



## IEA SHC Task 53

# Solar cooling: worldwide overview and challenges

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Task53 Workshop on the New Generation of Solar Cooling and Heating  
Systems driven by Photovoltaic or Solar Thermal Energy

Task 53 

# The Future of Cooling - Implications and opportunities for 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.

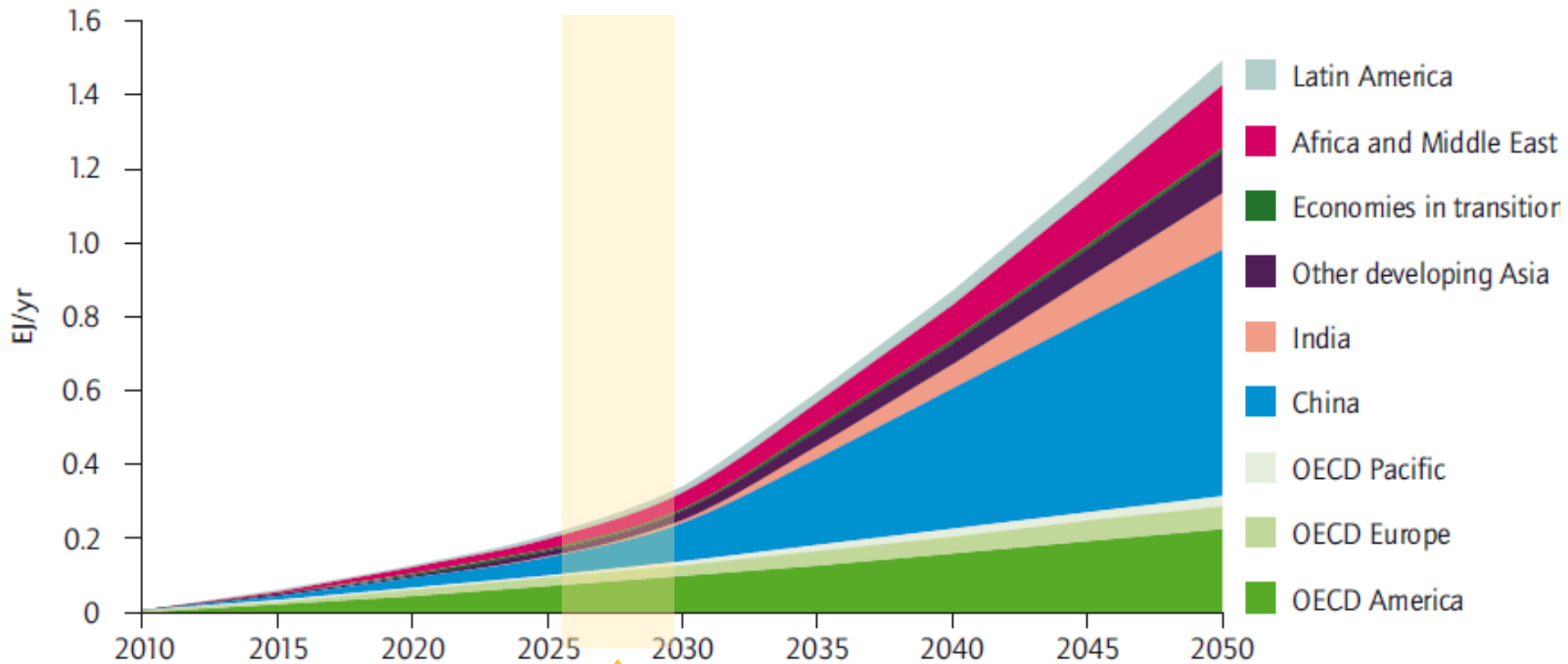
# The Future of Cooling Implications and opportunities energy efficiency

## Efficient cooling scenario

- Energy needs for air conditioning **almost double over 2016-2050 in the Efficient Cooling Scenario** but the increase is less than half that of the Reference Scenario.

**How to deal with this MAJOR challenge !**

# Vision for solar cooling – ROADMAP until 2050



**Cost of solar cooling technology is expected to reduce**



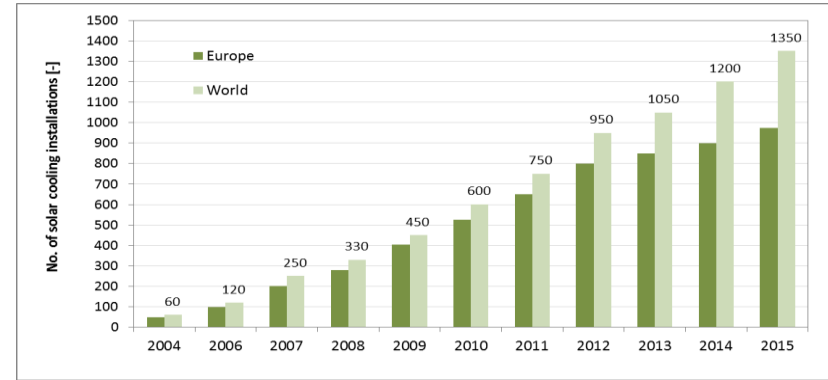
**Electricity cost is expected to continuously increase**

# Solar cooling market trends in the World

Still a niche market :  
≈ **1,350** systems installed  
worldwide (2015)

A High level of innovation  
still present :

- \* Heat rejection
- \* Electric consumption reduction
- \* kWh cooling cost decrease



Source: Solem Consulting / TECSOL



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<http://task53.iea-shc.org/>

Already very accurate concepts for Arabic countries

- \* low & medium temperature solar thermal absorption
- \* small size PV air-conditioning

# Need of a new Generation solar cooling systems

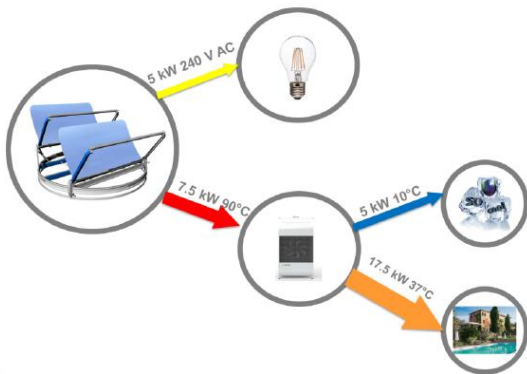
Solar thermal « traditionnal » cooling has **difficulty to emerge as a economically competitive solution**

Main reasons :

- **Technical** : Limit on adaptability due to hydraulics, complexity
- **Economical** : High upfront cost, especially for small systems

⇒ Still need **intensive R&D** for quality improvment and best solution selection (ongoing IEA SHC Task 53)

⇒ Very innovative concepts such...



SOLABCOOL (NL)  
4,5 kWc

# Main categories of PV cooling systems

Solar air conditioners : Splits



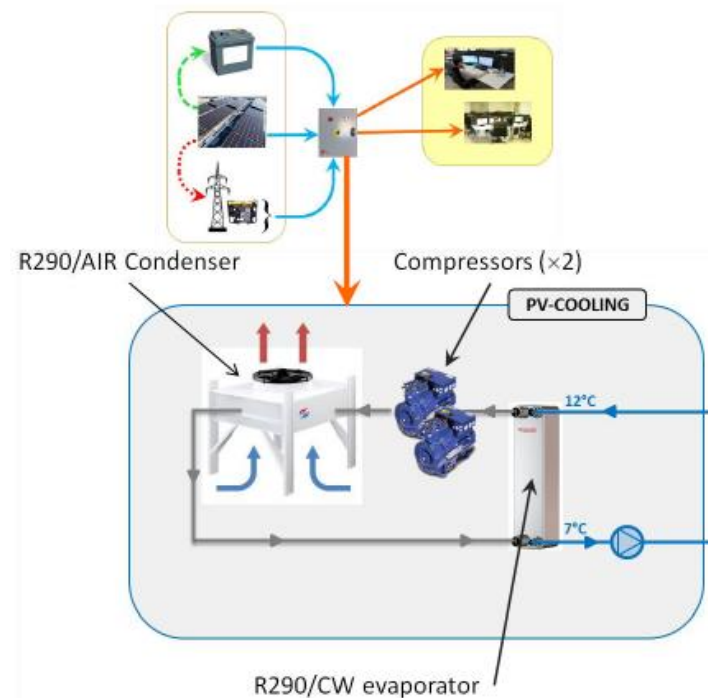
PV+ HP coupling for Office/Commercial

## PV COOLING CONCEPT

PV + INVERTER + R290 « clean » chiller

Ready for the market via demos..

ATI *sys* Concept



# Conclusions

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



# Main driving future for solar cooling...



**Linked with Mission Innovation Challenge #7**

***Affordable Heating & **Cooling** for Building Innovation***

**Statement :** Cooling is one of the major energy need increase worldwide and except solar, no renewables are really competing

**The future market is essentially in the Sunbelt : **MENA**, India, Asia, Africa, America, Oceania**

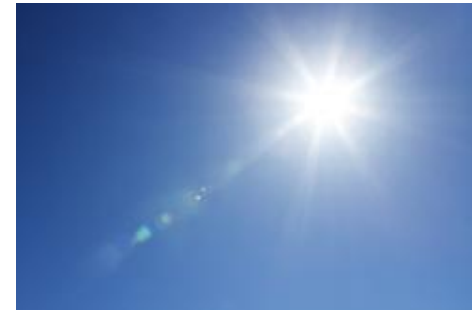
**IEA SHC Countries own a real knowhow on solar cooling but the “mistake” was to imagine to develop solutions for IEA SHC countries**

**A “technology-transfer” collaborative Work/Task is more than ever needed**

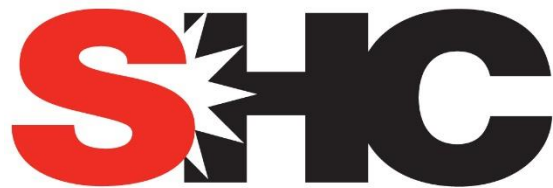
# Thanks for your attention !

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