

Solar Cooling in North America

Lucio Mesquita, Ph.D.



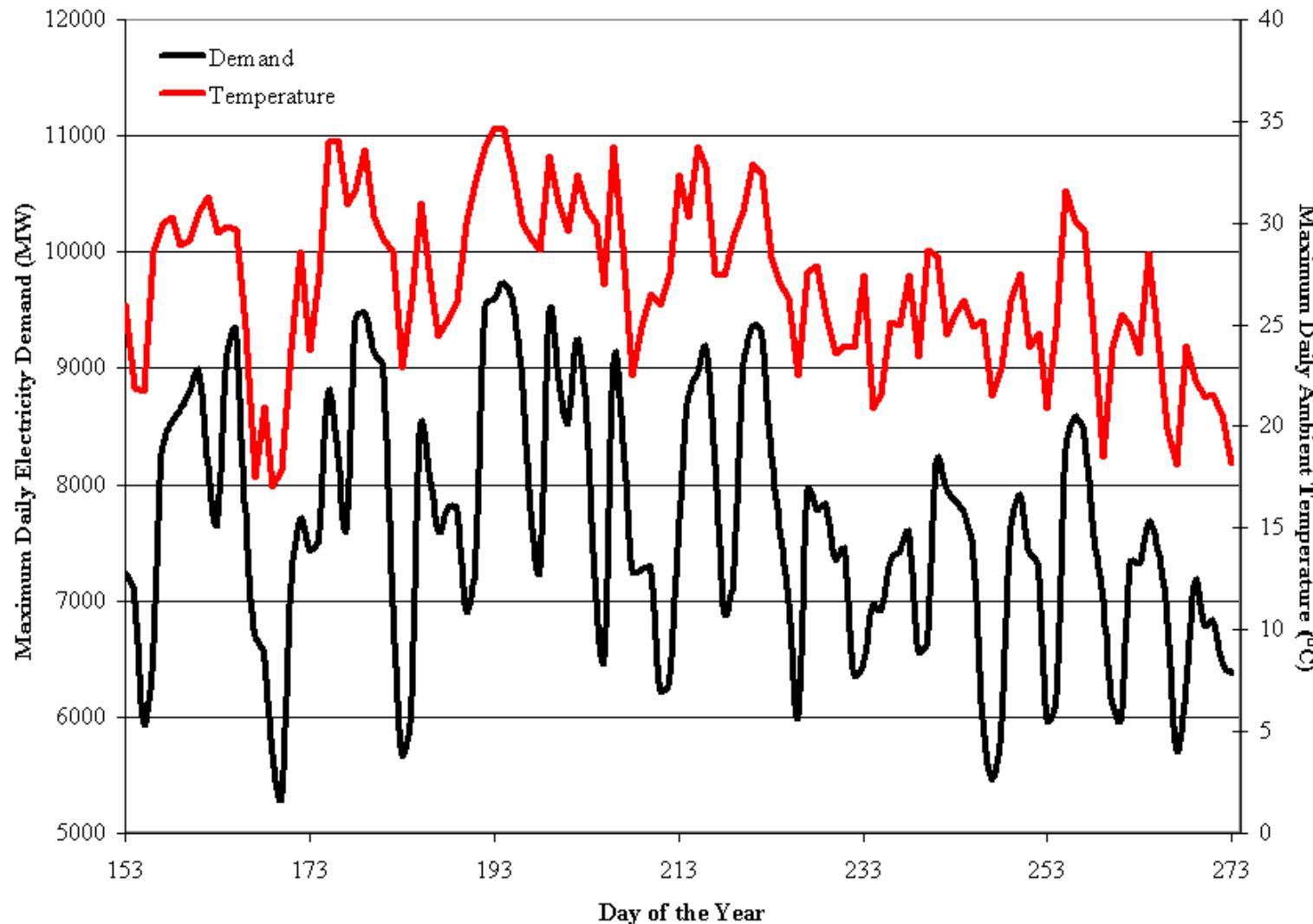
**Thermosol Consulting
Intersolar NA, July 2010**



- 81 million of housing units with AC (82% of total / 71% central) - 2005
- 3.6 million of commercial buildings (78% of total / 88% floor space) - 2003
- Energy consumption:
 - 258,000 GWh - residential
 - 151,000 GWh – commercial
 - PV(2007) – 611 GWh
- Electricity Demand

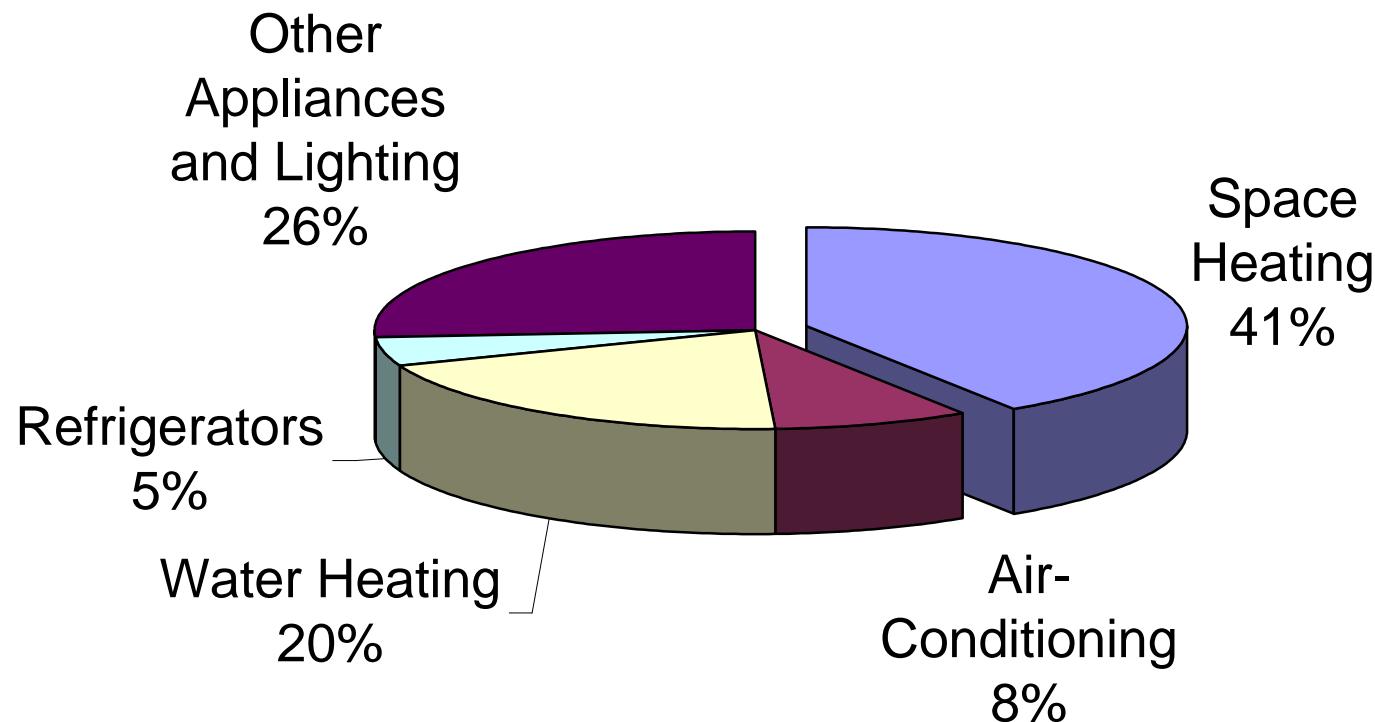


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Residential Sector Energy Usage - 2005



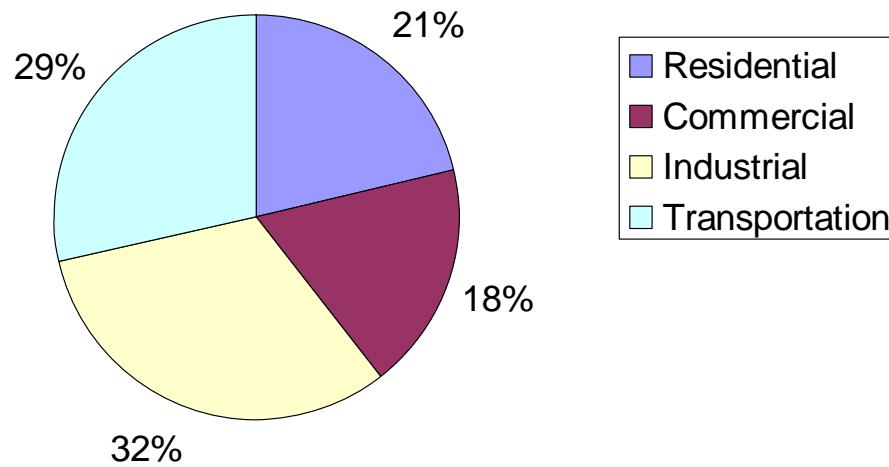
Source: EIA, 2010

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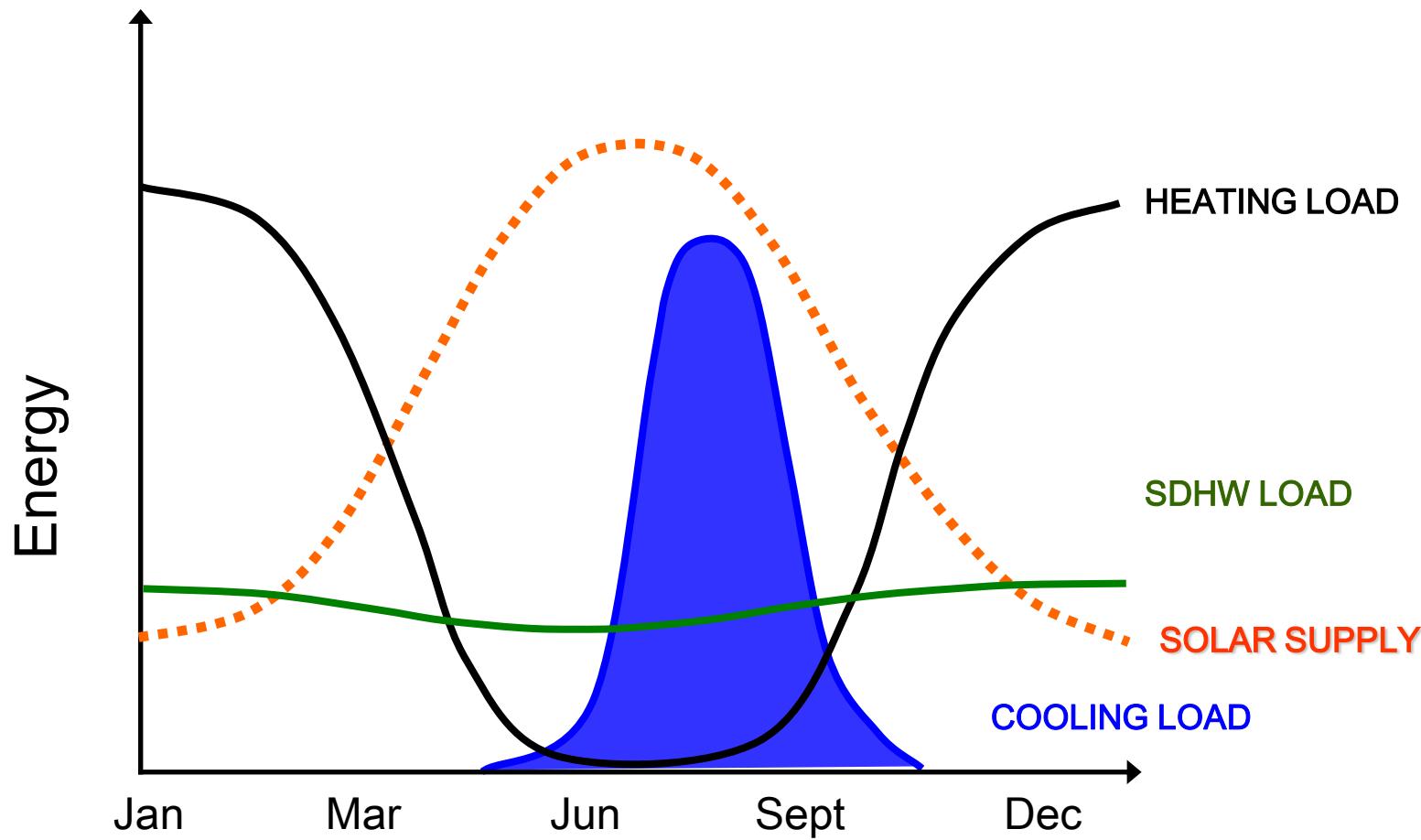


U.S. Energy Consumption by Sector 2007

Source: EIA



- 7% of industrial sector for facilities heating
- 61% of residential for space and water heating
- 40% of commercial for space and water heating
- ~22% of total energy consumption



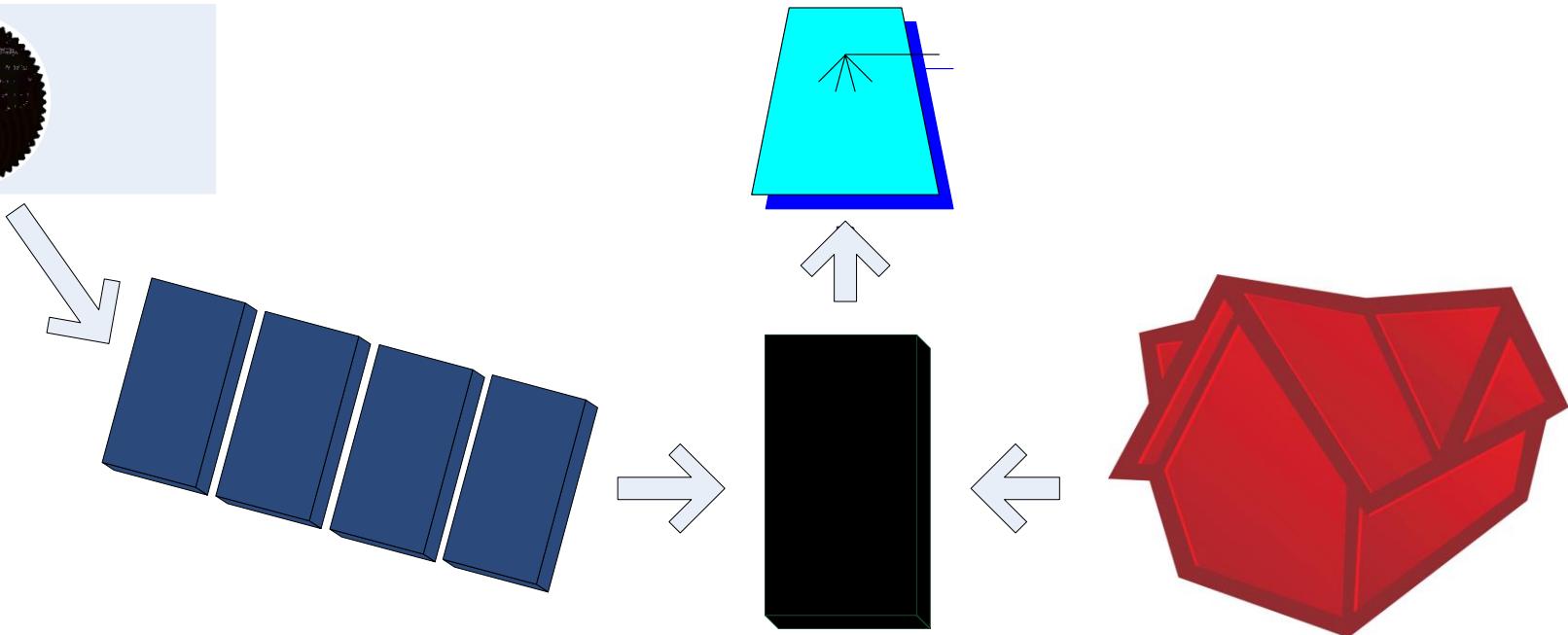


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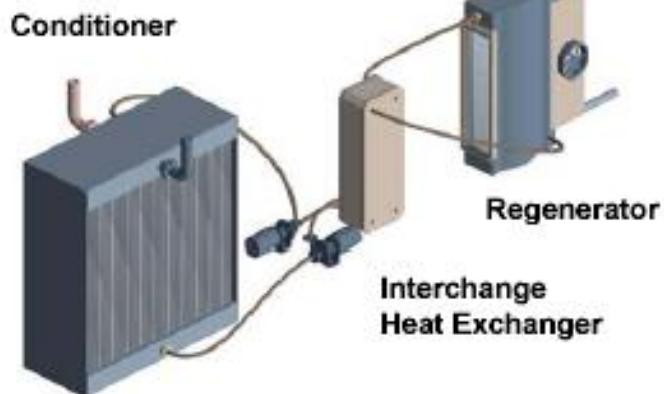
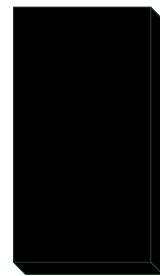
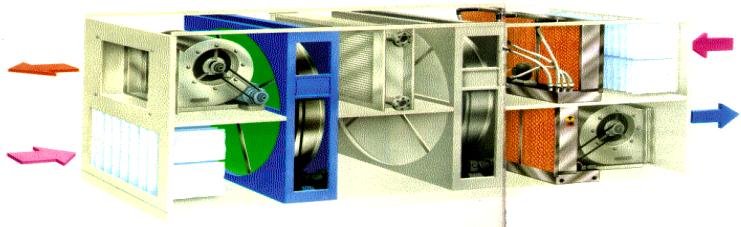


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SorTech



Yazaki



Invensor



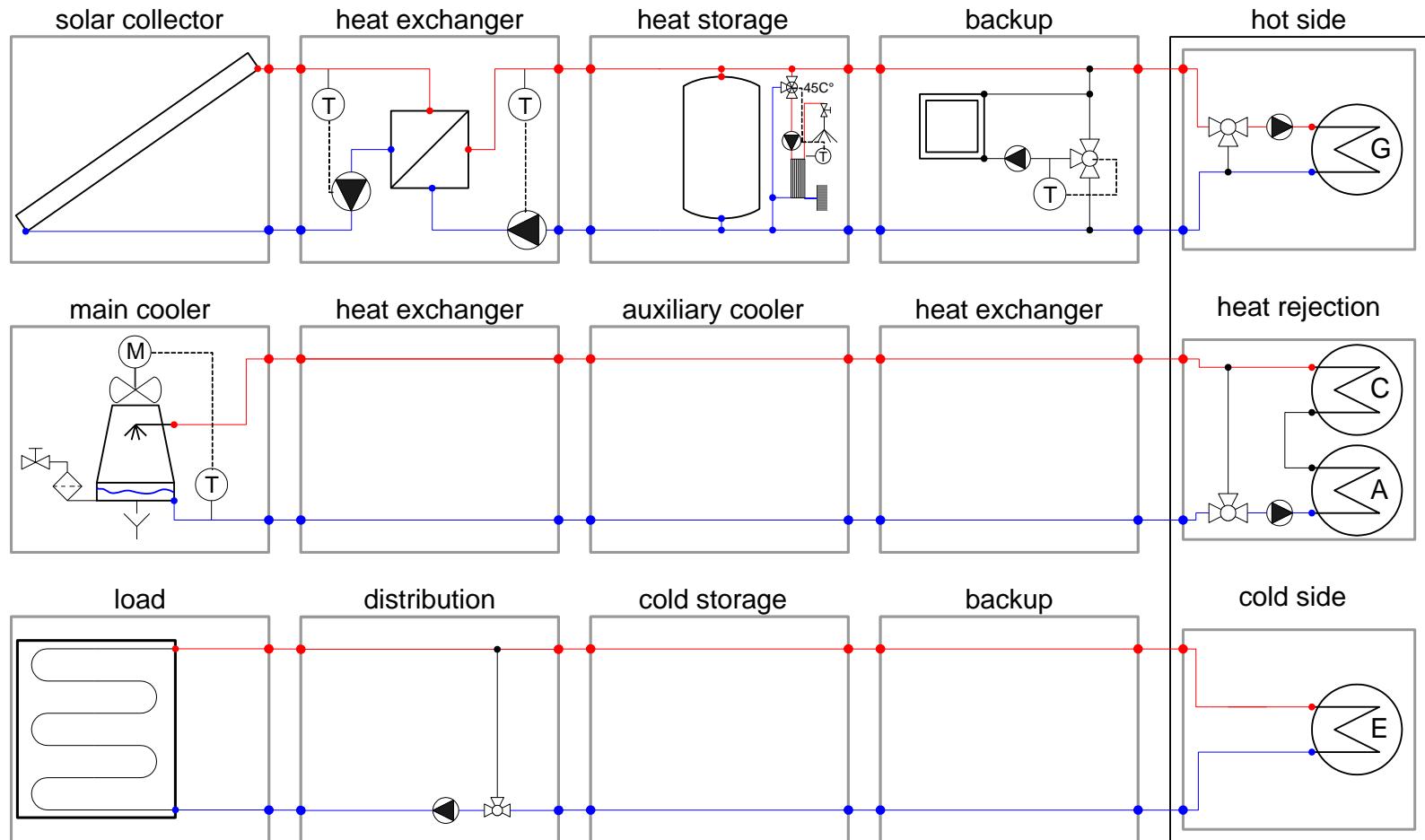
Climatewell



Pink



SonnenKlima



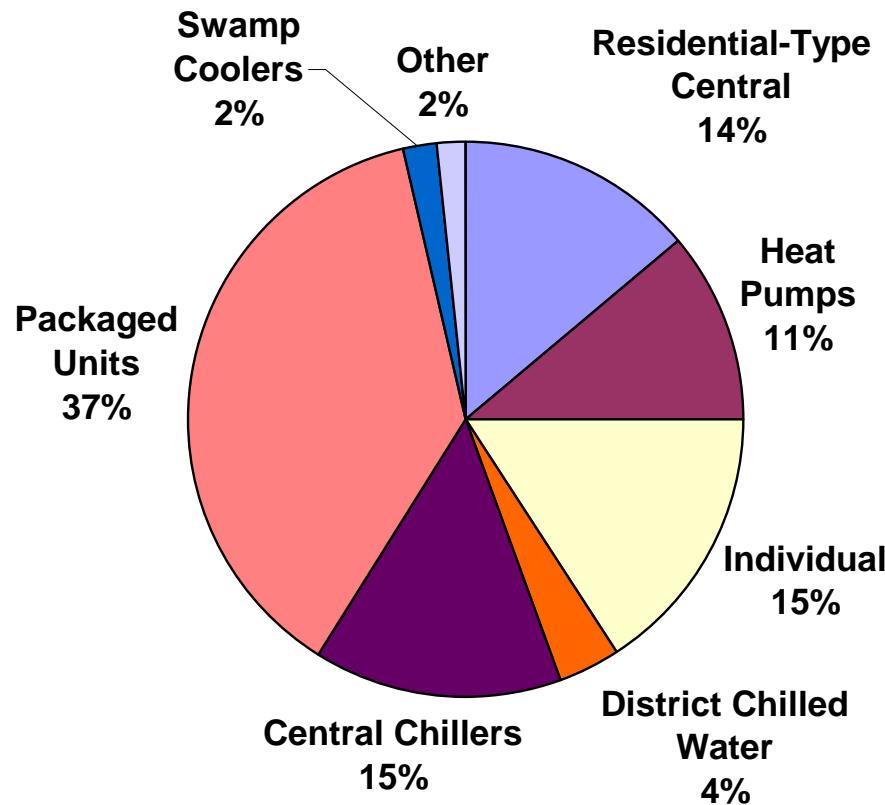
Source: Dr. Christian Schweigler, ZAE Bayern

Temperature lift	Low 15-35 °F	Medium 35-55 °F	Medium 35-55 °F	High 55-75 °F	Very high > 75 °F
Supply temperature, room system	60-70°F e.g. chilled ceiling, floor cooling	60-70°F e.g. chilled ceiling, floor cooling	40-50°F e.g. fan coil, AHU with dehumidification	40-50°F e.g. fan coil, AHU with dehumidification	< 32°F e.g. ice production, ice storage
Rejecting temperature, system	75-85°F wet cooling tower; ground	95-115°F dry cooler	75-85°F wet cooling tower; ground	95-115°F dry cooler	95-115°F dry cooler
Driving temperature, single effect	160-185°F	185-230°F	185-230°F	212-270°F	360-480°F
Collector type	Flat plate Evacuat. tube	Flat plate Evacuat. tube	Flat plate Evacuat. tube	Evacuated tube Single-axis track.	Single-axis tracking
Driving temperature, double effect		260-320°F	260-320°F		
Collector type		Single-axis tracking	Single-axis tracking		

Source: Dr. Hans-Martin Henning, Fraunhofer



TYPE OF COOLING EQUIPMENT - COMMERCIAL PER FLOOR SPACE





- 81 million of housing units
- 3.6 million of commercial buildings



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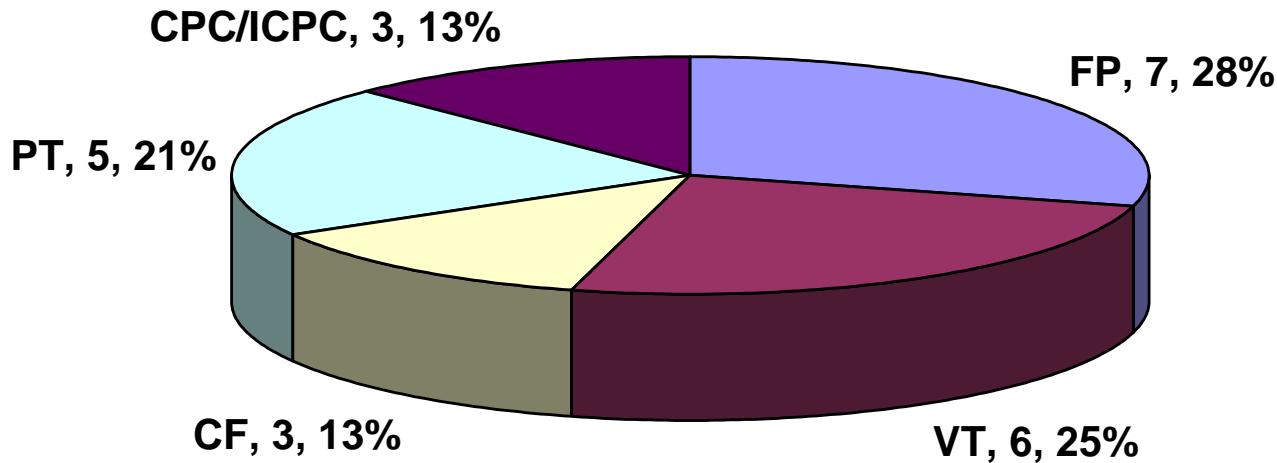
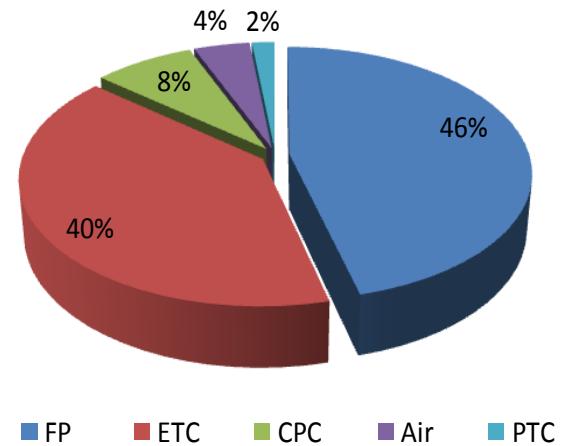
22



- 22 systems identified (work in progress).
- 7 CA, 5 AZ, 2 FL, IL, NM, NY, PA, TX, BC, ON.
- 15 are less than 5 years old



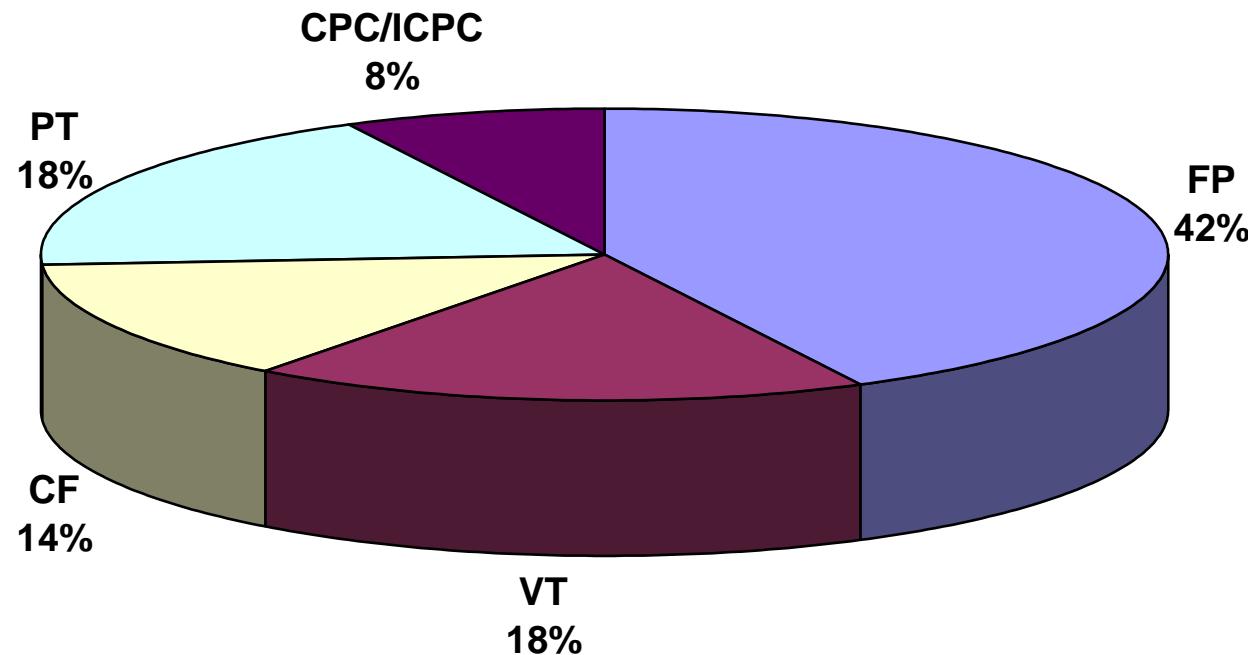
Technology share per number of installs



FP, flat plate; VT, vacuum tube; (I) CPC, (integrated) compound parabolic concentrator;
PT, parabolic trough; CF, concentrating Fresnel.



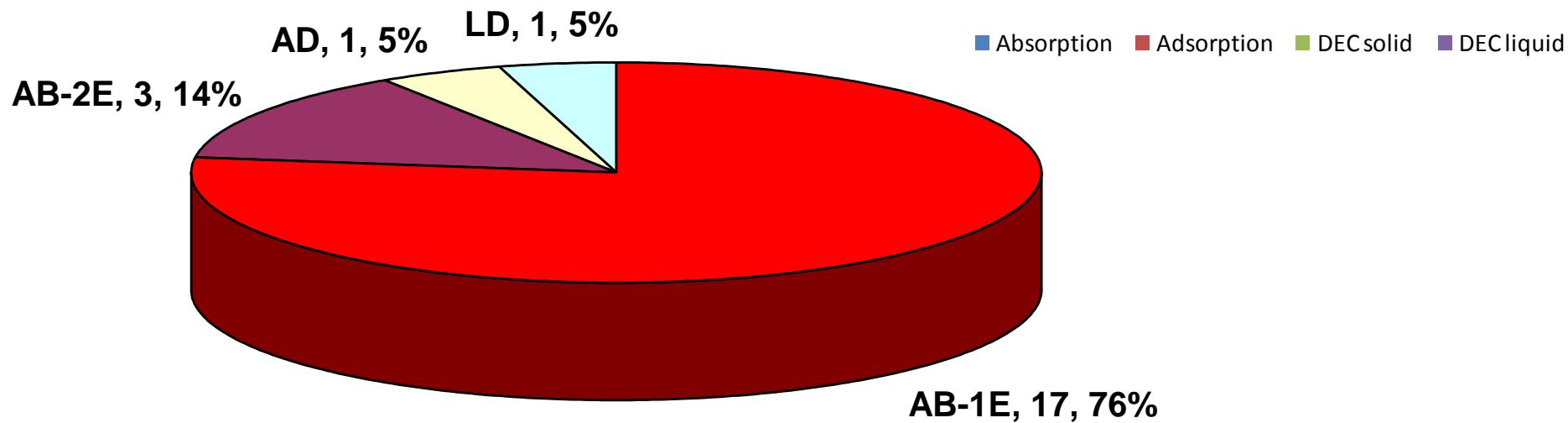
Technology share per installed gross area



Total Area: 74,018 sqft



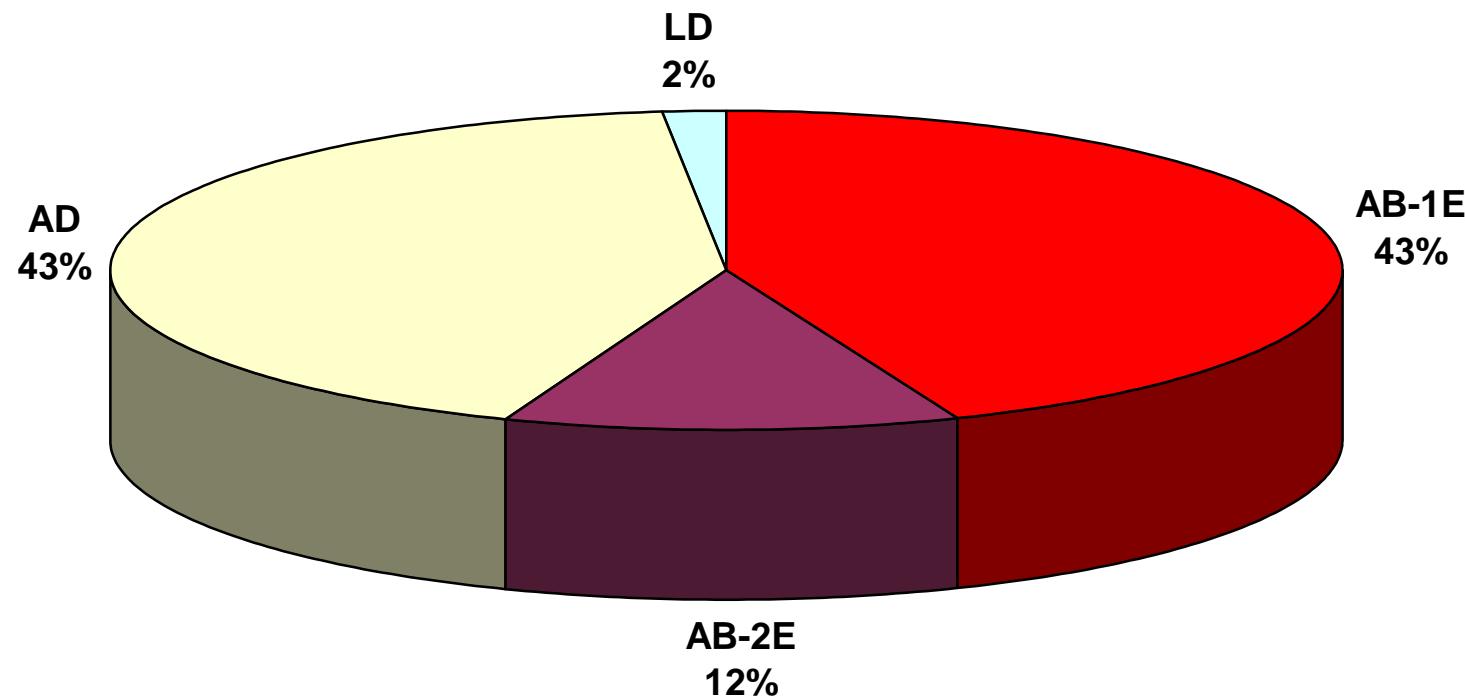
Technology share per number of installs



AB-1E, single effect absorption; AB-2E, double effect absorption;
AD, adsorption; LD, liquid desiccant.



Technology share per installed capacity



Total Capacity: 704 ton



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RESIDENCE ELDORADO HILLS
ELDORADO HILLS, CA
800 sqft – FP
3 ton AB-1E
1985





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AUSTIN POWER/SOLARGENIX

4100 sqft – CPC

30 ton AB-1E

YAZAKI

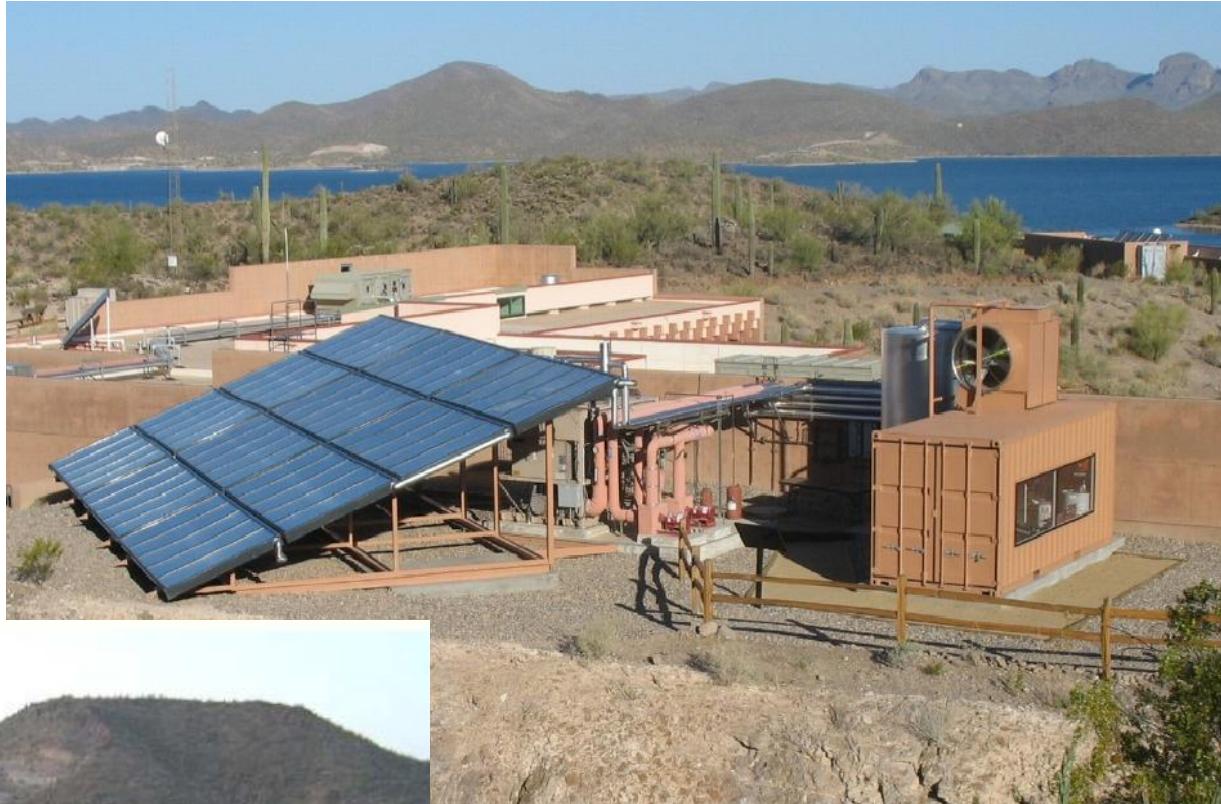
Apr, 2003





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DESERT OUTDOOR CENTER
SOLID
PHOENIX, AZ
1356 sqft – FP
20 ton AB-1E
YAZAKI
Mar, 2006





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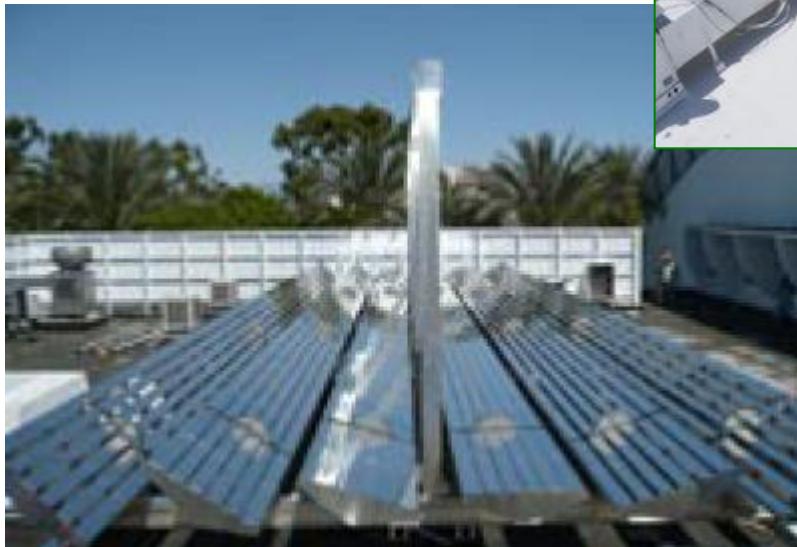
FLETCHER PARK
VANIR/ENERWORKS
19800 sqft – FP
300 ton AD
HIJC
Dec, 2008





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SOUTHERN CALIFORNIA GAS
SOPOGY/HELIODYNAMICS
DOWNEY, CA
540 PT + 690 CF
10 ton AB-1E
YAZAKI
Jul, 2009





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FREEDOM FIELD PROJECT
ROCKFORD, IL
750 sqft – VT
10 ton AB-1E
YAZAKI
Nov, 2009



<http://www.freedomfieldenergy.com/index.html>

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TYNDALL AIR FORCE BASE
PANAMA CITY, FL

1370 sqft – VT
VIESSMANN
3000 cfm – LD
SONOMA/AILR
Feb, 2010





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STEINWAY
NEW YORK, NY
5738 sqft – PT
ABENGOA
90 ton AB-2E
BROAD
Apr, 2010





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- Barriers
 - Low energy costs
 - High initial costs
 - Technical barriers: heat rejection
 - Lack of knowledge
- Opportunities
 - Very large market potential
 - Cooling only or combi-plus
 - Enhanced SDHW



- Effective support program (even if small)
- Need coordinated effort to share and create information for designers and engineers.
- Solar Cooling North America



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THANKS!

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II IEA Workshop January 2011 AHR/ASHRAE