SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2016 HIGHLIGHTS

Task 53 – New Generation Solar Cooling & Heating Systems (PV or solar thermal driven systems)

THE ISSUE

A tremendous increase in the market for air-conditioning can be observed worldwide especially in developing countries. The results of the past IEA SHC Tasks and work on solar cooling in *SHC Task 38: Solar Air-Conditioning and Refrigeration* show the large potential of this technology for building air-conditioning, particularly in sunny regions. However, solar thermal cooling faces barriers to emerge as an economically competitive solution. Thus there is a strong need to stimulate the solar cooling sector for small and medium sized systems.

OUR WORK

SHC Task 53, building upon earlier IEA SHC work in this field, is working to find solutions to make solar driven heating and cooling systems cost competitive and to help build a strong and sustainable market for new innovative thermal cooling systems and solar PV. These objectives are being tackled through five activities:

1. Investigation of new small to medium size PV & solar thermal driven cooling and heating systems and development of best suited cooling and heating systems technology with a focus on reliability, adaptability and quality.
2. Proof of cost effectiveness of the above mentioned solar cooling and heating systems.
3. Investigation on life cycle performances on energy and environmental terms (LCA) of different options.
4. Assistance with the market deployment of new solar cooling and heating systems for buildings worldwide.
5. Increasing energy supply safety and influencing the virtuous demand side management behaviors.

The Task's scope is technologies for the production of cold/hot water or conditioned air by means of solar heat or solar electricity. That is, the Task starts with the solar radiation reaching the collectors or the PV modules and ends with the chilled/hot water and/or conditioned air transferring to the application. It is focused on solar driven systems for both cooling (ambient and food conservation) and heating (ambient and domestic hot water).

Participating Countries

Australia
Austria
China
France
Germany
Italy
Netherlands
Spain
Sweden
Switzerland

Task Period 2014 - 2018
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Task 53

KEY RESULTS IN 2016

SHC Task 53 started in March 2014. The first results have been presented at numerous events, which can be found on the Task 53 webpage.

Innovative Solar Cooling System Solutions

The biggest challenge of the still small solar cooling market is the reduction of system costs. One way to reach this target besides scaling up market volumes is standardization. The industry has reacted globally with the development of pre-engineering solar cooling kits. To bring more transparency into this innovative technology field the researchers of SHC Task 53 gathered technical data on 11 small- and medium-size solar cooling systems and published them in a table (see below). The overview includes market-ready as well as close-to-market solutions.

Logo	Manufacturer, country	Market status	Service	Solar input type	Nominal cooling capacity (kW or m^3/h)	Nominal heating capacity (kW)	Nominal solar input (Wp for PV and m^2 for ST	Cooling Storage	Target market area	Heat rejection	Back up
ATISYS Concept	ATISYS, France	R&D	Cooling/ heating	PV	4 kW	5.1 kW	4.6 kW	Sensible tank	France, Northern Africa	Air	Grid
ClimateWell	CLIMATEWELL, Sweden	R&D	Cooling/ heating/DHW	ST	40 kW	108 kW	180 m2	Sensible tank	Europe, sunny countries	Air	Electric chiller (390 kW)
FREECOLD	FREECOLD, France	Commercial	Cooling	PV	2.5 kW	No heating	1.5 kW	-	Africa, developing countries	Air	Grid
freescoo	FREESCOO, Italy	R&D	Cooling/ heating	ST/PV	500 m3/h	1.44 kW	2.4 kW	-	Italy	Air	
GREE 格力	GREE. China	R&D	Cooling/ heating	PV	33.5 kW	37.5 kW	12.2 kW	None	China	Air	Grid
Kaysun by Frigicoll	KAYSUN, Spain	Commercial	Cooling/ heating	PV	3.5 kW	3.5 kW	0.7 kW	None	Spain, Europe	Air	Grid
PURIX	PURIX, Denmark	Commercial	Cooling/ heating	ST	2.5 kW	3.6 kW	4.8 m2	None	Europe, sunny countries	Air	Boiler
senr DIFFUSION	SENR, France	Commercial	Cooling/ heating	PV	3,6 kW(split) 45 kW (VRF)	3,6 (split) 50 (VRF)	650 (split) 20,000 W (VRF)	None	France, Europe, sunny countries	Air	Grid
SolabCool	SOLABCOOL, Netherlands	R&D	Cooling/ heating	ST	4,5 kW	8 kW	13.3 m2	None	Europe, sunny countries	Air	District heating
YAZAKI	YAZAKI, Japan	R&D	Cooling/ heating	ST	35 kW	60 kW	0.1 kW	Sensible tank	China	Air	Electric chiller (29,3 kW)

The presented solutions apply to a wide range of applications from single-family houses, to small multi-family buildings as well as commercial centres, offices and hotels. They can be either driven by solar thermal collectors (four systems) or by photovoltaics (five systems) or by both solar thermal and PV (one system). Obviously solar electricity driven cooling develops dynamically. This new competition also drives R&D activities among the solar heat driven system developers.

Best Practices For Energy Storage Including Both Efficiency And Adaptability In Solar Cooling Systems

This technical report is dedicated to presenting the most accurate storage methods for solar cooling and heating systems, including a guideline for choosing the best storage technology depending on climate and building types. The following table shows an estimation of the most economical storage technology for an office building depending on its location.

The table can only be used as estimation; the best storage method for an individual building and location has to be evaluated on a case-by-case basis.

	Office building – northern climate zone	Office building – middle climate zone	Office building – southern climate zone
UTES	+	+	++
ATES	+	+	+
Pit storage	+	+	+
Solid media	o	o	o
PCM	o	o	o
Ice storage	o	++ / o	++ / o
Hot and cold water tank	++	+ / o	o

\+ main storage (long term) o additional storage (short term)