

Task 65

Solar Cooling for the Sunbelt Regions



ANNEX

June 2020

Annex 65

Solar Cooling for the Sunbelt Regions

1 Definitions

(a) *Definition of technical sector*

In 2016, air-conditioning accounted for nearly 20% of the total electricity demand in buildings worldwide and is growing faster than any other energy consumption in buildings. If measures are not taken to counteract this increase, the space cooling demand will almost triple by 2050; the demand can reach 6,200 TWh, or 30% of the total electricity use in buildings.

Although latest studies are calculated using the most recently available conventional technology, further attention should be directed at advancing components and systems. Solar cooling, either thermal or electrical driven systems, tend to cater mainly to niche markets.

To foster affordable, safe and reliable Solar Cooling systems for the Sunbelt regions requires a combination of cost reduction, simplifications of the systems and stimulation of market conditions through policies. The implementation/adaptation of components and systems for the different boundary conditions should be forced by cooperation with industry and with support of target countries like UAE through Mission Innovation (MI) Innovation Challenge “Affordable Heating and Cooling of Buildings” (IC7).

(b) *Definitions*

The proposed Task aims at covering the small to large size segment of cooling and air conditioning (between 2 kW and 5,000 kW). Both technologies, solar thermal and PV, can be integrated to support a HVAC system accordingly and both systems can be competitive against reference systems when they are well designed, and boundary conditions are favourable.

The project is focusing on SUNBELT REGIONS with its different boundaries worldwide (sunny and hot, and humid climates, between the 20th and 40th degrees of latitude in the northern and southern hemisphere) by using solar energy either solar thermal or solar PV.

The innovation driver and the keyword is ADAPTATION of existing concepts to the SUNBELT REGIONS, which is defined in the next chapter of the document.

2 Purpose and Objective

The goal of the proposed Task is to focus on innovations for affordable, safe and reliable Solar Cooling systems for the Sunbelt regions worldwide. Generally, this requires a combination of cost reduction, simplifications of the systems and stimulation of market conditions through policies. The implementation/adaptation of components and systems for the different boundary conditions is forced by cooperation with industry and with support of target countries like UAE through Mission Innovation (MI) Innovation Challenge “Affordable Heating and Cooling of Buildings” (IC7). It is the expectation that this new approach of linking SHC Task work with MI IC7 activities and funding opportunities for Solar Cooling helps to develop a market uptake of Solar Cooling in the Sunbelt regions. The innovation driver and the keyword is Adaption of existing concepts/technologies to the Sunbelt regions using solar energy either solar thermal or solar PV.

3 Activities

(a) *Main activities*

The key objective of this new Task is to adapt, verify and promote Solar Cooling as an affordable and reliable solution in the rising Cooling demand across Sunbelt countries. The (existing) technologies need to be adapted to the specific boundaries and analysed and optimized in terms of investment and operating cost and their environmental impact (e.g. solar fraction) as well as

compared and benchmarked on a unified level against reference technologies on a life cycle cost bases.

(b) Sub-activities

The activities will be performed in four sub tasks

Subtask A: Adaptation

- A1 Climatic conditions & applications
- A2 Adapted components
- A3 Adapted systems
- A4 Building and process optimization potential
- A5 Standardization activities

Subtask B: Demonstration

- B1 Show cases on system and component level
- B2 Design Guidelines
- B3 KPI definitions
- B4 Standardized Solar Cooling Kits
- B5 Lessons learned (technical and non-technical)

Subtask C: Assessment & Tools

- C1 Design tools and models
- C2 Database for technical and economic assessment
- C3 Assessment mechanism
- C4 Benchmarking and sensitivity analysis

Subtask D: Dissemination

- D1 Homepage / publications
- D2 Policy advice & financing models
- D3 Guideline / Roadmaps for sunbelt countries
- D4 Book or booklet
- D5 Workshops
- D6 Stakeholder Engagement

(c) Workshops and seminars

Industry workshops will be held in conjunction with every second Task meeting. The workshops will be organized in the host country of the meeting or online and all relevant target groups will be invited.

(d) Participants and/or experts' meetings

Task meetings will be held twice a year with all participants. In between expert meetings will be held as web meetings if possible.

(e) Publications/Newsletters

The overall scope and objectives of the Task and the different Subtasks will be described on the Task Website.

A publicly available database of international solar cooling projects will be promoted.

In addition, the task results will be published at conferences and webinars, in journals and magazines.

4 Expected Results/Deliverables

The deliverables, allocated to the four subtasks, will be:

Subtask A: Adaptation

- D.A1 Compilation of climatic conditions and applications / demands
- D.A2 Report on adapted market available components for solar cooling and adapted system concepts

- D.A3 Potential for solar cooling based on energy efficient buildings & processes
- D.A4 Report on standardization activities

Subtask B: Demonstration

- D.B1 Collection of existing applications, projects and products and future potential new ones
- D.B2 Design, integration, and monitoring guidelines
- D.B3 Collection of technical and economic key performance indicators
- D.B4 Standardization and cooling kit solutions
- D.B5 Selection of best practice and lessons learned

Subtask C: Assessment & Tools

- D.C1 Report on tools from pre-design to detailed simulation models
- D.C2 Technical and economic database for assessment of solar cooling
- D.C3 Adapted assessment tool
- D.C4 Technical and economic benchmarking for solar cooling plants

Subtask D: Dissemination

- D.D1 IEA website and best practise website
- D.D2 Report on financing models
- D.D3 Roadmaps for solar cooling in sunbelt countries
- D.D4 Book/Booklet
- D.D5 Report on workshops
- D.D6 List of Stakeholders and activities

5 Rights and Obligations of Participants

In addition to the obligations enumerated in Article 4 of the implementing agreement:

- (a) Each participating institution/company shall provide the Operating Agent with detailed reports on the results of the work carried out for each Subtask;
- (b) Each participating institution/company shall participate in the editing and reviewing of draft reports of the Task and Subtasks.
- (c) Meetings
The cost of organising meetings will be borne by the host country but can be shared with the participants.
- (d) Level of effort
Each country will bear the costs of its own participation in the Task, including necessary travel costs. The Participants agree on the following funding commitment:

Each Participant (country) will contribute to this Task a minimum of 0.1 person year per year of the Task, i.e. a total minimum of 0.4 person years.

Participation in the Task requires participation in at least one of the Subtasks.

The Operating Agent will contribute with a minimum of 0.25 person year per year to the Task (i.e., a total of 1.0 person years for his/her work as Operating Agent).

Participation may partly involve funding already allocated to a national (or international) activity that is substantially in agreement with the scope of work outlined in this Annex. Aside from providing the resources required for performing the work of the Subtasks in which they are participating, all Participants are required to commit the resources necessary for activities that are specifically collaborative in nature and that would not be part of activities funded by national or international sources. Examples include the preparation for and participation in Task meetings, co-ordination with Subtask Participants, contribution to the documentation and dissemination work and Task related R&D work which exceeds the R&D work carried out in the framework of the national (or international) activity.

6 Management

- (a) Germany, acting through the Green Chiller Association for Sorption Cooling e.V., is designated as Operating Agent.
- (b) The Operating Agent's rights, obligations and responsibilities in addition to those indicated in the main body of the implementing agreement and the organisation of the work under this Annex enumerated in Section 5 of this Agreement, the Operating Agent shall:
 - 1) Prepare and distribute the results mentioned in paragraph 4 above
 - 2) Prepare the detailed Program of Work for the Task in consultation with the Subtask Leaders and the Participants and submit the Program of Work for approval to the Executive Committees of the Solar Heating and Cooling Programme
 - 3) Provide reports semi-annually to the Executive Committees on the progress and the results of the work performed under the Programme of Work
 - 4) Provide to the Executive Committees, within six months after completion of all work under the Task, a final report for its approval and transmittal to the Agency
 - 5) In co-ordination with the Participants, use its best efforts to avoid duplication with activities of other related programmes and projects implemented by or under the auspices of the Agency or by other competent bodies
 - 6) Provide the Participants with the necessary guidelines for the work they carry out with minimum duplication;
- (c) The Subtask Leaders shall be Participants that provide to the Subtasks a high level of expertise and undertake substantial research and development in the field of the Subtask. The Subtask Leaders shall be proposed by the Operating Agent and designated by the Executive Committee.

A Subtask Leader for each of the foregoing Subtasks will:

 - 1) Co-ordinate the work performed under that Subtask
 - 2) Assist the Operating Agent in preparing the detailed Programme of Work
 - 3) Direct technical workshops and provide the Operating Agent with written summaries of workshops results
 - 4) Edit technical reports resulting from the Subtask and organise their publication.
 - 5) Arrange meetings in between or in association with Experts meetings of the Task.
- (d) Task meetings: There will be Experts meetings of the Task at intervals of approximately 6 months. Subtask Leaders may arrange meetings in between or in association with Experts meetings of the Task.
- (e) It is intended to organize expert / industry workshops every year, directly linked to Task meetings.
- (f) The overall scope and objectives of the Task and the different Subtasks will be described on the Task Website.

7 Admission, Participation and Withdrawal of Participants

For purposes of this Annex the provisions of the implementing agreement shall apply.

8 Information and Intellectual Property

For purposes of this Annex the provisions of the implementing agreement shall apply.

9 Entry into Force, Term and Extension

This Annex shall enter into force on 1st of July 2020 and shall remain in force for a period of 4 years/until 31st of June 2024.

At the conclusion of that period, this Annex can be extended by at least two Participants, acting in the Executive Committee, for a period to be determined at that time, provided that in no event shall the Annex continue beyond the current term, or actual termination, of the TCP.