SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2021 HIGHLIGHTS

Task 65 – Solar Cooling for the Sunbelt Regions

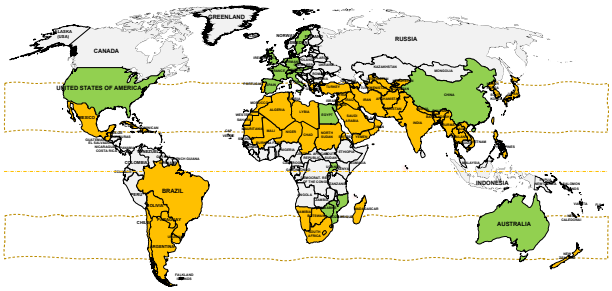
THE ISSUE

In 2016, air-conditioning accounted for nearly 20% of the total electricity demand in buildings worldwide and consumption is growing faster than any other energy source used in buildings. If measures are not taken to counteract this increase, space cooling demand will almost triple by 2050; the demand could reach 6,200 TWh, or 30% of the total electricity used in buildings. The latest studies are primarily directed at existing conventional technology. However, greater attention should be directed at enhancing 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 in the Sunbelt regions a combination of cost reduction, adaptation and system simplification is required. Stimulation of market conditions through policy measures is also necessary. The implementation of revised components and systems that cater to the different boundary conditions should be introduced by cooperation with industry and with support of target countries like India and UAE through the Mission Innovation (MI) Innovation Community, “Affordable Heating and Cooling of Buildings” (IC7).

OUR WORK

SHC Task 65 targets the small to large cooling and air conditioning market (between 2 kW and 5,000 kW). Both solar thermal and PV can be integrated to support a HVAC system. When well designed and boundary conditions are met, these systems are highly competitive when compared with reference systems.



This project focuses on using solar energy across Sunbelt regions where boundary conditions vary (sunny and hot, and humid climates, between 20-40 degrees latitude in the northern and southern hemisphere). Adaptation of existing concepts is key. To utilize solar heat in industry and to support the solar thermal market, the integration of solar thermal systems into existing energy supply structures is paramount.

Participating Countries

Australia
Austria
China
Denmark
Egypt
France
Germany
Italy
Mozambique
Netherlands
Slovakia
Spain
Sweden
Switzerland
Uganda
United Kingdom
USA
Zimbabwe

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SOLARCOOLING SUNBELT REGIONS TASK65

KEY RESULTS IN 2021

Novel GIS Tool for Identification of Potential Solar Cooling Markets

In general, climatic conditions and typical (solar) cooling applications strongly depend on the location. Therefore, a geographic information system (GIS) is being used in the Task to process data. GIS is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. The most relevant GIS data are already available from different sources, such as solar radiation data, climatic data, population data, etc.

In the scope of this activity, the aim is to understand the reference boundary conditions for adaptation of the components and solar cooling systems for Sunbelt regions. In addition, using population density data, for example, gives a base for future market potential studies on certain products/technologies. In a first approach, the following conditions and sources from the SunBeltChiller research project funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWi) were considered:


Source: ZAE

- Geographic areas regarded as requiring cooling include latitudes between 40°N and 40°S,
- Solar direct normal irradiance (DNI > 1,500 kWh/m²a),
- Population density/Built-up areas/Settlement levels (SMOD 13…30), and
- Climate zones (Köppen–Geiger climate classification system, potentially suitable climate).

SHC Solar Academy Training for SOLTRAIN

The IEA SHC Solar Academy and SOLTRAIN (Southern African Solar Thermal Training and Demonstration Initiative) hosted with the support of SACREEE and SANEDI, an on-site specialized course for professionals on Solar Cooling for Sunbelt Regions on November 8th-9th, 2021 at Stellenbosch Institute for Advanced Study in South Africa. A total of 46 participants from 7 countries took part, with around 8 of them participating virtually. Speakers were Task 65 experts Manuel Ostheimer, Daniel Neyer, and Uli Jakob.

Source: JER

Day 1 was dedicated to an overview of Task 65's work, state-of-the-art and future trends of solar cooling, basic functions, and finally, a look at several state-of-the-art products and systems, such as the HyCool technology.

On Day 2, the training turned to an economic and technical assessment of solar cooling systems, focusing on hybrid chillers for southern African applications. Therefore, the IEA SHC Tool T53E4 was presented in detail as part of the interactive workshop to carry out an economic case study to compare a hybrid solution to a standard vapor compression chiller solution. During this interactive session, the group discussed in detail the key technical and economic figures, load analyses, and specific design issues. Finally, a compilation of a do's and don'ts list and best practice examples were presented.


Source: Werner Weiss, AEE