

Task 53 



# IEA SHC TASK 53

Workshop

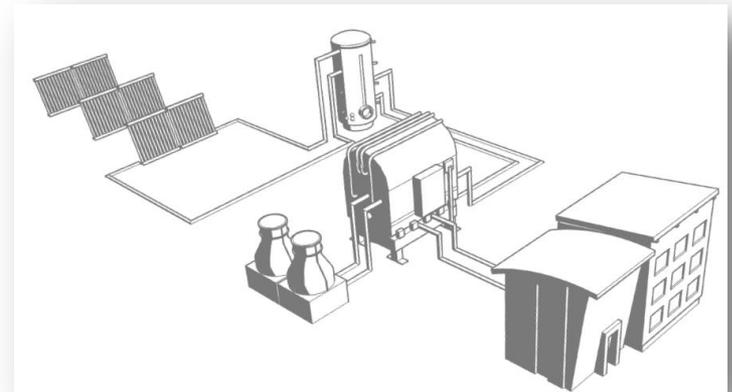
Tim Selke

SHC Task53 / PVPS Task1 Joint Workshop

Instituto para la Diversificación y Ahorro de la Energía, IDAE

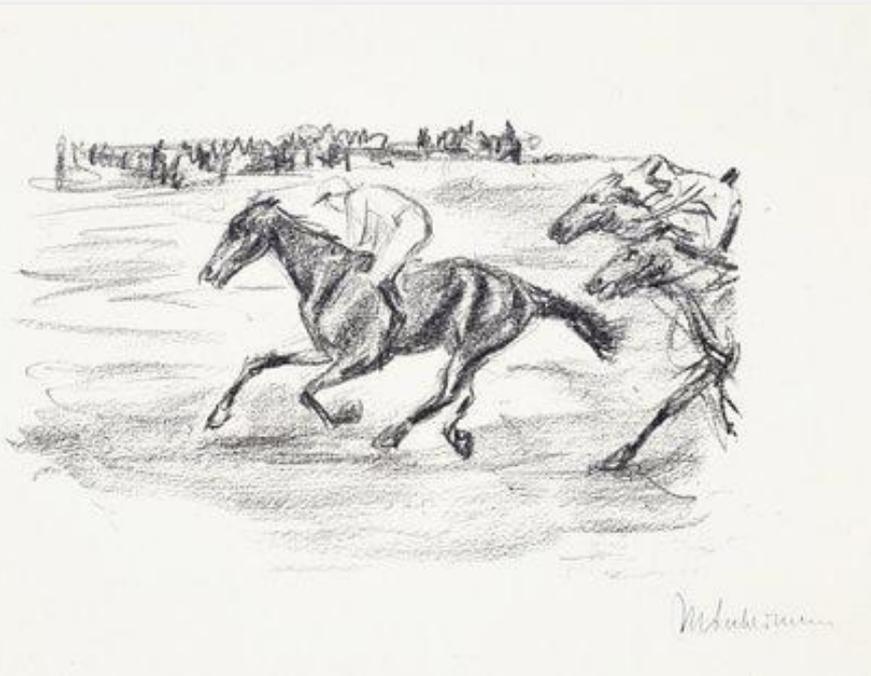
Ministerio de Industria, Energía y Turismo C/ Madera 8, 28004, Madrid

Monday, April 11<sup>th</sup> , 2016, 11.00 – 13.00 hrs



# IEA SHC TASK 53

## Framework and challenge



- Transformation of the existing energy system into secure, affordable, reliable and robust renewable energy system
- Solar technologies (thermal and power) are key components of future solution for the world wide ,energy system transformation ‘Energiewende’
- Good coincidence between solar radiation and cooling demand of buildings

**Max Liebermann**

Berlin, 20. Juli 1847 - 1935, Berlin

# IEA SHC TASK 53

## Driving forces and framework



- National energy and climate targets
- Increasing comfort and cooling demand
- High electric peaks in the grids
- Coincidence between sunshine and demand
- Products are on the markets
- Affordable, secure, reliable and robust



Quelle [www.oew.org](http://www.oew.org)

# IEA SHC TASK 53

## Lessons learnt

- Solar cooling highly needs innovations: cost reduction, 30 years reliability and performance..
- High stimulation from PV to solar thermal for small to medium cooling power range
- High priority targets in term of markets :
  - MENA region
  - China
  - Sun Belt
- Very promising segments for solar thermal cooling with large system concepts
- According to the IEA's Technology Roadmap on Solar Heating and Cooling, solar cooling should cover at least 17% of the total cooling needs by 2050

# IEA SHC TASK 53

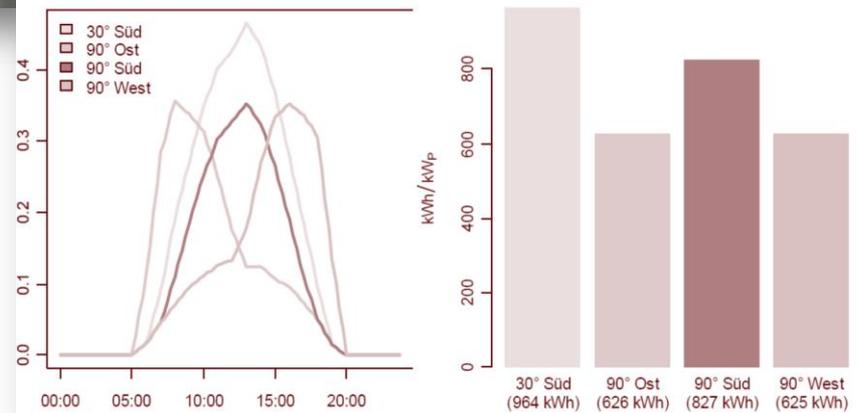
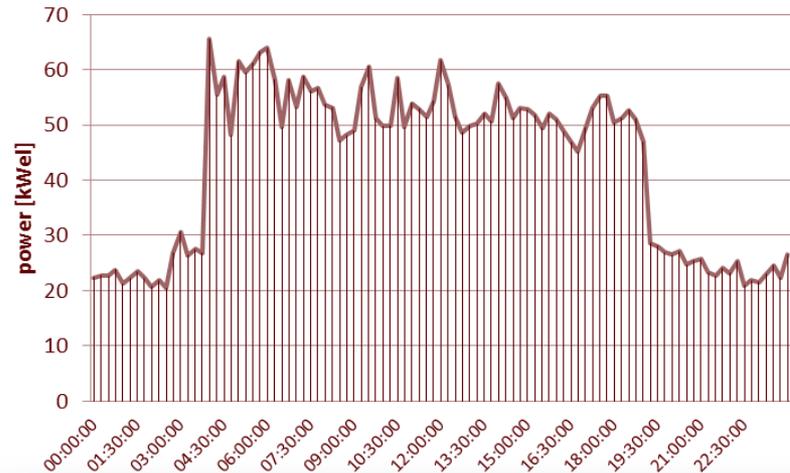
## Best practice

- Supermarkets PV Cooling



Source: ÖGNI / Austria

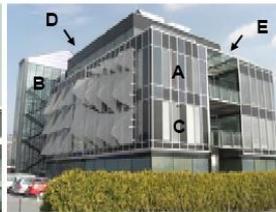
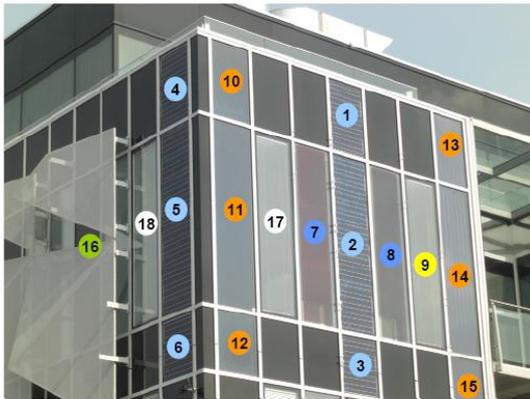
Source: REWE group Austria



# IEA SHC TASK 53

## Prototypes

### ■ Façade Integrated PV Cooling



A .. Testfassade Prototyp 1  
 B .. Stiegenturm Prüfstand  
 C .. Innovationslabor mit Warmwasserspeicher  
 D .. Fassadenprüfstand  
 E .. Entwicklungsräume der „predictive control“

- Experience with decentral PV cooling systems (façade integrated and small scale ..)
- Direct use of PV electricity (increased self consumption, ..)
- Requirements of technical adaption of the electrical drive of the cooling unit (critical electrical power .. )
- Operational system observation (monitoring data for energy assessmanet ..)

# IEA SHC TASK 53 Kick-Off

CoolSkin

Expected Contribution for SHC TAS53 Subtask A

- Experience with decentral PV cooling systems (façade integrated and small scale ..)
- Direct use of PV electricity (increased self consumption, ..)
- Requirements of technical adaption of the electrical drive of the cooling unit (critical electrical power .. )
- Operational system observation (monitoring data for energy assessmanet ..)

# IEA SHC TASK 53

What is it about?



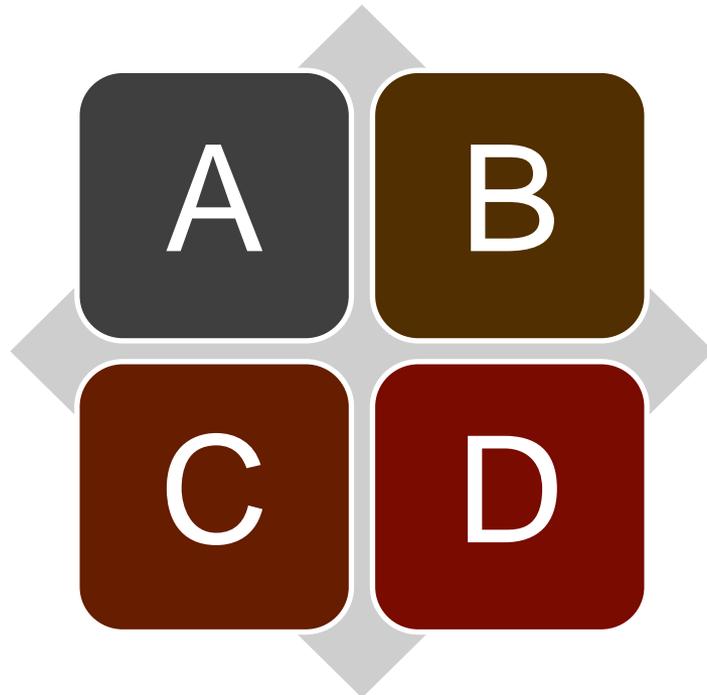
- What is the state-of-the-art market available products and upcoming R&D?  
Solar thermal and PV
- What system configuration do exist and fit for what application?  
NG technology, storage, control strategies, building type
- What are the benefits of NG Systems in comparison to conventional solution  
Economically, environmentally, maintenance ..



Quelle [www.oew.org](http://www.oew.org)

# IEA SHC TASK 53

## Structure



**Subtask A: Components, Systems & Quality**  
Leader: Tim Selke (AIT, Austria, [tim.selke@ait.ac.at](mailto:tim.selke@ait.ac.at))

**Subtask B: Control, Simulation & Design**  
Leader : Roberto Fedrizzi (EURAC, Italy, [roberto.fedrizzi@eurac.edu](mailto:roberto.fedrizzi@eurac.edu))

**Subtask C: Testing and Demonstration Projects**  
Leader : Richard Thygesen (Mälardalen University, Sweden, [richard.thygesen@mdh.se](mailto:richard.thygesen@mdh.se))

**Subtask D: Dissemination and Market Deployment**  
Leader : Daniel Mugnier (TECSOL, France, [daniel.mugnier@tecsol.fr](mailto:daniel.mugnier@tecsol.fr))

# IEA SHC TASK 53

Area of work

Subtask A: Components, Systems & Quality

Leader: *Tim Selke (AIT, Austria, tim.selke@ait.ac.at)*

- Focusing on the knowledge of the commercially available equipment on the AC side compatible with PV electricity supply as well as solar thermal cooling equipment
- Classify the ST/PV cooling products/application (schematic square view method) so as to prepare a certification process. It will estimate the value of electricity and LCA of the main components and systems

## Our Products

- Collection of market available NG SC products and system
- Simple classification of the identified NG SC systems
- Life cycle assessment/ inventory of selected NG SC systems

# IEA SHC TASK 53

Area of work

Subtask B: Control, Simulation & Design

Leader : *Roberto Fedrizzi (EURAC, Italy, roberto.fedrizzi@eurac.edu)*

- Investigating the different control strategies of new generation cooling & heating systems for buildings in order to select the best strategies for given climates and countries and developing modeling tools to predict performances and size/design systems and to manage smart interactions with the electric grid.

## Your Products

- Identified best NG system configuration (energy and costs performance with respect to application, control strategies and impact on the grid)
- Design advice for different NG system configuration (country- and climate-sensitive economical analysis)

# IEA SHC TASK 53

Area of work

Subtask C: Testing and Demonstration Projects

Leader: *Richard Thygesen*

*(Mälardalen University, Sweden, richard.thygesen@mdh.se)*

- Stimulating, monitoring and analyzing the performances of field test systems and demonstration projects for new generation solar cooling & heating systems.

## Our Products

- Monitoring procedure for field test & demo systems
- Documentation of performance data by field + laboratory tests
- Best practice examples
- Proposal for methods of quality standard

# IEA SHC TASK 53

Area of work

Subtask D: Dissemination and market deployment

Leader : *Daniel Mugnier (Tecsol, France, [daniel.mugnier@tecsol.fr](mailto:daniel.mugnier@tecsol.fr))*

- implementation of targeted promotion activities
- production of dissemination material for external communication; the implementation of knowledge

## Your Products

- Handbook
- Workshops (Industry,
- Publication on SHC Task53 website

# IEA SHC TASK 53

What systems do we have?  
(no claim for completeness)



# IEA SHC TASK 53

What systems do we have?

NG systems market available

PV (Cooling/ Heating)

- COSSECO (CH)
- FREECOLD new PV split unit (F)
- Chinese System PV MIDEA

R&D Systems close to Market

PV (Cooling/ Heating)

- ATISYS / PV cooling (F)
- Helioherm

Solar thermal (Cooling/ Heating)

- YAZAKI (JP)
- PURIX A25 multi split chiller (DK)
- SolabCOOL (NL)

Solar thermal (Cooling/ Heating)

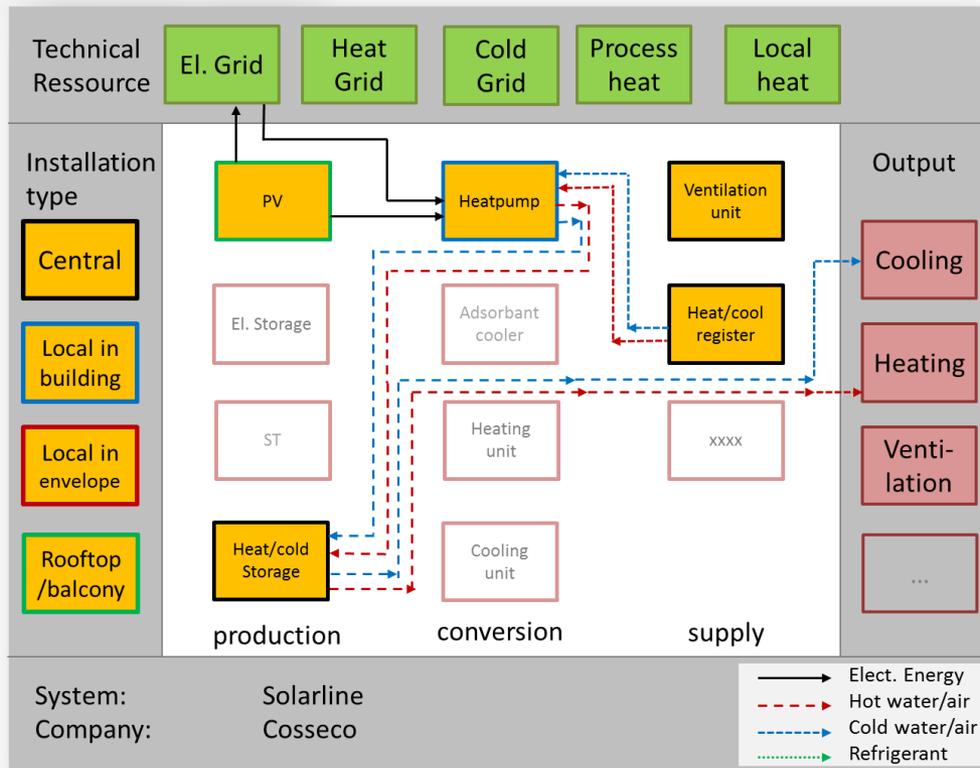
- FREESCOO (I)
- ClimateWELL (S)

# IEA SHC TASK 53

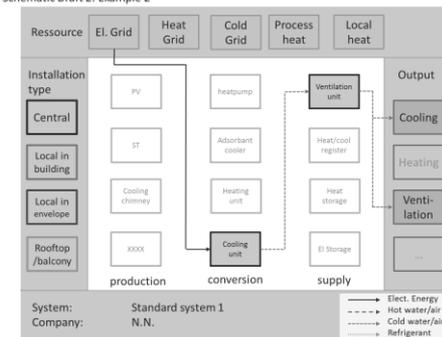
What do we have?

- System Integration

Schematic Draft 3: Example 2



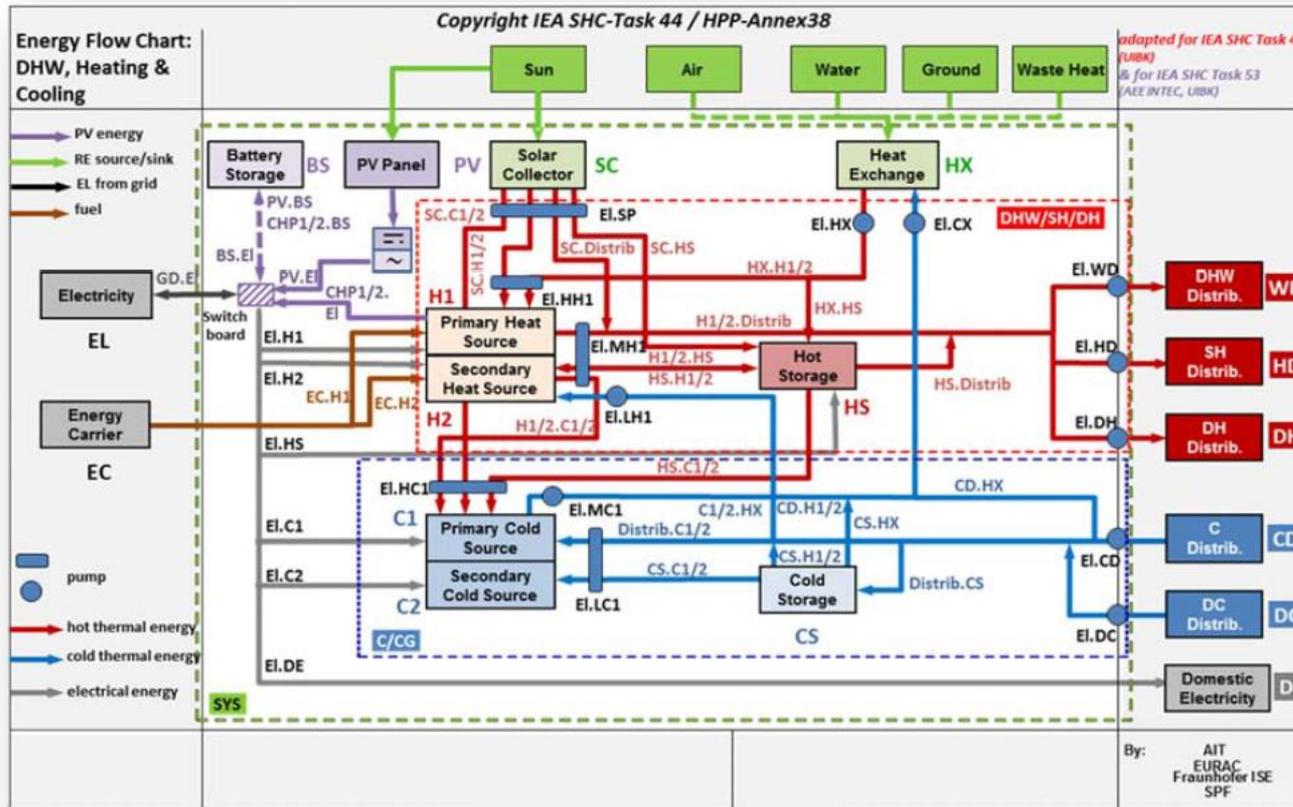
Schematic Draft 2: Example 2



# IEA SHC TASK 53

What do we have?

- NG system energy and ecology performance assessment



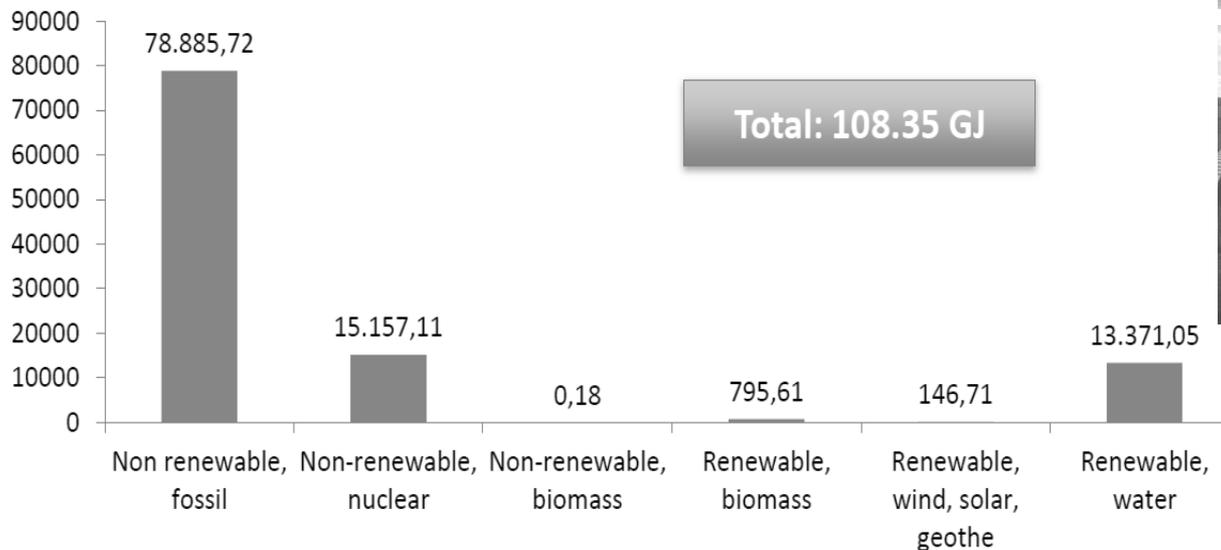
# IEA SHC TASK 53

What do we have?

- LCA and Techno-ECO Analysis
  - Already 2 Italian NG cooling systems R&D analyzed
  - Literature review on existing LCA

Air handling unit desiccant cooling (AHU-DEC): first results

Primary energy consumption (MJ) for the manufacturing step



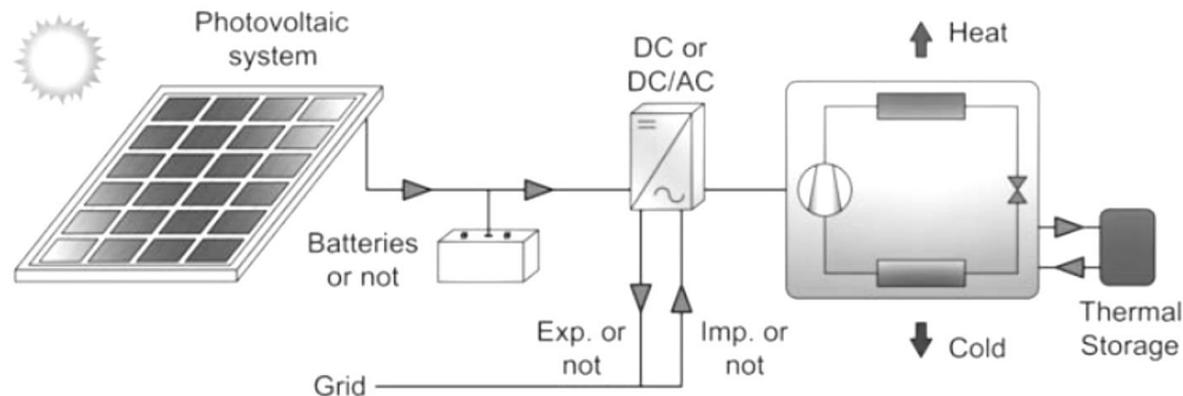
# IEA SHC TASK 53

What do we have?

## Monitoring Procedure for Field Test & Demo Systems

### Compression Heat Pumps Driven by Photovoltaic Solar Energy

- Generic schemes of PV driven heat pumps
- Electrical and thermal flows to be measured
- Definition of Performance Ratio Indicators (KPI)
- Measurement methods for air-to-air heat pumps
- Uncertainty analysis

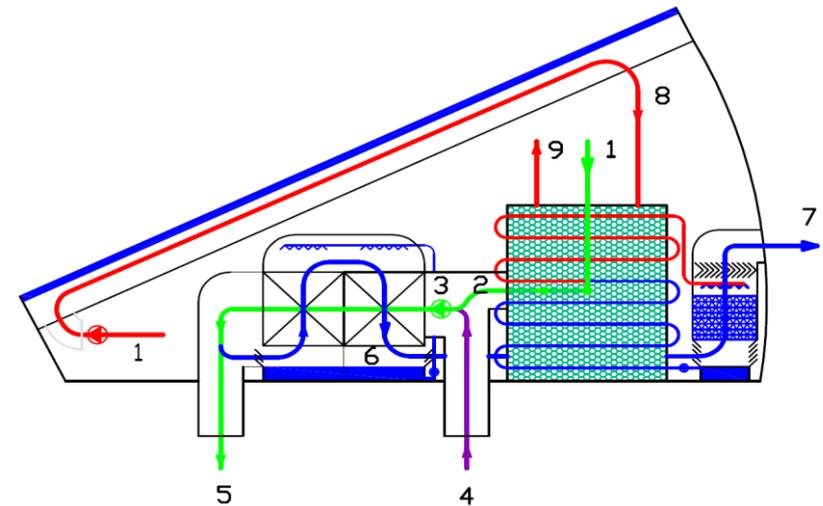


**Compression heat pump driven by PV panels (UMH)**

# IEA SHC TASK 53

Screening and investigation on upcoming new concepts

- Dimension 1,2 x 2 m<sup>2</sup>
- Collector area 2.4 m<sup>2</sup>
- Inclination 25°
- Max volume flow 500 m<sup>3</sup>/h
- Cooling Capacity 2,7 kW  
(Tamb 35° C, Xamb = 14 g/kg)
- Internal el. power demand 120 W



# IEA SHC TASK 53 - Workshop in Rom

What is the outcome in 2017

- State of the art of new generation commercially available products
- Technical report on optimized control strategies for solar cooling & heating systems
- Design tool including a country- and climate-sensitive economic analysis
- Handbook on new generation solar cooling and heating systems
- International workshops



# AIT Austrian Institute of Technology

your ingenious partner

Tim Selke

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