

Welcome to the third 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.

This is the third 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 by numbers
6 Priority Areas,
20 Interest countries,
14 Participating countries + EC

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



Luiz Friedrich

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

A joint workshop took place between IC6 and IC7 in May in Ottawa. The aim of the workshop was to discuss the development of low cost high thermal energy density materials via the Thermal Energy Storage Materials Acceleration Platform (MAP).

The workshop brought together over 40 heat storage experts from 12 MI and IEA participating countries. 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. TES systems can be adapted in a variety of settings: inside buildings, as building components, and as part of wider thermal networks.

The development of novel, advanced, compact thermal energy storage materials presents a fantastic opportunity for heating and cooling.

Barriers remain to wider deployment of TES solutions, 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

Mark Kozdras; mark.kozdras@canada.ca;

Wim van Helden; w.vanhelden@aee.at

Report on the Delft PMO workshop on 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.

Approximately 30 participants attended a Workshop in Delft 3-4 April, from ten countries (Australia, Canada, Denmark, Ireland, Japan, Netherlands, Norway, Sweden, UAE, UK). The meeting follows on from an initial workshop in September 2018 in Montreal and approximately 60 experts have contributed so far.



The workshop agreed to work collaboratively with the IEA as a joint project. The draft structure of the project is as follows:

- Task A on 'Shared infrastructure for exchanging data' (task leader: Australia)
- Task B on 'Shared test bed for safe prototyping' (data emulator) (task leader: Canada)
- Task C on 'Software-as-a-service tools' (Task leader: Netherlands)
- Task D on 'Case studies' (Task leaders: Denmark and UK)

Stephen White – (Australia IC7 Lead) who led the workshop commented - "I'm delighted with the enthusiasm we've found from around the world for this initiative – there is huge potential to apply smart, data-driven solutions in commercial and institutional buildings and this team will be at forefront of this".

A key action from the workshop is wider dissemination and to encourage additional countries to participate. If you would like to get involved, please contact Stephen White – Stephen.d.white@csiro.au

Alternative heat sources/ sinks - gathering

The UAE convened a teleconference on the 25th April to identify interest from IC7 countries on research on alternative heat sources and sinks.

Interest was expressed by the UAE, the European Commission, Sweden, Australia, India, and the UK, as well as the Rocky Mountain Institute, London South Bank University and Tabreed – a leading district cooling provider.

There was interest shown from all participants for research into this area. Specifically, cold sources such as sea water and the night sky and heat sources such as substations and sewers were noted as presenting significant opportunities for delivering low carbon heating and cooling.

An information gathering phase was agreed as a next step to identify all IC7 countries interested in collaborating and to capture existing work in this area. A potential workshop meeting was discussed for later this year in the UAE.

Please contact Amal Hamadeh if you interested in this have research area.

Amal.Hamadeh@moei.gov.ae

Endorsing the Clean Cooling Congress

The Clean Cooling Congress took place in London on the 24th/25th April hosted by the World Bank and BEIS, the UK Department for Business, Energy and Industrial Strategy. The aim of the Congress was to inform the development of a multi-sectoral roadmap on sustainable cooling providing affordable and sustainable access for all. The event brought together industry, international organisations, academia and governments from both developed and developing countries, NGOs and civil society to take part in informed discussions.



By endorsing the event IC7 aimed to raise the profile of MI and potential collaborations. We also wanted to raise the possibility of IC7 working with developing countries, as participation with MI is currently limited.

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

International Workshop - Decarbonising Heating and Cooling

On the 26 March Mission Innovation and UKRI (UK Research and Innovation) held a Decarbonising Heating and Cooling Workshop in London.



The workshop addressed the following:

- Barriers to progress in heating and cooling,
- Solutions requiring a significant international and interdisciplinary effort.

The workshop identified key opportunities/challenges such as public engagement, ensuring the costs of heat decarbonisation are distributed equitably across society and whole-systems thinking.

Following the workshop a call for funding for UK institutions has been launched in which international collaboration from IC7 participants is encouraged. More information on the call can be found here -

<https://epsrc.ukri.org/funding/calls/decarbonising-heating-and-cooling/>

If you are interested in collaborating with this call contact Graeme.maidment@beis.gov.uk

IC7 in MI Austria Week

IC7 (represented by Emina Pasic from Sweden and Huub Keizers from The Netherlands) participated in MI Austria Week (6-10th May) to promote international cooperation in Europe and globally.

A key outcome of the meeting was the ongoing preparation for a global and multinational call for

research and innovation projects in energy storage. This builds on the ongoing work within ERA-NET Smart Energy Systems in Europe.



To view the meeting online via YouTube see <https://www.youtube.com/watch?v=tL7nROREZt0&feature=youtu.be>

To find out more about participating in the ERA-NET Smart Energy Project please contact:
Emina Pasic - emina.Pasic@energimyndigheten.se
Michael Huebner - Michael.HUEBNER@bmvit.gv.at

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

A number of MI countries have expressed interest in the topic of integrated smart heating and cooling energy systems and have suggested a workshop to explore.

We have therefore agreed to run a workshop in Montreal on the 28th August at the International Congress of Refrigeration. For more information <https://icr2019.org/>. This is in collaboration with the International Institute of Refrigeration and some UK project teams working in this area.

The aim of the workshop would be 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 including those wanting to take a lead in a new priority area. To participate in the workshop please contact

Graeme.maidment@beis.gov.uk

Scaling & Financing Sustainable Cooling Solutions - Roundtable discussion at MI4 in Vancouver

IC7 was represented at the recent MI-4 ministerial meeting in Vancouver with a public-private roundtable on the topic of "Scaling and Financing

Sustainable Cooling Solutions”. The co-chairs for the roundtable were the EC and UAE, the discussion was led by Iain Campbell from the Rocky Mountain Institute and the roundtable had representation from 12 countries including MI Youth Henrique Lagoeiro representing Brazil.

The roundtable acknowledged the rapid and continuous demand for cooling due to economic growth, urbanization and climate change and the critical need to transition to more sustainable cooling. A key barrier identified is the visibility of first cost (CAPEX), whereas lifecycle cost/value is often not visible at the time of procurement. It was discussed that district cooling (and heating) models can overcome this barrier because the investor is incentivized to focus on lifecycle cost, e.g. being compensated for shifting the cooling load away from the peak. If there is no central infrastructure in place and no mandated district cooling, the path for a sustainable solution becomes constrained as focus shifts to small distributed AC systems with low CAPEX.

A collaboration opportunity was identified: Countries/cities at different stages of economic development, building stock maturity, and climate conditions are factors that lead to different pathways of sustainable cooling. Developing best practice pathways for clusters of countries/cities with similar attributes is needed to accelerate innovation and adoption.



The Global Covenant of Mayors (GCoM) representing many cities worldwide are a potential platform to share best practices and change how the general public and financial sector approaches the rising demand for cooling. This will be explored further by IC7 and others.

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 Nov 2017. The CCB concept provides integrated heating, cooling and energy storage at the same time as working with a smart energy grid. It is 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 Technology Collaboration Programmes (TCPs).

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.



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.

Challenge

The pace and scale of the global clean energy transition is not in line with climate targets. Energy-related carbon dioxide (CO₂) emissions rose again in 2018 by 1.7%. The building sector represented 28% of those emissions. The growing global need for and availability of thermal comfort technology is a large contributor to emissions of greenhouse gases world-wide, and the transition to renewable energy is too slow.

New technology can reduce buildings emissions while improving comfort and energy services. There is potential for cost-effective technologies to deliver energy savings of 500 Mtpce per year in the building sector worldwide between 2020 and 2050. To meet the needs of the future, new innovative thermal comfort solutions must be developed. Heat pumps have the potential to massively reduce carbon emissions for heat-but have had limited take up. By integrating heat pump and storage systems to deliver heating, cooling, and energy storage we can accelerate their uptake and deliver low carbon heating and cooling. By combining heat pumps and storage, through the development of a **Climate and Comfort Box solution** several issues are addressed, such as:

*Balancing & controlling electricity grid loads;
Capturing a large (or larger) share of renewable (local/regional) power input (e.g., solar thermal, solar PV, wind);
Optimizing economics, CO₂ emissions, total fuel use over time;
Providing optimal security of supply to buildings.*

This project aims to accelerate market development of Climate and Comfort Box (CCB) 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

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

Peter Wagener - wagener@bdho.nl

Opportunities for Innovation in Heating and Cooling in Finland

Miika Rämä of the VTT Technical Research Centre of Finland is one of the Finnish representatives for IC7. He explains how Finland are delivering innovation in heating and cooling.

Recently, the new Finnish Government has pledged to make the country carbon neutral by 2035 as part of a policy programme that includes a major increase in public spending on welfare and infrastructure. Miika explains that the challenges for the heating and cooling sector in Finland are similar to other countries. He says, "It's all about letting go of fossil-fuel based supply. District heating provides the backbone of the Finnish heating sector, and while the use of renewables in its heat supply and related electricity production has doubled in 10 years, the share of fossil fuels is still 50 %. Finland will be phasing out coal (20 % share in DH supply) in energy production by 2030, and this will further challenge the sector in finding new solutions".



He explains "Changing the conventional energy system solutions is not trivial. It is necessary to test new ideas and technologies as well as simulate the impacts of large-scale changes before decision-making and regulatory development."

To support this development VTT Technical Research Centre of Finland has established Smart Otaniemi as a smart energy innovation ecosystem that connects experts, businesses, technologies and pilot projects. It provides a platform for testing the components for a future energy system, deploying digitalization and IoT in the energy sector with the latest technologies such as a 5G network.

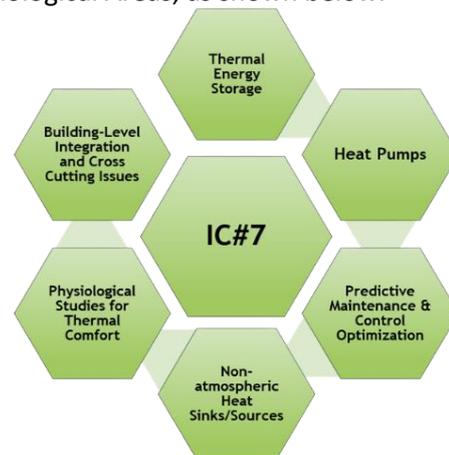
"The ecosystem is open for new partners with new pilot ideas ranging from quick testing of new

solutions to more research-oriented energy topics. Innovation topics identified include district energy systems, energy storage, flexibility market, Power-to-X, autonomous driving and future city structures. The current partner network represents multiple sectors from ICT to energy utilities, service providers, technology vendors and real estate owners. Companies vary from start-ups to big corporations - everyone sharing the same long-term energy vision and mission to make energy future smarter." Says Miika.

More information and to subscribe for a newsletter: <https://subscription.smartotaniemi.fi/>
Contact: smartotaniemi@vtt.fi

How to get involved with IC7 and any of our 6 Priority areas?

IC7 is about investigating low carbon heating and cooling of buildings with the aim to make low carbon heating and cooling affordable to everyone. It has 23 Project themes within 6 Priority Technological Areas, as shown below.



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

Graeme Maidment has been seconded into UK Government to support Mission 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

<http://mission-innovation.net/our-work/innovation-challenges/affordable-heating-and-cooling-of-buildings/>