E. J.) Lee of Korea Institute of Energy Research (KIER), a national research agency for Korea, is one of the Korean representatives for IC7. Below, we introduce his



**How to get involved with IC7?**

We welcome involvement with IC7 through any of our priority areas, as well as news items, announcements, etc for inclusion in future newsletters.

Graeme Maidment has been seconded into UK Government to support Innovation Challenge 7. If you would like to get more involved and find out more about IC7 activities, please contact Graeme.



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

[IC7 Activities Website](http://mission-innovation.net/our-work/innovation-challenges/affordable-heating-and-cooling-of-buildings/) <http://mission-innovation.net/our-work/innovation-challenges/affordable-heating-and-cooling-of-buildings/>