

## EBC Strategic Planning - EBC Project Concept

<b>Proposed Project Title</b>	<b>Resilient Cooling for Residential and Small Office Buildings</b>
<b>Date</b>	Feb 18 <sup>th</sup> , 2018

### Research problem / Objectives

Urbanisation and densification, together with climate change, raise severe issues of building overheating prevention & cooling. The development in building energy efficiency towards nearly-zero energy buildings, with high air-tightness and high insulation level, even tends to increase buildings' tendency to overheat.

Consequently, the worldwide energy consumption for cooling is rising significantly, challenging the aims of energy-decarbonisation and of nearly zero energy buildings.

This recent phenomenon of increased cooling need is a special technological challenge for residential and small office building, both due to their dominant share within the building stock and due to technical reasons:

Big office and commercial buildings are already commonly objects to cooling technologies, and industry offers system solutions at high levels of efficiency. Otherwise, residential and small office buildings in many climates are now facing the question if being equipped with enhanced overheating protection, passive cooling, or if active cooling / air conditioning is necessary. Still, the market for appropriate and sustainable solutions is very much fragmented:

- The market of passive cooling technologies for residential and small offices still suffers from a somewhat experimental status of many technologies, low standardisation, missing design guidance or operation guarantees and, last not least, consideration in compliance tools.
- The market of air conditioning technologies for residential and small offices is dominated by cheap but low efficiency split units. There's significant need for more efficient technologies, for peak shaving, load shifting, hybrid operation, for coupling with PV-gains and other volatile renewable energy sources.
- Finally, in many residential and small offices, hybrid cooling in principle is a sufficient and favourable solution, which raises numerous research issues of system layout and system integration, balance point definition, control algorithms and, again, coupling with PV-gains and other volatile renewable energy sources.
- Furthermore, knowledge about overheating protection, passive cooling and robust active cooling is traditionally regionally based. Since overheating problems in dense urban surroundings become an international phenomenon, this calls for exchange of knowledge and experience between cultures and climate zones.

## Scope

The new Annex Resilient Cooling for Residential & Small Office Buildings will investigate, develop and exchange solutions of overheating prevention and cooling of buildings.

In accordance with its title, the new Annex will focus at residential & small office buildings. Within this focus the new Annex will include both new and existing buildings and will welcome participating researchers from all climate zones.

The term of “Resilience” in the title of the new Annex in this case is interpreted as: robust, energy efficient, carbon neutral, affordable. Specific technologies and system solutions will meet specific qualities to a higher or lower extent, leading to different levels of (total) resilience.

The Annex will bridge the gaps between overheating protection, passive cooling and air-conditioning.

The Annex will internationally exchange and deepen fragmented knowledge on overheating protection and cooling of buildings.

The scope of the new Annex will focus at developing practically applicable solutions as well as methodologies for assessment. It will build upon the broad basis of scientific and commercial knowledge available in this field. It therefore makes use of but excludes with the Annex, fundamental research in related fields, such as urban climatology, indoor comfort, indoor health or similar.

A knowledge-base of the new Annex will be the Annexes that have dealt with specific aspects before:

Annex 28	low energy cooling systems
Annex 35	Hybrid Ventilation
Annex 37	Low Exergy Systems for Heating and Cooling
Annex 48	Heat Pumping and Reversible Air Conditioning
Annex 49	Low Exergy Systems for High Performance Buildings and Communities
Annex 59	High Temperature Cooling and Low Temperature Heating in Buildings
Annex 62	Ventilative Cooling (ongoing)
Annex 67	Energy Flexible Buildings (ongoing)
Annex 69	Strategy and Practice of Adaptive Thermal Comfort in Low Energy Buildings (ongoing)

## Agenda

According to the research problem / objectives and to the scope we suggest four subtasks:

### **Subtask A – Technologies**

Analyse, internationally compare and further develop individual technologies within the field of overheating protection, passive cooling and active cooling / air conditioning, such as (non-exclusive):

- > Sun protection
- > Cool coatings
- > Ventilative cooling
- > Thermal mass utilization, including PCM
- > Natural heat sinks, such as ground water, borehole heat exchangers and others
- > Small compression chillers, including split and multiple split and VRV units
- > Small absorption chillers, including desiccant cooling

### **Subtask B – System integration**

Analyse, internationally compare and further develop concepts of system integration, such as (non-exclusive):

- > Hybrid solutions of parallel or alternative passive/active cooling
- > PV-driven chillers
- > Low cost applications for small income households
- > Micro-cooling / personal comfort control
- > Cooling applications in refurbishment
- > Applied control systems

### **Subtask C – Real performance**

Assessment and optimization of real performance of applied cooling/overheating-protection solutions by in-situ measurement

- > Real total SEER of passive, hybrid and active cooling solutions, including auxiliary components such as circulation pumps, controllers, actuators
- > Effectivity of sun protection including control strategies
- > Effectivity of low tech, passive and hybrid cooling strategies
- > Effectivity and optimization of advanced control strategies, including demand-side management, cloud technologies and predictive control

### **Subtask D – Regulatory context**

Identify best practice and obstacles in regulatory context

- > indoor comfort, IEQ and ergonomic qualities
- > components and system efficiency
- > system integration in compliance tools
- > implications in regulatory context arising from BIM implementation

***Who would be the intended target audience (receptor) for each specific project outcome?***

The intellectual outcome will be a renewed and internationally shared understanding of adequate solutions to the worldwide challenge of buildings' overheating prevention and resilient cooling.

Physically, the outcomes of the Annex proposed are intended being subsumed and published within four main deliverables:

**The Guidebook**

The guidebook shall contain an application-oriented knowledge-base of Resilient Cooling, its scope and its specific potential. Promising examples of applications and new developments shall be presented. Furthermore the guidebook shall contain practical design assistance for identifying climate- and situation sensitive solutions and system options. The content of the guidebook is an extract of all four subtasks. The intended target audience of the guidebook are architects, builders, politicians at national and international level, as well as building service and building construction engineers.

**The Sourcebook**

The sourcebook shall contain a comprehensive collection of available components and solutions useful for Resilient Cooling, including materials, building construction elements, building service units, personal control devices and more. The content of the sourcebook is linked closely to the work of Subtask B. The intended target audience of the sourcebook are those who are interested in applying resilient cooling and are interested in information on products, qualities and solutions. The sourcebook targets will form a valuable source for building service and building construction engineers, furthermore architects, builders and politicians at a communal level.

**The Scientific Review**

The Scientific Review shall contain the collection of scientific findings within the manifold fields of Resilient Cooling that will have been investigated within the Annex. It will systematically document the research carried out, forming a sound basis for practical application, ongoing product development and further research activities. The intended target audience of the Scientific Collection are scientists and developers both in research and industry.

**The Regulatory Review**

The Regulatory Review shall form the outcomes of the regulatory context' review, carried out in subtask 4. The intended target group are members of interest groups, public authorities, and standardisation committees as well as members from innovation departments in industry.

<p><b>State any expertise or skills the project will require that you have not already been able to source.</b></p> <p>It is anticipated that the Annex participants can provide all required expertise.</p>	
<p><b>What is your initial estimate for how long the project will take to complete:</b></p> <ul style="list-style-type: none"> <li>- For the preparation phase 1 year</li> <li>- For the working phase 3 years</li> <li>- For the reporting phase 1 year</li> </ul>	
<p><b>Has a relevant 'Technology Readiness Assessment' already been carried out in any of the interested countries?</b></p> <p>A preliminary 'Technology Readiness Preliminary Assessment' shall be carried out as part of the international workshop, with the agreement of the EBC Executive Committee. Its outcomes will be presented attached to the Annex proposal.</p>	
<b>Your name</b>	Peter Holzer
<b>Email address</b>	peter.holzer@building-research.at
<b>Telephone</b>	+43 – 664 - 88267801
<p><b>Will you be able to:</b></p> <ul style="list-style-type: none"> <li>- Lead development of the proposal?</li> <li>- If approved by the Executive Committee, act as the project manager (“Operating Agent”)?</li> </ul>	<p>Yes</p> <p>Yes</p>
<b>Name of your national EBC Executive Committee member</b>	Theodor Zillner
<b>Not including EBC participating</b>	

<b>organisations, state which other organisations with whom you propose to collaborate on this project</b>	Potential participants to be determined
<b><i>For national Executive Committee member use</i></b>	<i>Do you approve this proposal for submission to the ExCo? (Yes / No)</i> <i>Are the objectives clearly stated? (Yes / No)</i> <i>Do the objectives align with the EBC Strategic Plan? (Yes / No)</i> <i>Is the scope clearly stated? (Yes / No)</i>

## Summary of Annex Development and Quality Assurance Process

Step	By When	By Whom
<b>1. Complete this EBC Project Concept Template</b>	<b>4 weeks before the EBC Executive Committee Meeting at which the project concept will be presented (held in June or November each year)</b>	<b>You and your national EBC Executive Committee Member</b>
<i>For your reference, the later steps (2) to (9) are explained below</i>		
2. Decide whether to develop EBC Project Concept into a full Annex proposal	EBC Executive Committee Meeting	EBC Executive Committee
3. Convene an international workshop to which all EBC member countries have been invited, including a 'Technology Readiness Preliminary Assessment'. Agree timing for review of the draft Annex Text with your national ExCo member and the Annex Adviser	7 weeks before the next EBC Executive Committee Meeting	You
4. Develop a full EBC Annex proposal in the form of a draft Annex Text (see EBC Operating Agent Guidelines for more information)	5 weeks before the next EBC Executive Committee Meeting	You and the workshop participants
5. Review draft Annex Text	4 weeks before the next EBC Executive Committee Meeting	Your national ExCo Member and the Annex Adviser
6. Update draft Annex Text based on national ExCo member and Annex Adviser feedback and send to ESSU	3 weeks before the next EBC Executive Committee Meeting	You
7. Circulate draft Annex Text to the EBC Executive Committee	No later than 2 weeks before the next EBC Executive Committee Meeting (hard deadline)	ESSU
8. Discuss draft Annex Text in EBC member countries and decide on national participation	Next EBC Executive Committee Meeting	EBC Executive Committee
9. Decide whether to approve new EBC Annex based on draft Annex Text and proceed to Preparation Phase	Next EBC Executive Committee Meeting	EBC Executive Committee