



**SOLAR HEATING & COOLING PROGRAMME**  
INTERNATIONAL ENERGY AGENCY



# Solar PV and Thermal Cooling

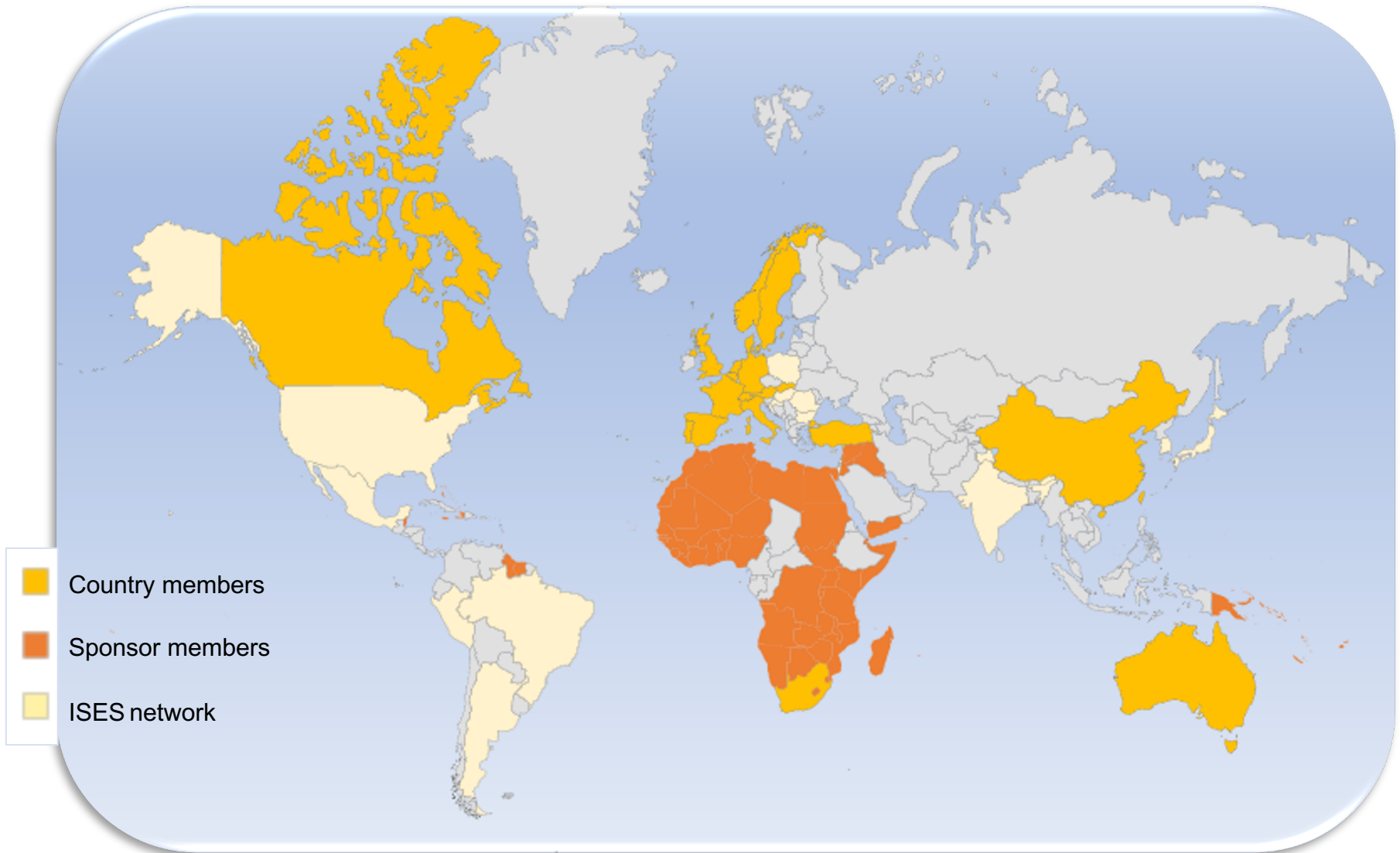
"SUNHORIZON SOLAR  
STAKEHOLDERS  
WORKSHOP"



Webinar, 10 September 2020

Daniel Mugnier, SHC TCP Chairman

# IEA SHC Members

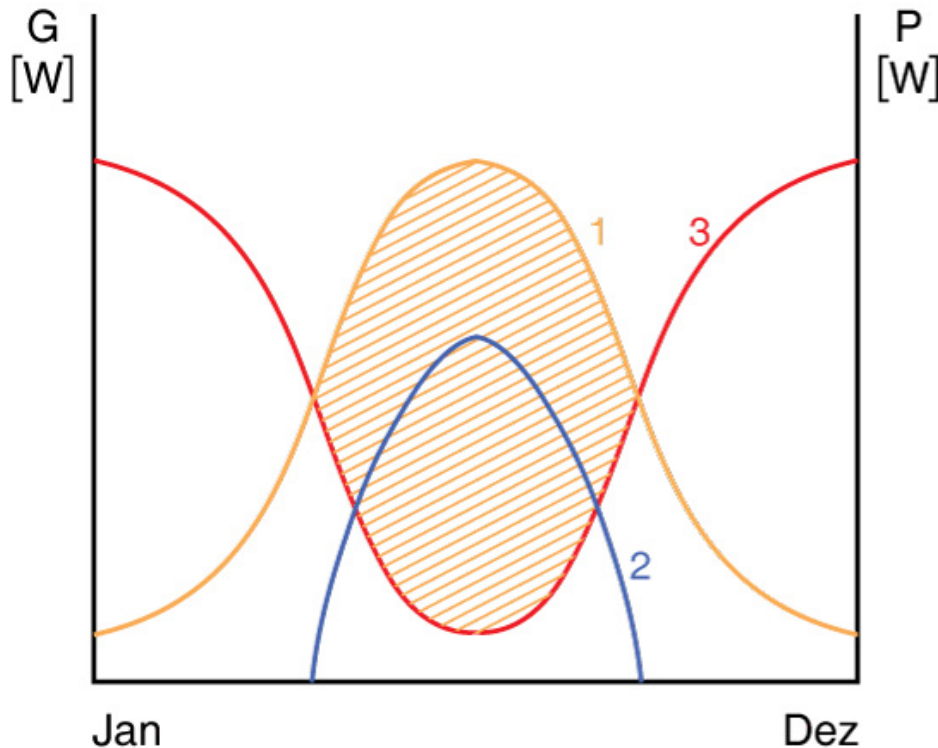


**19 Countries + EC**

**8 Sponsors**

European Copper Institute, ISES & UNIDO GN-SECs: EACREEE, ECREEE, RCREEE & SACREEE (CCREEE & PCREEE in process of joining)

# Solar cooling – Solar resource vs. Cooling demand



Source: SolarNext

Resource and demand are in phase

1 Global radiation

2 Cooling demand

3 Heat demand

 Excess solar heat in summer

# The Future of Cooling - Implications & opportunities energy efficiency (IEA)

Reference scenario

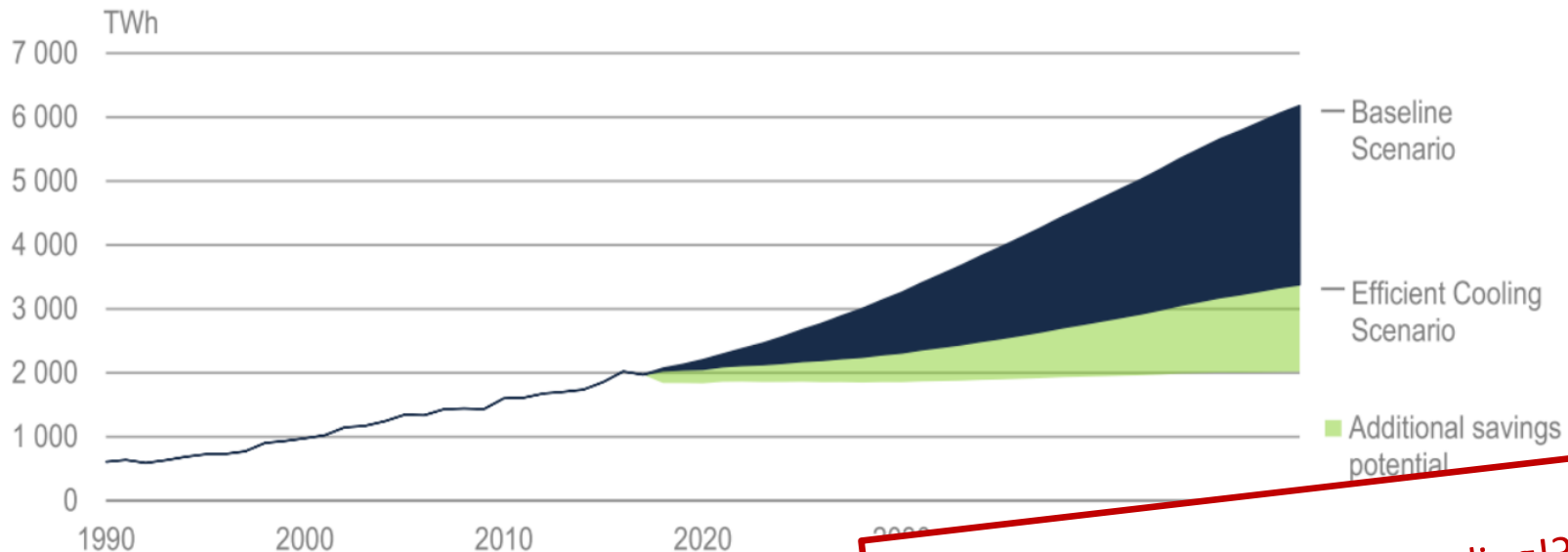
- On current trends, energy needs for space cooling – almost entirely in the form of electricity – will more **than triple between 2016 and 2050, driven mainly by the residential sector (2 000 TWh => 6 000 TWh)**
- Most of the **projected growth in energy use for cooling is set to come from India, China and other emerging economies.**
- Space cooling is set to overtake appliances and plug loads **to become the single largest user of electricity in buildings (2015:10% ; 2050 : 30%)** and the second largest electrical end use after industrial motors.
- The **share of cooling in electricity demand increases everywhere bar China and most notably in India and Brazil,** where the potential for increased use of air conditioners is greatest.

# Future cooling demand

<https://www.iea.org/cooling/>



- OECD/IEA efficiency scenario
  - Component level: SEER 8.5 by 2050
  - Measures on building level are possible but limited...



Source: OECD/IEA (2018) The Future of Cooling

→ Contribution of solar cooling!?

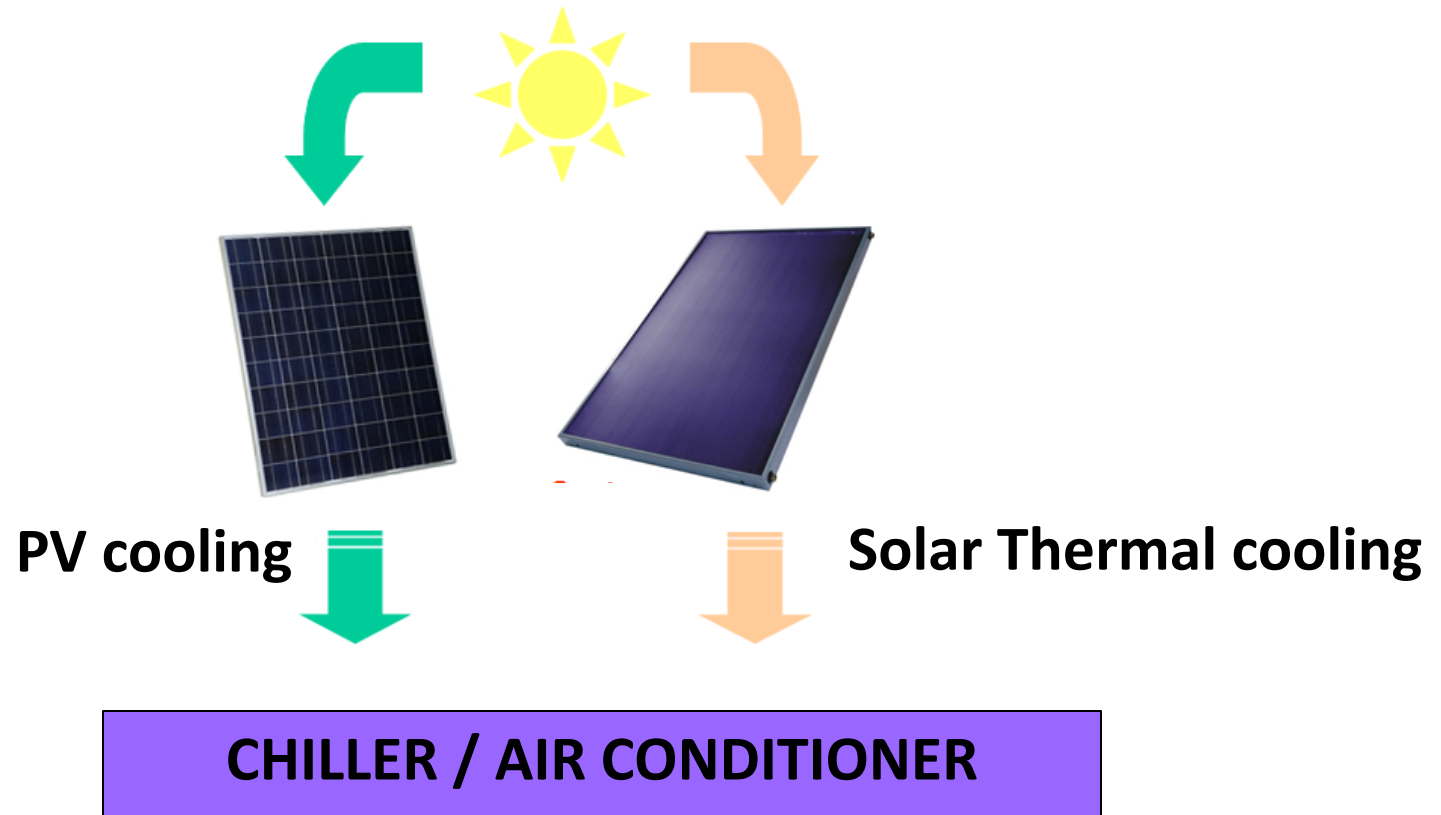


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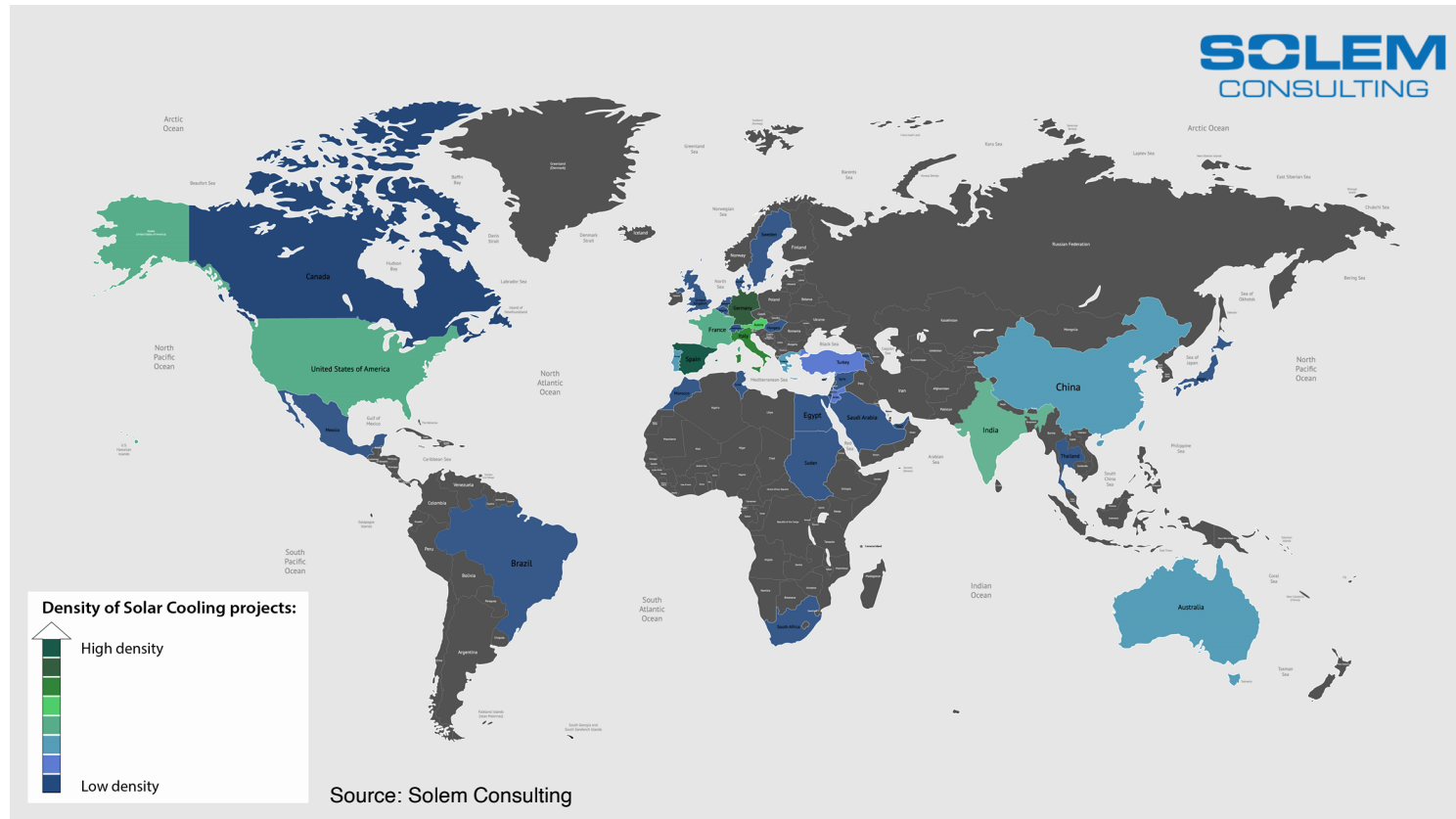
[www.iea-shc.org](http://www.iea-shc.org)

**SHC**  
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# 2 channels for solar cooling in 2020..



# Development of Solar Cooling Market



TECSOL/SOLEM Consulting estimates about 1.800 installed solar cooling systems worldwide (2020)



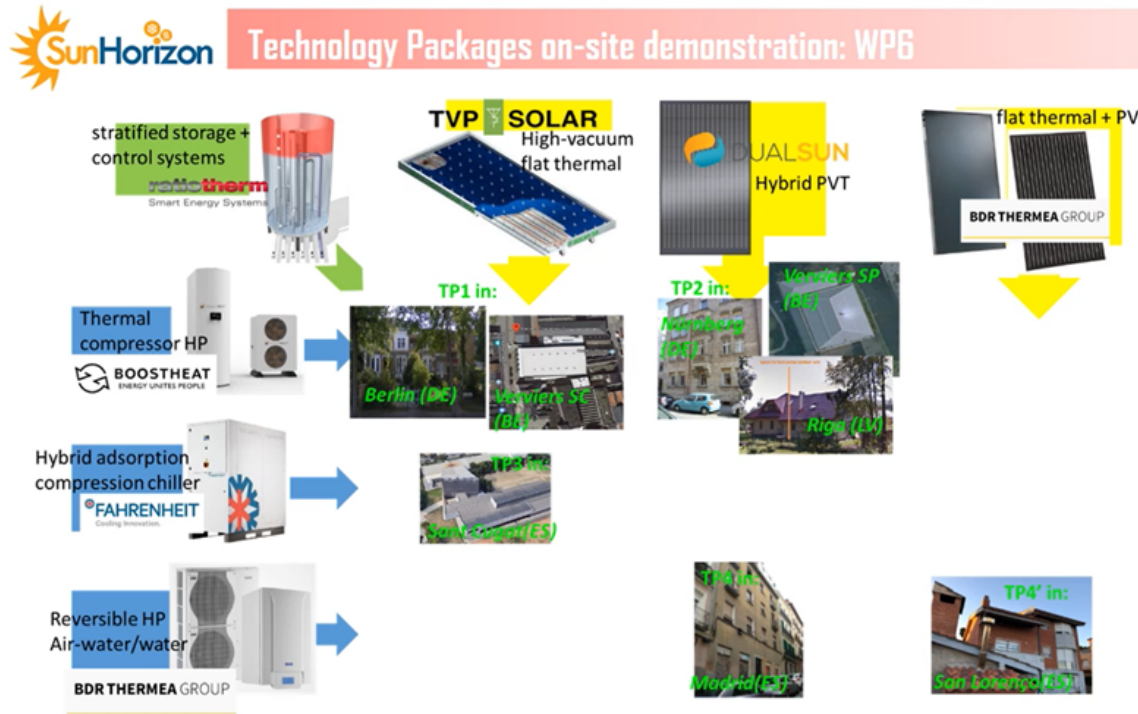
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01-10-2019 | Slide 8  
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# Solar cooling in Europe...

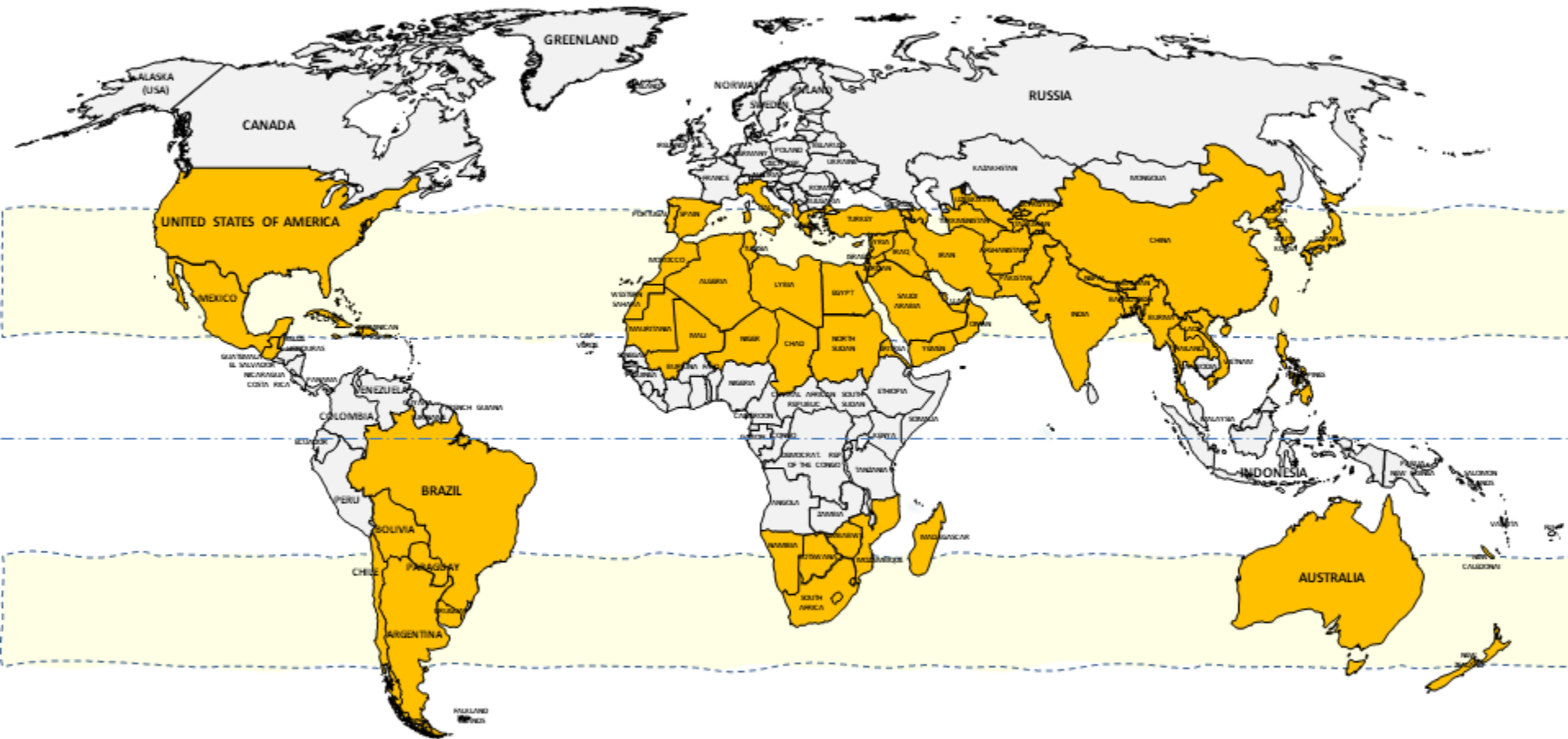


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## ... but not only !



# Sunbelt regions



# IEA SHC Task 65 : Objective & Scope

## Objective

- Focus on innovations for **affordable, safe and reliable solar cooling systems for the sunbelt regions worldwide**
- 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 IC7
- The innovation driver and the **keyword is adaptation** of existing concepts/technologies to the sunbelt regions using solar energy either solar thermal (ST) or solar PV

## Scope

- Build on previous tasks 25, 38, 48 and 53
- **Target size segment** on cooling and air conditioning between **2 kW and 5,000 kW** (PV and ST)
- Task duration: July 2020 – June 2024

# IEA SHC Task 65 : Subtask Structure

## **Subtask A: Adaptation**

lead country: Italy

subtask leader: Dr. Salvatore Vasta, CNR-ITAE

## **Subtask B: Demonstration**

lead country: USA

subtask leader: Wolfgang Weiss, ergSol Inc. (Limited Sponsor)

## **Subtask C: Assessment and Tools**

lead country: Austria

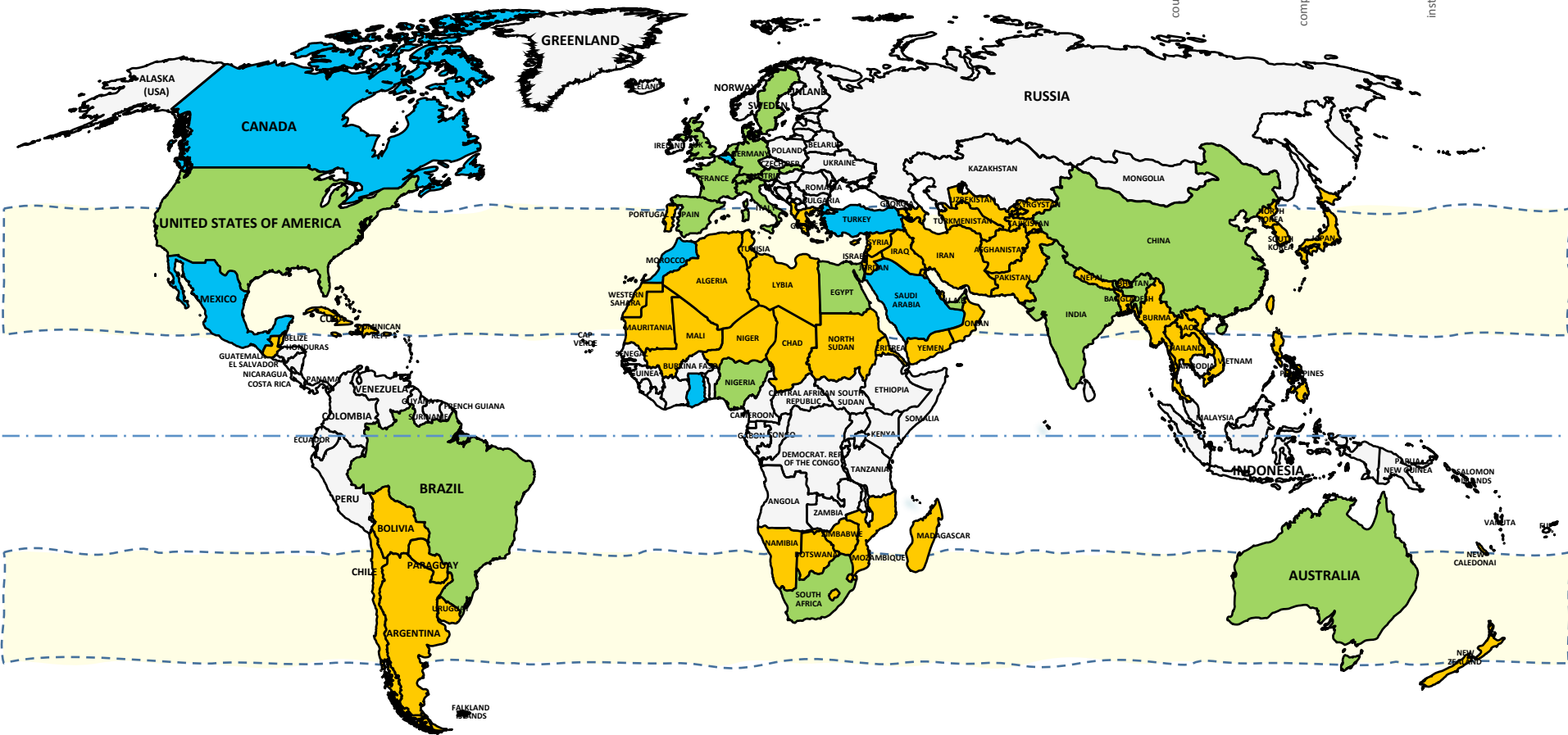
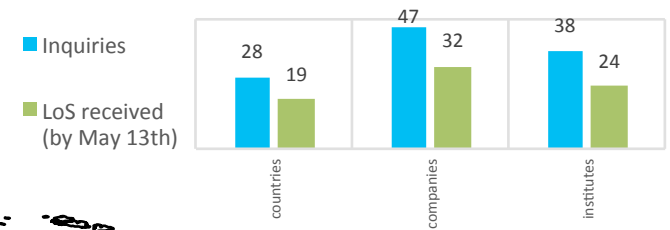
subtask leader: Dr. Daniel Neyer, Neyer Brainworks

## **Subtask D: Dissemination**

lead country: Germany

subtask leader: Prof. Dr. Paul Kohlenbach, Beuth University of Applied Sciences Berlin

# Task 65 : Countries interested (LoS)



# Task 65 : Kick off meeting soon !

## Task 65 Kick-off Meeting

**September 28, 2020, 1:00 - 4:00 PM CEST - GoToMeeting, Germany and  
September 29, 2020, 1:00 - 4:00 PM CEST - GoToMeeting, Germany**

The Kick-off meeting will introduce the new task and start the collaboration with Mission Innovation IC7.

Each subtask will be presented to discuss the contributions of the different participants.

Anyone interested to join the meeting please contact Uli Jakob.

**Meeting Contact (operating agent) :** [uli.jakob@drjakobenergyresearch.de](mailto:uli.jakob@drjakobenergyresearch.de)

**<https://task65.iea-shc.org/event?EventID=7307>**

# IEA SHC Current R&D Work..

Task 55: **Towards the Integration of Large SHC Systems into DHC Networks**

Task 59: **Renovating Historic Buildings To Zero Energy**

Task 60: **Application of PVT Collectors and New Solutions with PVT Systems**

Task 61: **Integrated Solutions for Daylight and Electric Lighting**

Task 62: **Solar Energy in Industrial Water and Wastewater Management**

Task 63: **Solar Neighborhood Planning**

Task 64: **Solar Process Heat**

**Task 65 : Solar Cooling in the Sunbelt Region**

**IEA SHC is fully ready to welcome you inside Task 65..**

**Contact : OPERATING AGENT - Prof. Dr. Uli Jakob**  
**[uli.jakob@drjakobenergyresearch.de](mailto:uli.jakob@drjakobenergyresearch.de)**

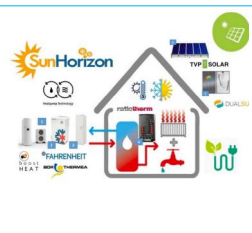
# IEA SHC for SUNHORIZON...

## Submissions in 2019 to 'Today in the Lab – Tomorrow in Energy?'

Technology Collaboration Programme  
by IEA

**Today in the Lab -- Tomorrow in Energy?**

**TCP on Solar Heating and Cooling (SHC TCP)**  
Pam Murphy  
SHC Secretariat  
[secretariat@iea-shc.org](mailto:secretariat@iea-shc.org)



**Name of the project and research institution(s)**  
SUNHORIZON - Sun Coupled Innovative Heat Pumps  
Research Institutions: CEA, CARTIF, CNR ITAE, IVL, RTU  
Heating Cooling Industrial Companies: DUALSUN, TVP, BOOSTHEAT, BDR THERMEA, RATIOTHERM  
Dissemination: EHPA

**Start and expected end-date**  
Start: 1 November 2018  
End: 31 September 2022

**Area of research (key words)**  
PVT, high vacuum flat plate collectors, thermal compression heat pump, hybrid adsorption chiller

**Project funders and size of research project (USD)**  
HORIZON 2020 Research and Innovation Program  
USD 9.94M

**Project goal and short description**  
The SunHorizon project demonstrates innovative solutions for integrating solar and heat pumps in existing and new buildings with the goal to increase energy performance, reduce CAPEX/OPEX costs (size optimization, installation cost reduction, optimization of operating conditions) and increase reliability (lifetime and predictive maintenance). Prototype tests are being performed at the component level by manufacturers and at the system level by CEA at INES test labs. Five Technology Packages are being demonstrated in eight SunHorizon demo sites across the EU. The integration between solar and heat pumps technology aims to cover the entire heating and cooling demand of the building, to maximize solar self-consumption, and to guarantee adequate indoor comfort.

## Lowering the costs of heating and cooling our homes through sun coupled innovative heat pumps

### What is the aim of this project?

Heat pumps and solar appliances are among the most installed residential renewable energy systems. In the SunHorizon project heat pump technologies will be combined with solar appliances and thermal storage in what so called Technology Packages, properly controlled, with the aim of unlocking the potential for a user-friendly and cost-effective heating and cooling solution for residential and public-sector buildings.

### How could this technology be explained to a high-school student?

Solar panels are devices that collect and turn sunlight into electricity and, simply put, a heat pump is an electrical device that extracts heat from one place and transfers it to another using a compressor pump and conductor coil. This project will connect advanced solar panels and heat pump technologies within homes and buildings, to maximize solar self-consumption and to guarantee adequate indoor comfort. The project will also develop IT tools with the purpose of maximizing the harvested solar energy and give inputs for the design of new installations with the aim to reduce operating and capital costs.

### What is the value of this project for society?

- ☐ Primary energy savings and lower energy bills
- ☐ Reduced fossil fuel dependency
- ☐ Increased energy reliability in buildings

### At what stage of development is this project?

The project was launched in November 2018 and is expected to run until September 2022. The sizing and layout of the Technology Packages is now defined and the eight demosites are preparing all the necessary steps for the installation that will be finalized in 2021.

### What government policies could bring this from the lab to the market?

- ☐ Making HP subsidies/incentives contingent upon PVT and solar ST+PV integration
- ☐ SET-Plan, Heating and Cooling policy at EU level



The Solar Heating and Cooling Technology Collaboration Programme (SHC TCP) was established in 1977 to promote the use of all aspects of solar thermal energy. The SHC TCP's work is accomplished through the international collaborative effort of experts from countries, industry and the European Union. Contact: [secretariat@iea-shc.org](mailto:secretariat@iea-shc.org)



Diagrammatic representation of solar and heat pump technologies

Source: SunHorizon project, GA 818329

### Partners

#### Research institutions:

CEA, CARTIF, CNR ITAE, IVL, RTU

#### Heating and cooling industrial companies:

DUALSUN, TVP, BOOSTHEAT, BDR THERMEA, RATIOTHERM

#### Dissemination: European Heat Pump Association

#### Industrial companies:

RINA-C, IES, SE, CW, GRE, AJSCV, EMVS, VEO

#### Funders

HORIZON 2020 Research and Innovation Program  
(under Grant Agreement N. 818329)

## Project selected in July 2020 for Communication among IEA family...



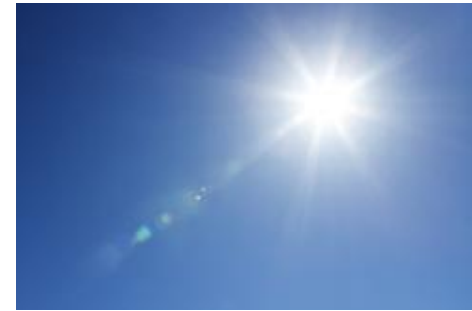
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# Thanks for your attention !

Contact IEA SHC : Daniel Mugnier

[chair@iea-shc.org](mailto:chair@iea-shc.org)



[www.iea-shc.org](http://www.iea-shc.org)



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