

**Università degli Studi di Palermo**  
**Dipartimento di Energia, ingegneria dell'Informazione e modelli**  
**Matematici (DEIM)**

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# **New research activities on DEC and PV/Th @ UNIPA**

## **Task 48**

**Quality assurance and support measures  
for Solar Cooling**

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# Smart Cities and Communities

  
Ministero dell'Istruzione,  
dell'Università e della Ricerca

  
PON Ricerca  
e Competitività  
2007-2013



i-NEXT

*Innovation for Green **NE**nergy and e**X**change in **T**ransportation*



OR4

POLIGENERATION FROM RES

## PROJECT

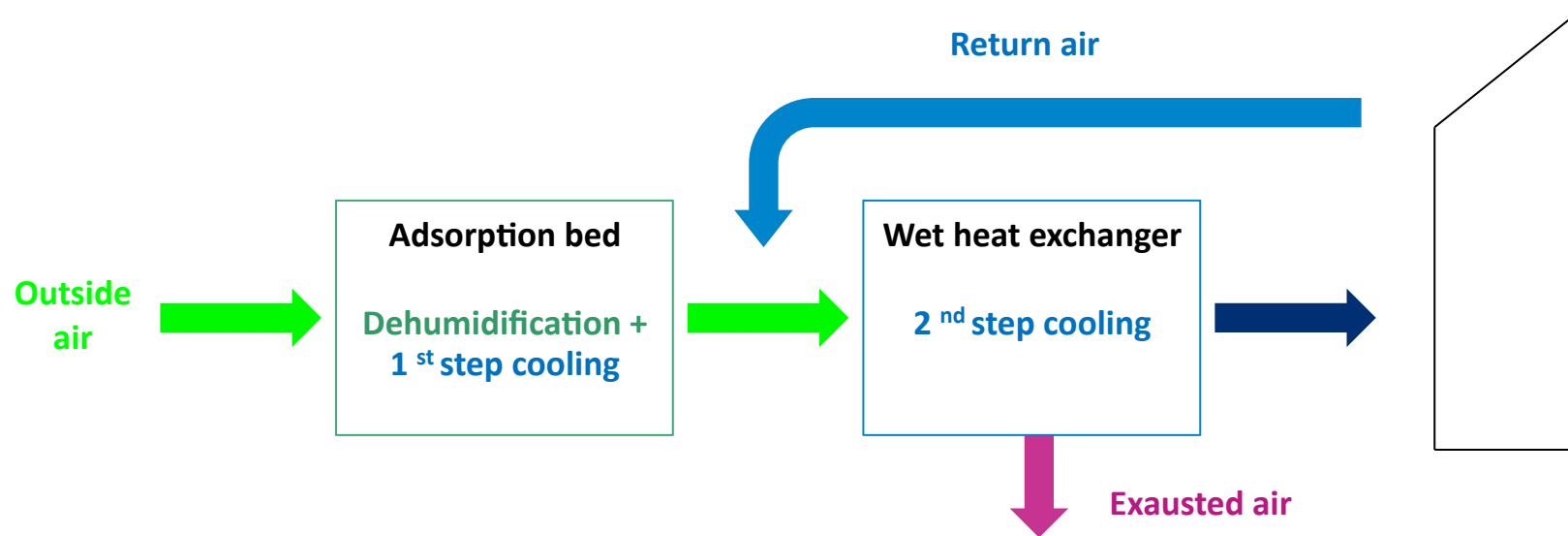
- **PV/Th GENERATOR (AIR COLLECTOR)**
- **NEW Air Handling Unit DEC starting**
- Electricity Storage and Smart Energy Management
- Small Wind Turbine
- Green roof of about 140 m<sup>2</sup>



**- Operation and monitoring will start in July 2014**



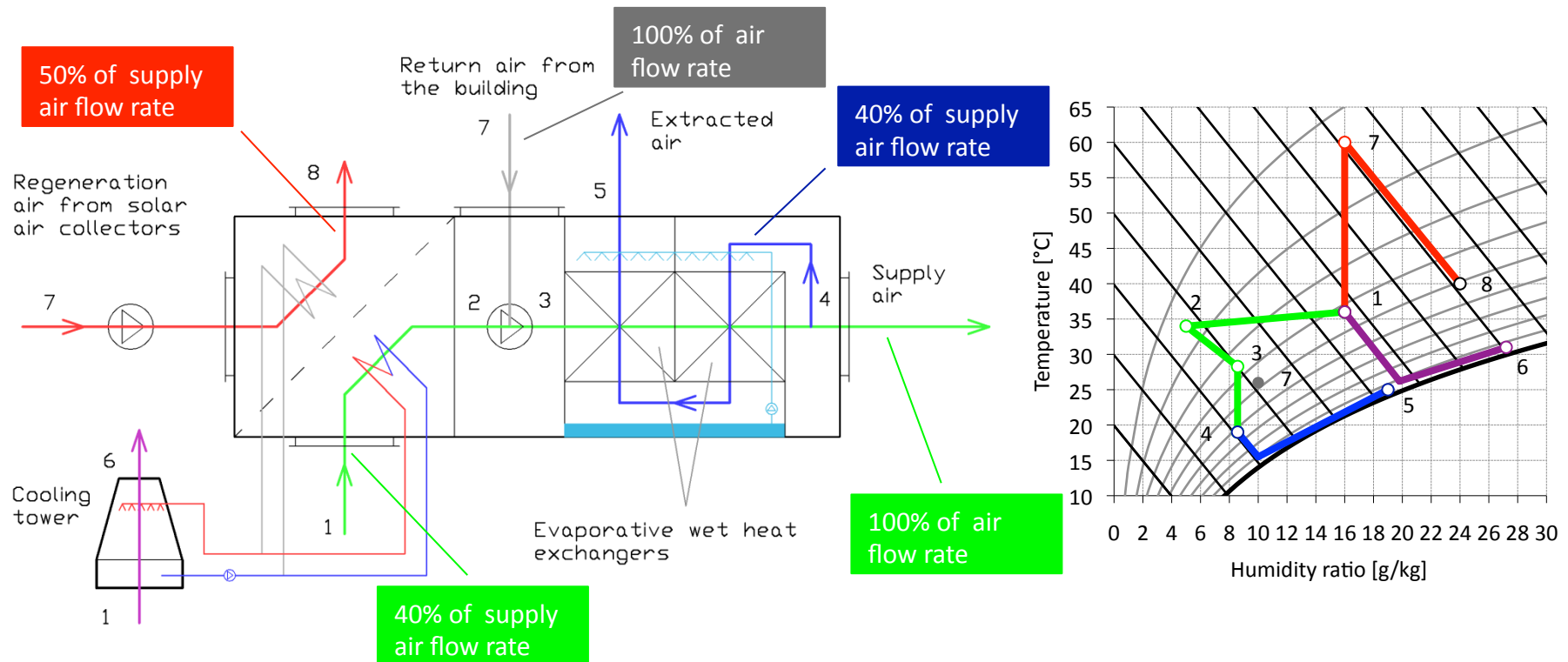
# DESIGN CONCEPT OF THE NEW DEC CYCLE



- System designed for air ventilation, dehumidification and cooling (heating in winter is also possible)
- Dehumidification and regeneration operated using outside air
- Regeneration carried out using solar air collectors

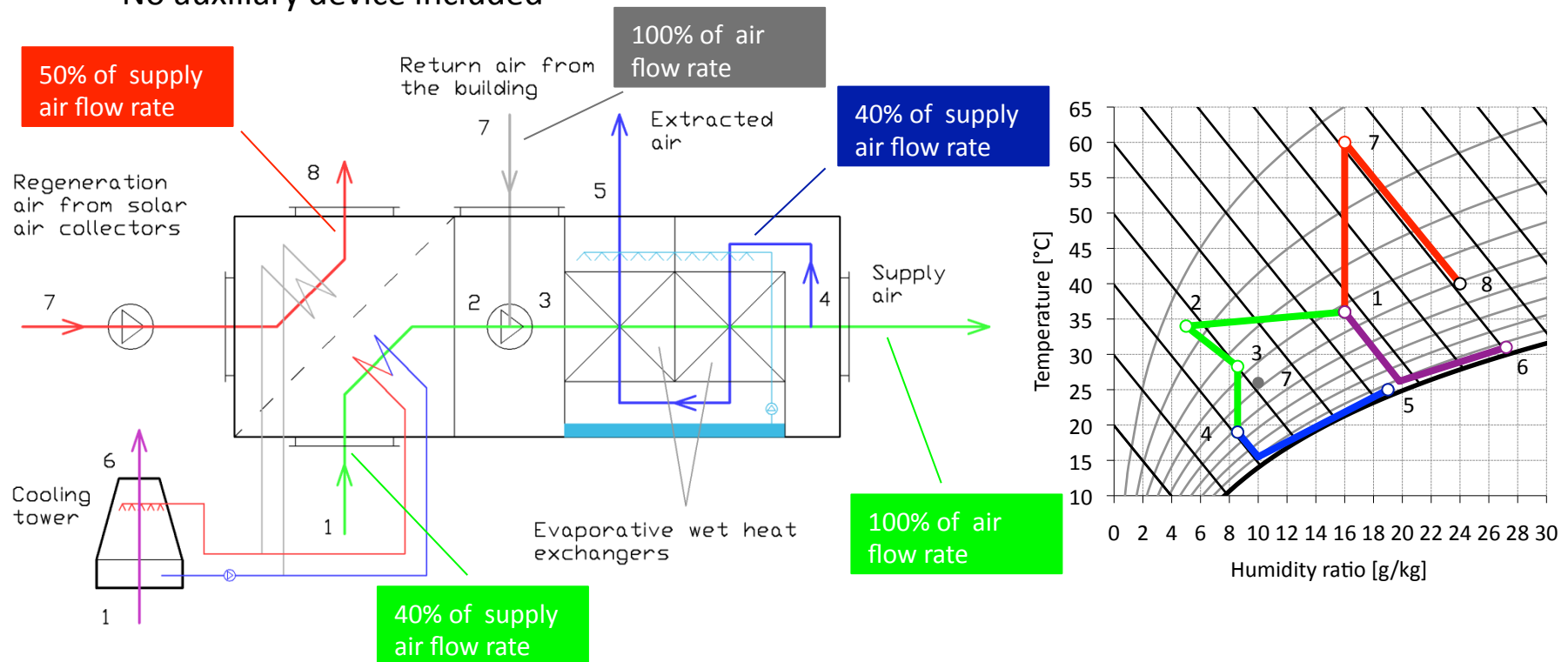
# DESCRIPTION OF THE NEW DEC CYCLE

Flow rate	[m <sup>3</sup> /h]	3000
Total cooling power	[kW]	20
Mass of Silica gel	[kg]	120
Parasitic power installed	[kW]	1.8
Speed controlled fans		
Average water consumption	[l/h]	37



# DESCRIPTION OF THE NEW DEC CYCLE

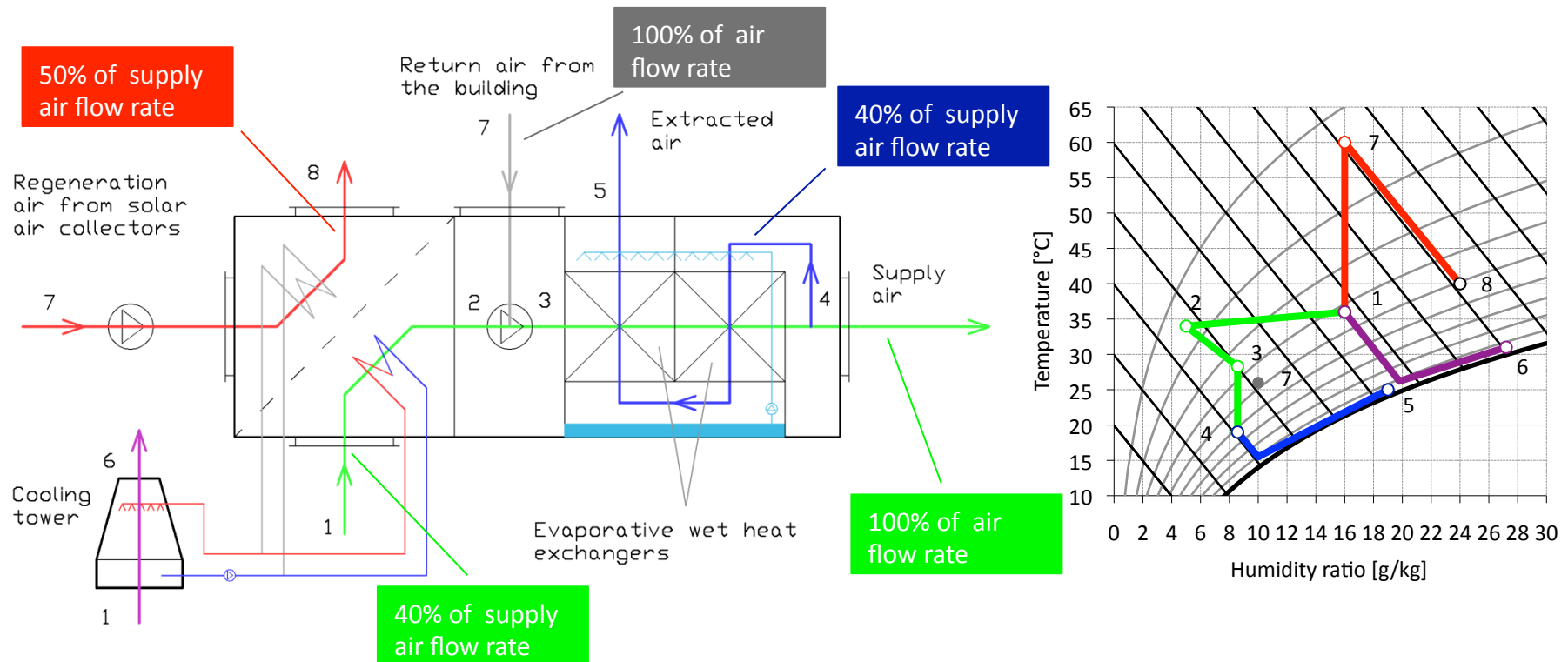
- System based on the use of two fixed packed desiccant beds of silica gel operating in a batch process and cooled by cooling tower, and two wet evaporative heat exchangers connected in series
- A system of air dumpers provides the commutation between the two adsorption beds in order to guarantee a continuous dehumidification process
- No auxiliary device included



# DESCRIPTION OF THE NEW DEC CYCLE

Flow rate [m<sup>3</sup>/h] 3000

- A portion of the primary air flow rate exiting the wet heat exchanger is drawn into the secondary side
- Electricity consumptions of the system are related to the use of two fans, two pumps and a cooling tower





# PVT COLLECTORS

Solar PVT collectors		
Lentgh of module	[m]	1
Width of module	[m]	2
Nr of module installed	[°]	19
Slope, Azimuth	[°]	10, 0
Gross Area	[m <sup>2</sup> ]	38
Solar thermal air collector area	[%]	50
PVT area	[%]	50
Peak power production	[kW]	2.4

