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A River of Energy Solutions

Solar Heating & Cooling

Les Nelson, Western Renewables Group

Solar Heating – Why is it Hot?

- Largest installed capacity – by far!
- Lowest cost solar technology
- Highest efficiency solar technology
- Used worldwide
- Ready now

- Numerous applications:
  - Military housing
  - Laundries
  - Food service
  - Hospital/healthcare
  - Warehouse heating
  - Cleaning facilities
  - Exercise/Recreation

SunEarth, Inc Manufacturing Facility

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Courtesy: SunEarth, Fontana, CA

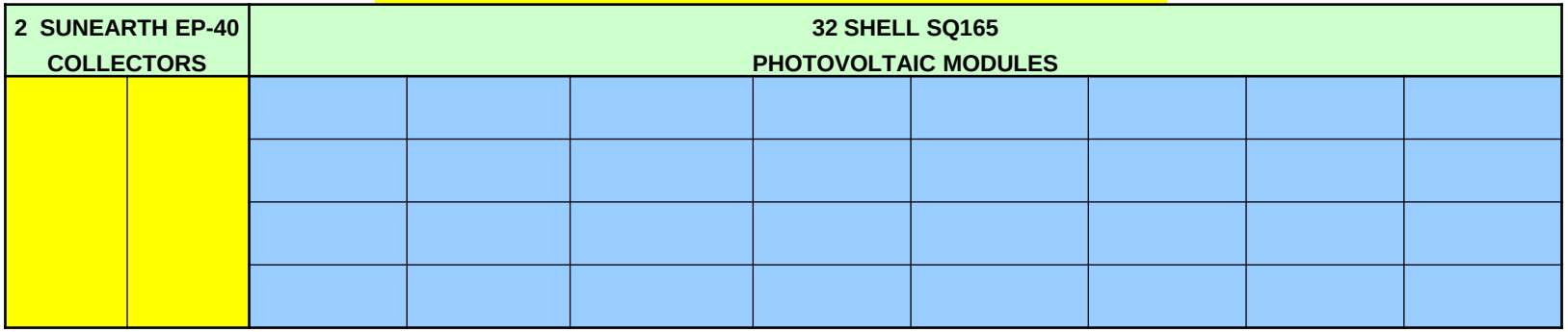
Solar Heat – Solar Electricity

COMPARISON OF SOLAR HEATING & SOLAR ELECTRIC (PV) SYSTEMS

(Statistics as of July 2011)

	Solar Heating	PV
Manufacturer	SunEarth, Inc.	Shell Solar
Model	EP-40	SQ165-PC
Units	2	32
Output/unit peak	40,000Btu/day ea.	165W ea.
Output/unit	38,745Btu/day ea.	120W ea.
Total Output/day	77,490Btu/day	22,272Whrs.
Total Output/day	22.7kWh$_e$[3]	22.3kWh
Area	80 sq. ft	456 sq. ft
Peak Power	5.0kW$_e$[4]	5.3kW
Gross Installed Cost	$7,200	$31,680
Gross Installed Cost	$1.44per W	$6.00per W

Heat **Electricity**



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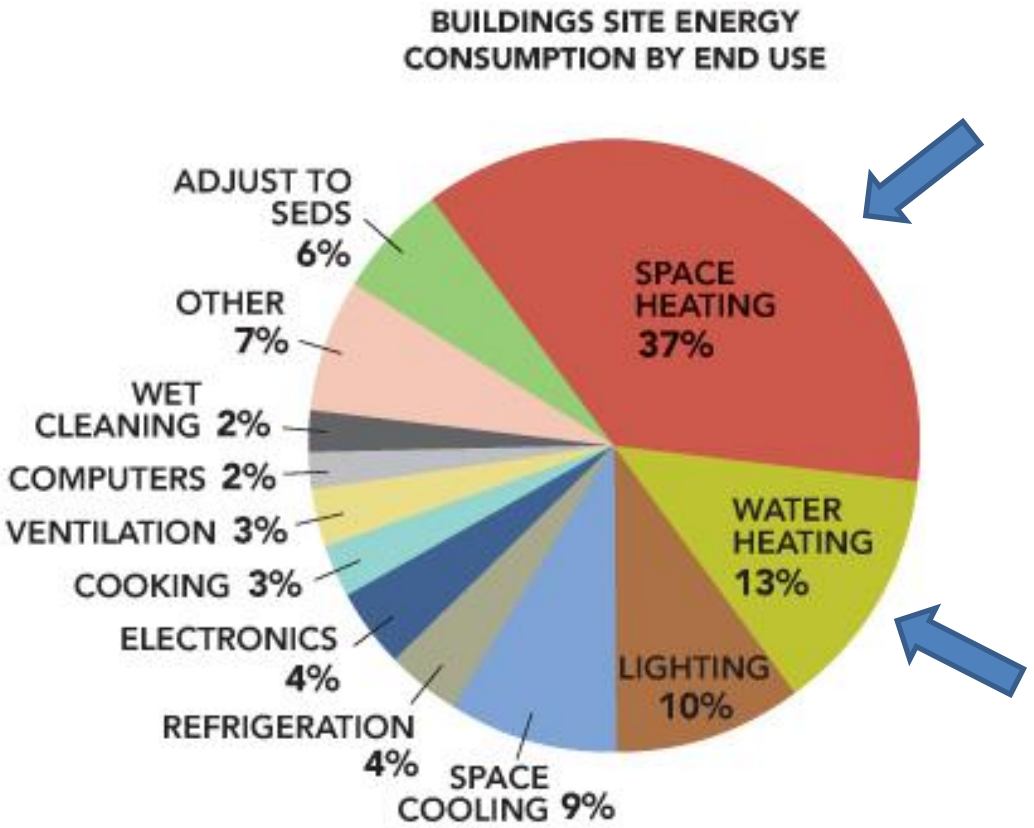
Courtesy: SunEarth, Inc

Why is Heat Important?

Space Heating and Water Heating = 50% of total building energy load



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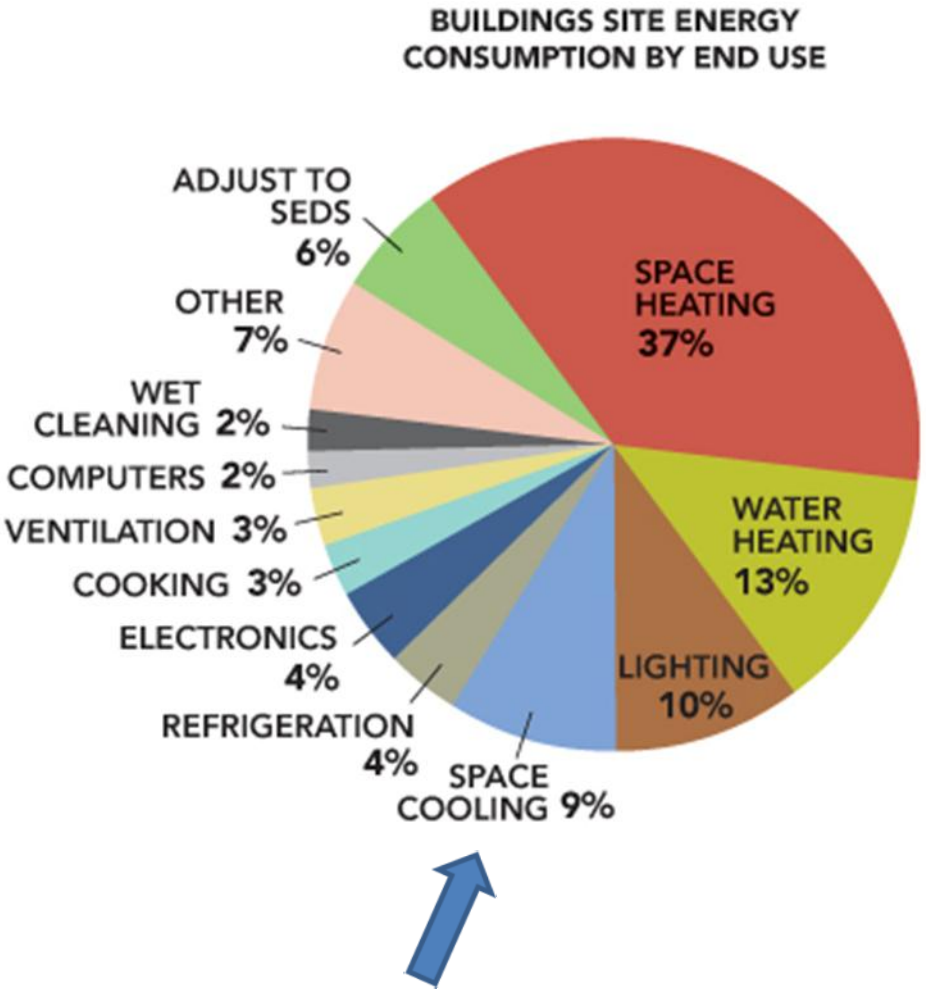
Source: DOE 2011 Buildings Energy Data Book

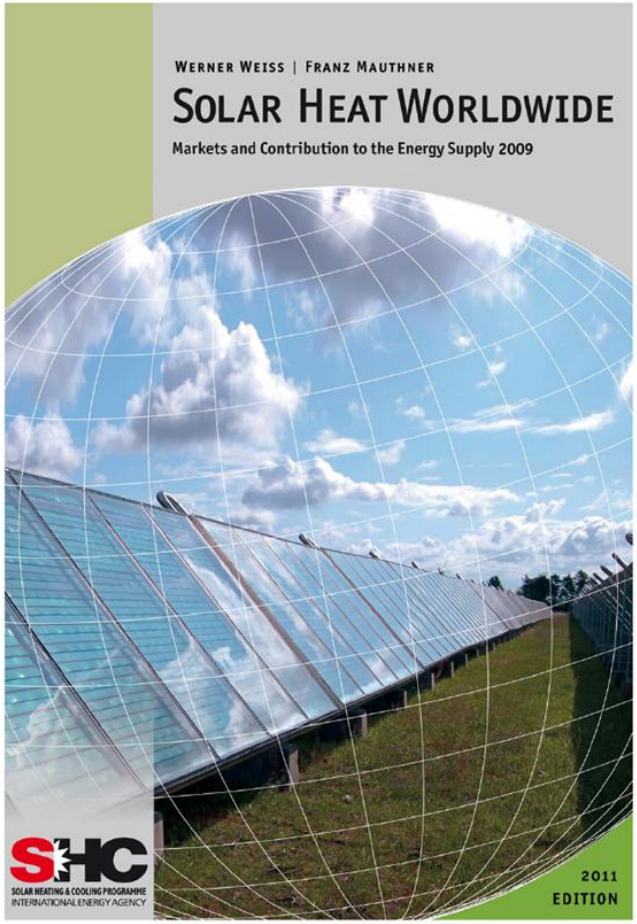
Absorption Chilling is a Thermal Load

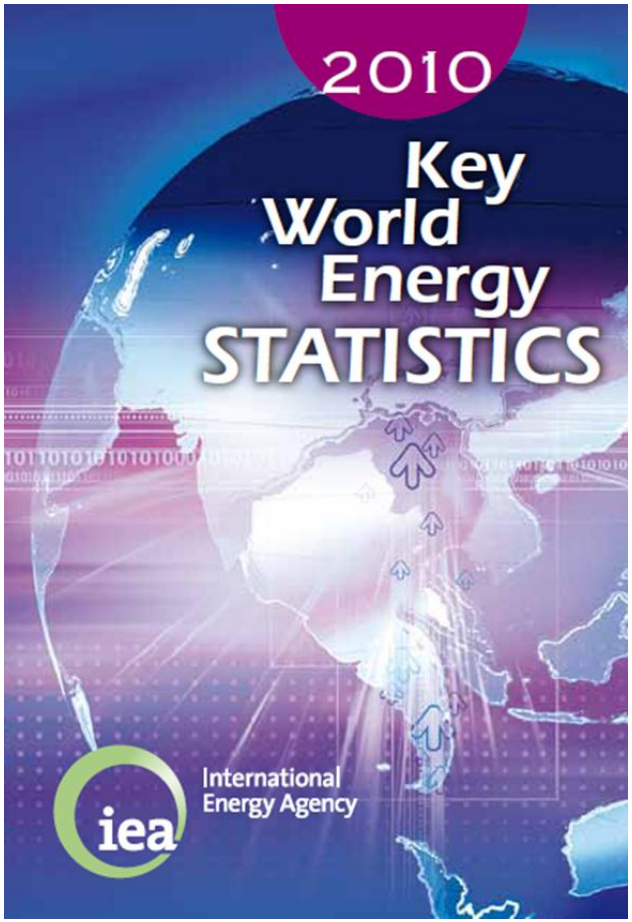
Add Cooling energy: Nearly 60% of total building energy load requires heat.



Source: DOE 2011 Buildings Energy Data Book

Data References





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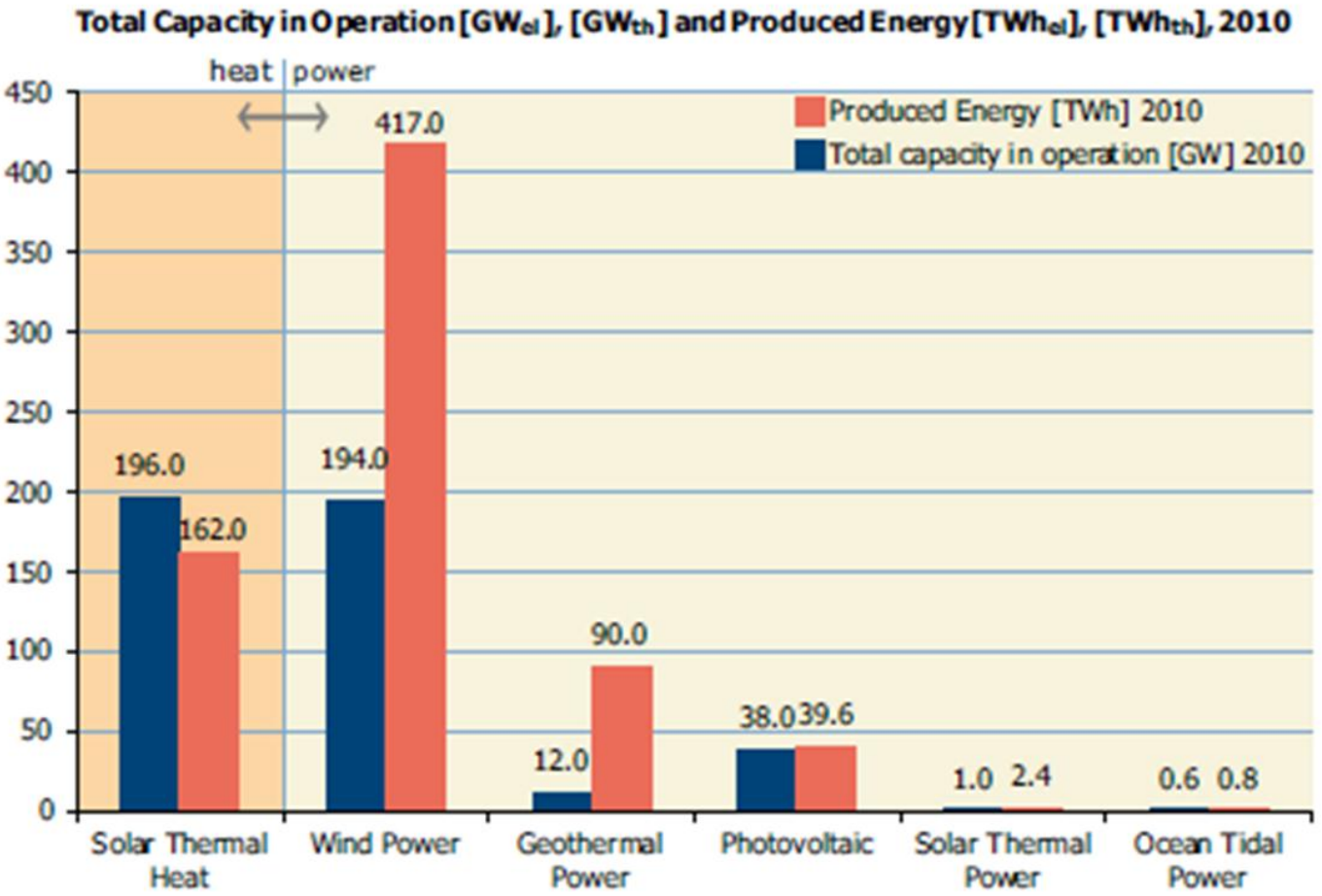
Heat Energy vs. Electrical Energy



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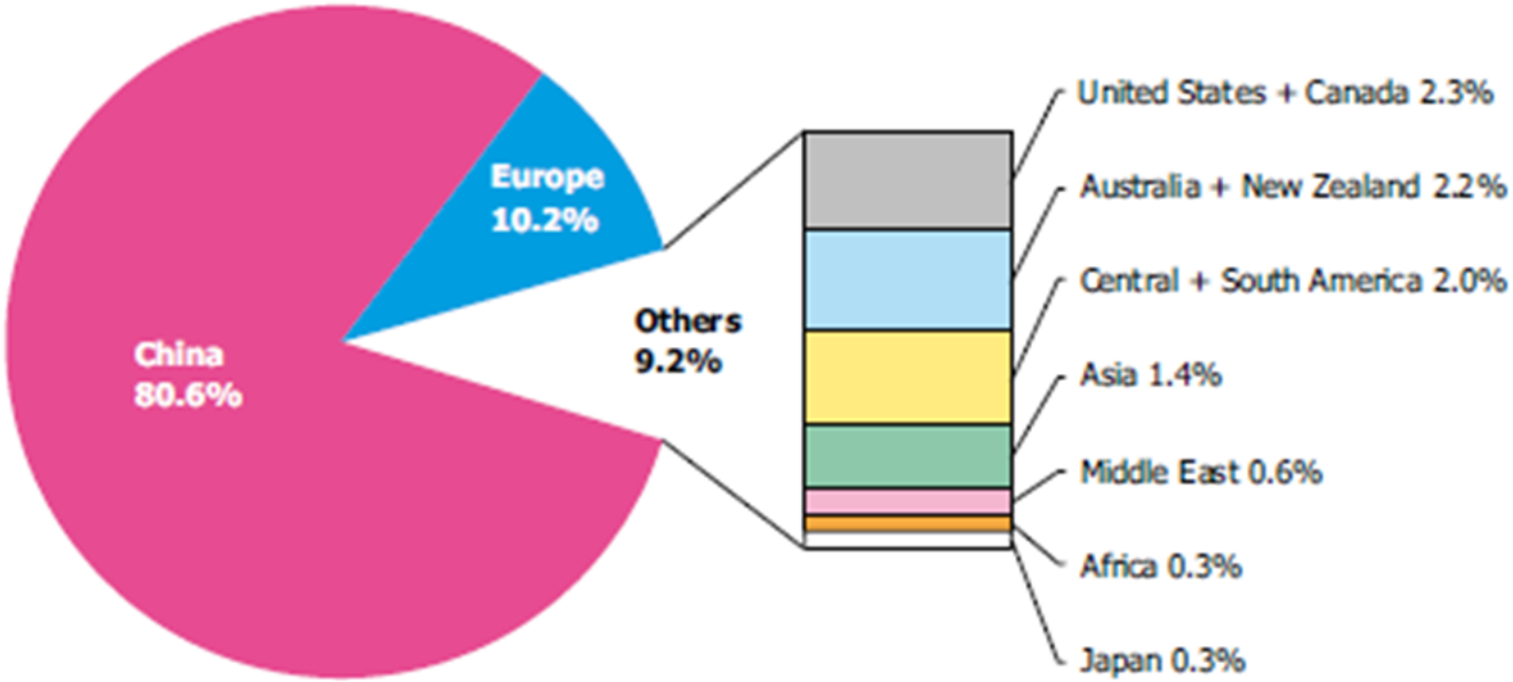
Solar Heat Worldwide; 2010 Edition

Solar Heating Market Share

Heat Generating Capacity by Economic Region in 2009



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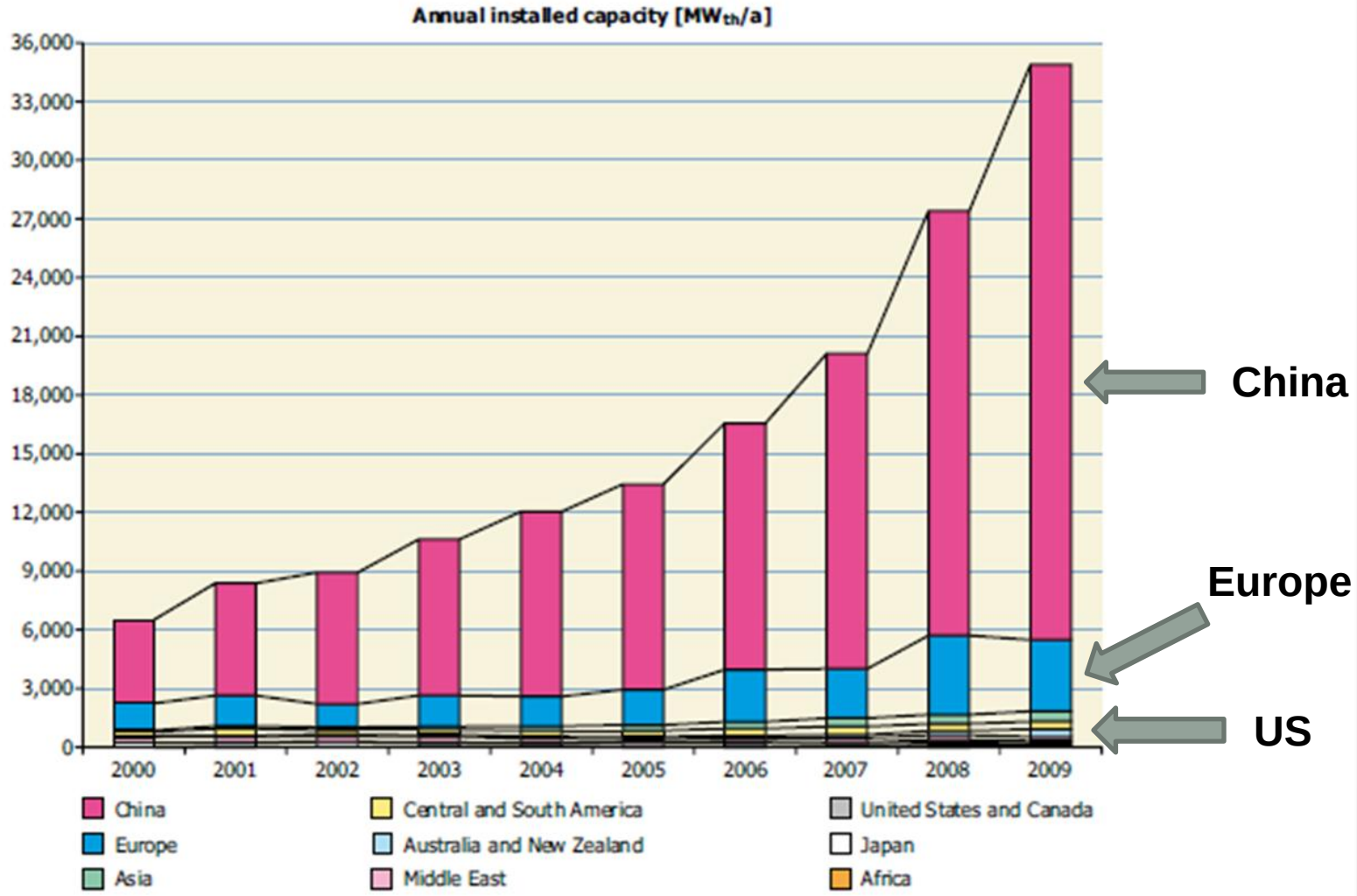
Solar Heat Worldwide; 2010 Edition

Solar Heating Installations by Year



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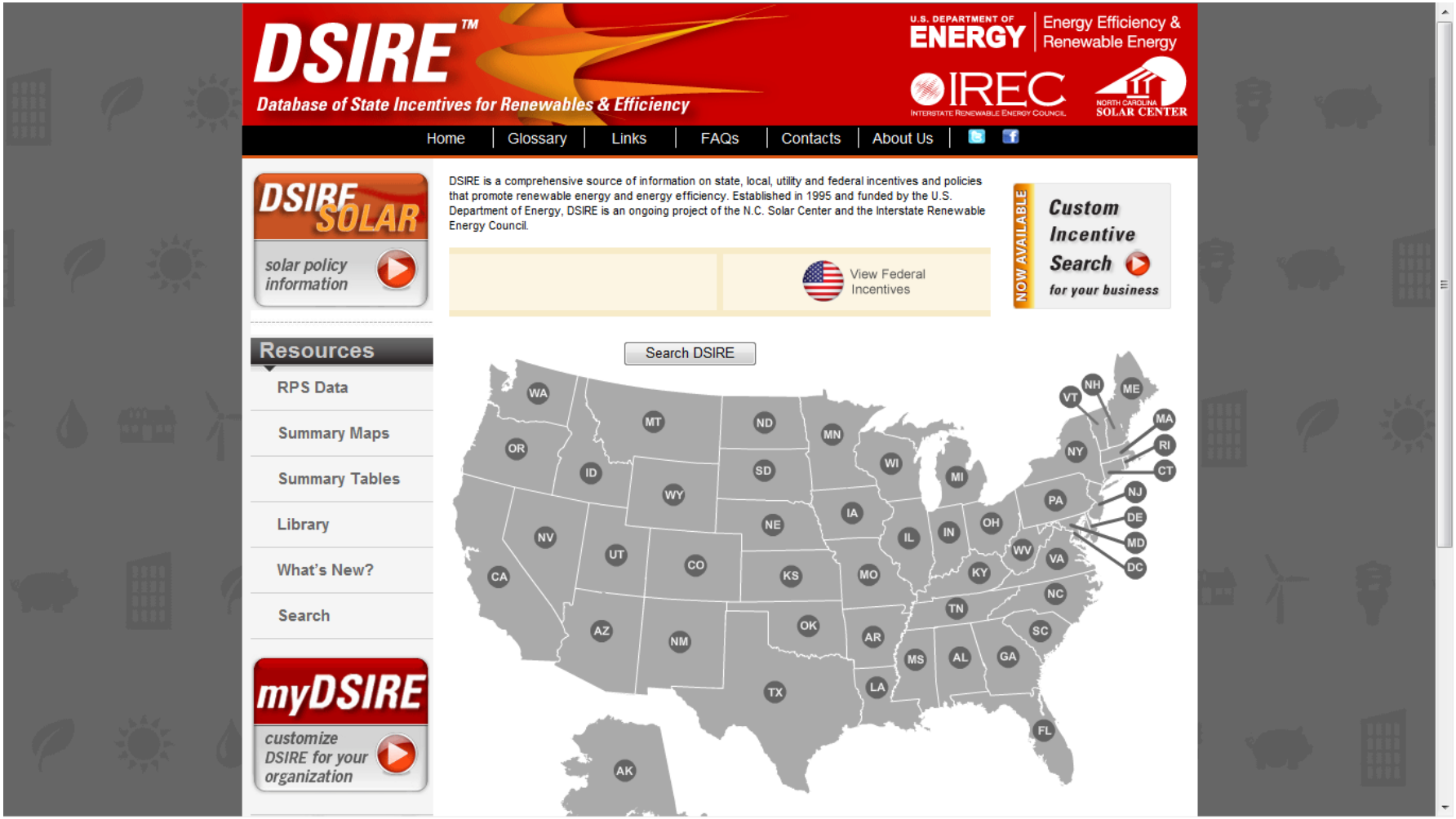
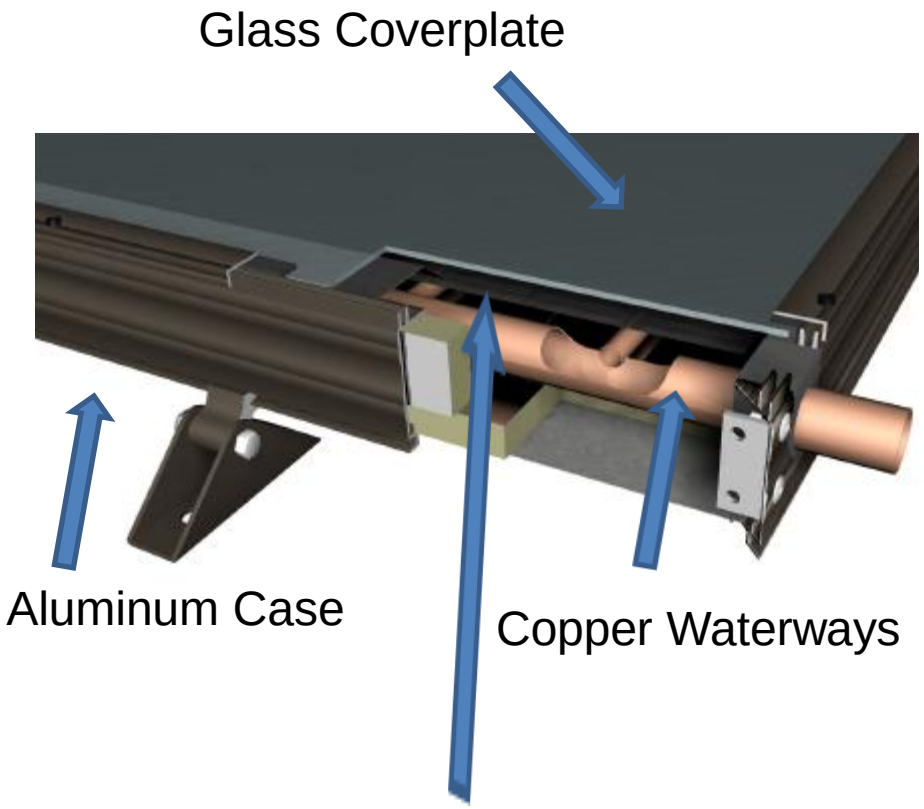
Solar Heat Worldwide; 2010 Edition

Database of State Incentives
www.dsireusa.org



Courtesy: North Carolina Solar Center

Flat Plate Collector



Courtesy: Alternate Energy Technologies

Helemano Army Housing - Oahu

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Courtesy: SunEarth, Inc.

Space Heating for Greenhouse Operation

Courtesy Aztec Solar; Houweling's Nursery in CA

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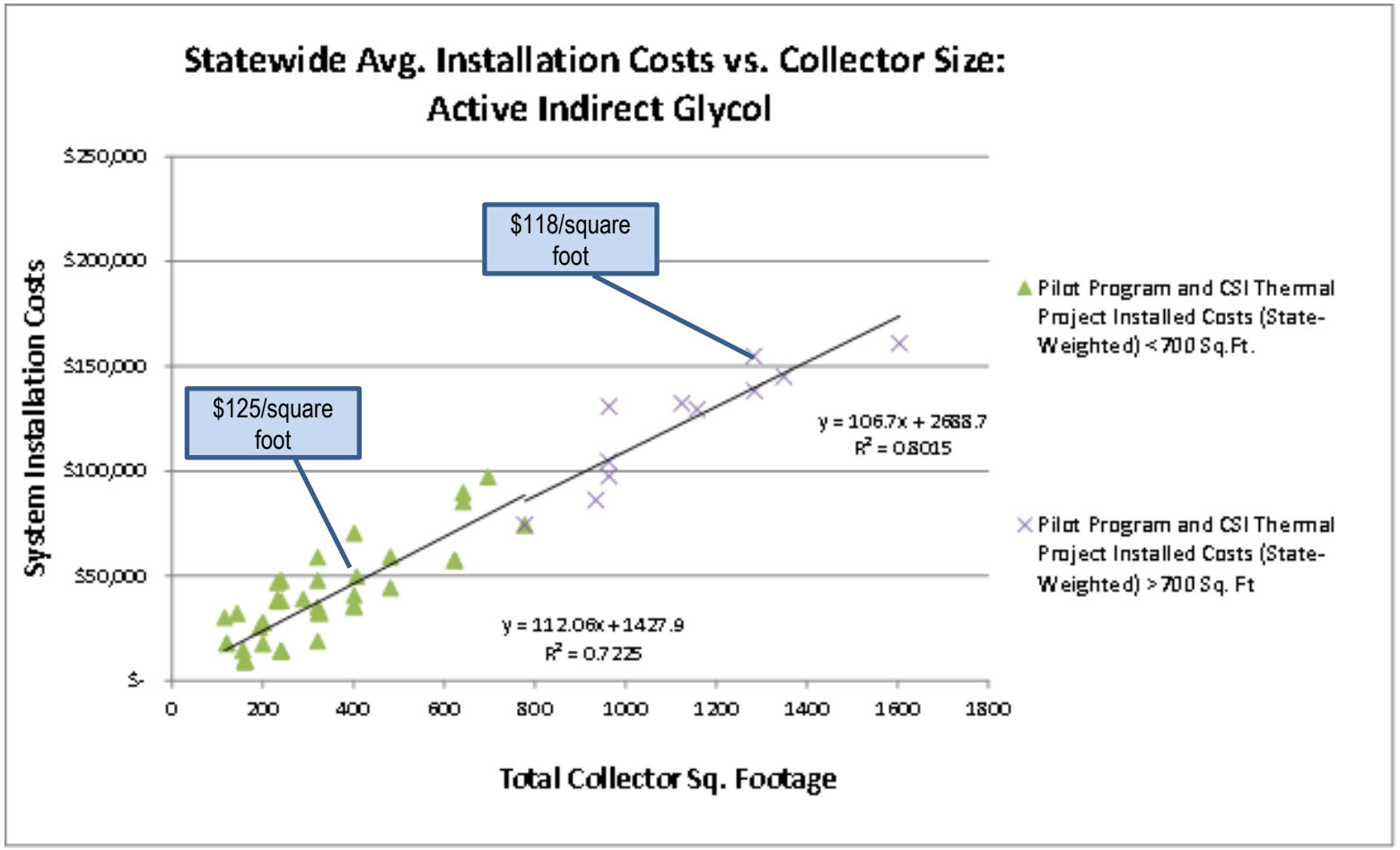
Installed Commercial Systems in California
(Glazed Collectors – 2011 Data)



Source: CSI Thermal Program/Heschong Mahone Group, Inc.

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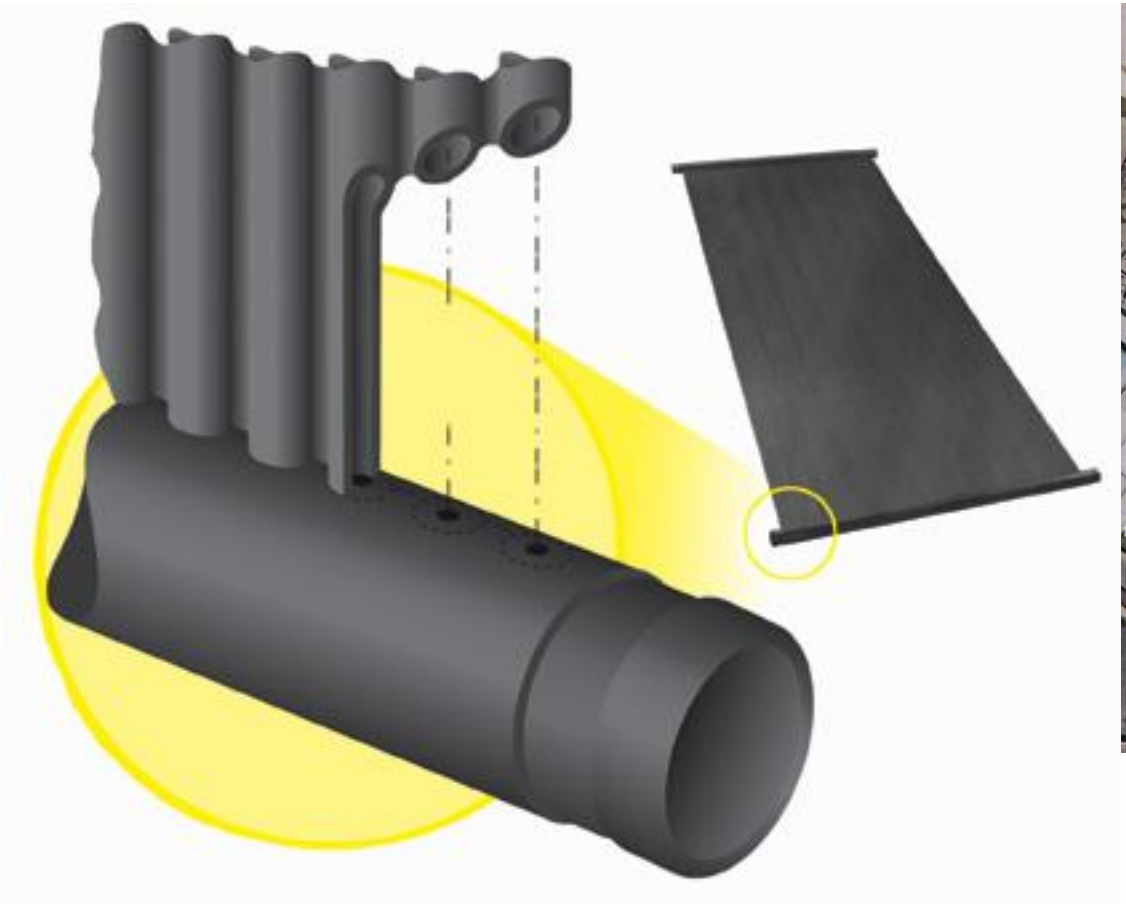
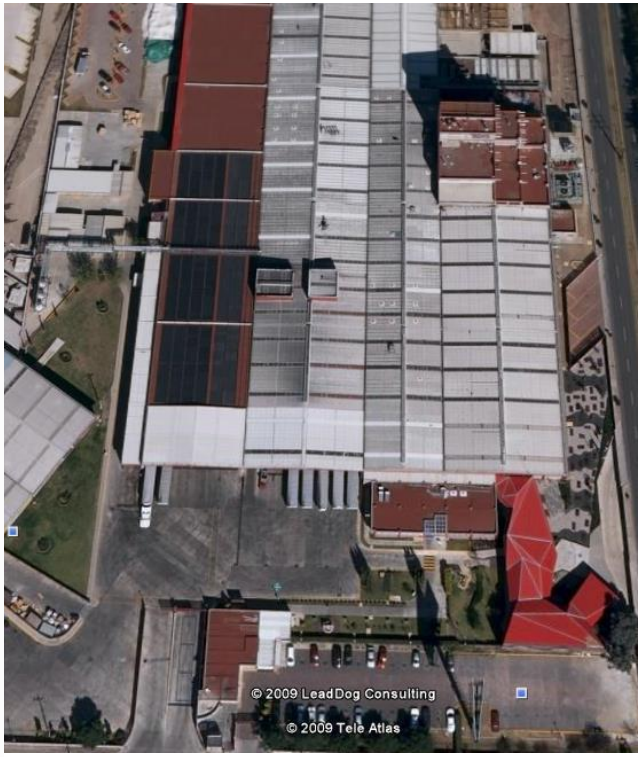
Unglazed Polymer Flat Plate





Nestle Chocolate Factory
Paseo Tollocan, Mexico
904 panels; 36,160 square feet

Courtesy: Aquatherm Industries, Inc.

Commercial, Federal, Municipal, School Pool Heating

Terravita Community Association
Scottsdale, AZ
Courtesy: Aquatherm Industries, Inc.

San Diego State University
Aztec Aquaplex – 8,000 sq. ft.
Courtesy: Heliocol

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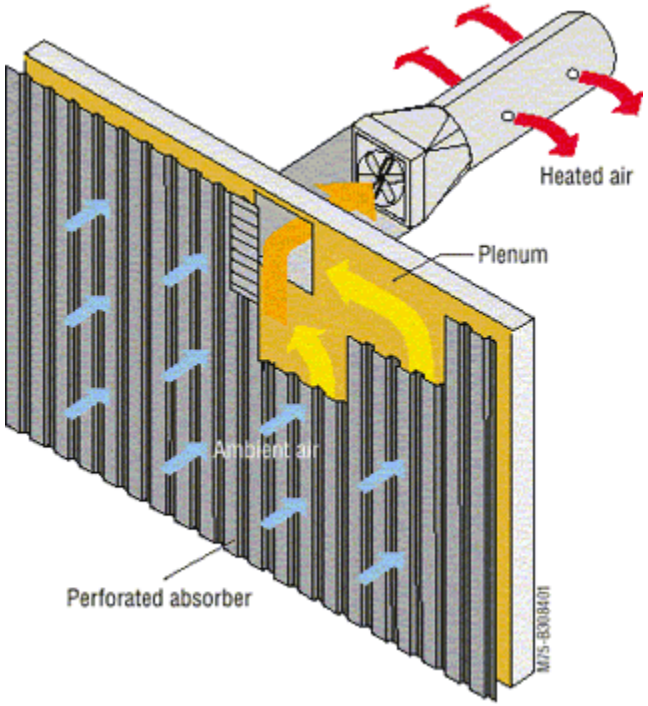
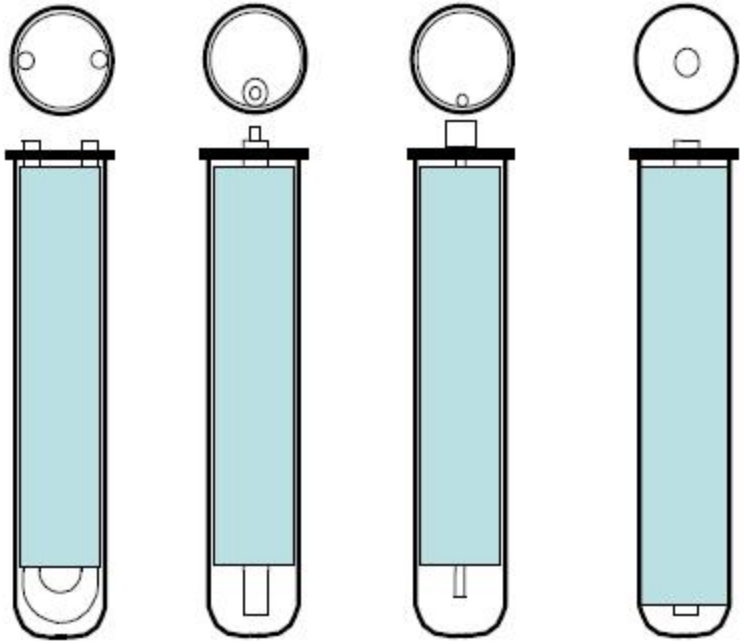
Transpired Air Solar Pre-Heating

- Up to 40°F temperature rise @ 4 CFM
- 60% to 65% annual efficiency
- ~ $30/square foot installed
- ~ 240,000 BTU/sq. ft. annually



NREL Research Support Facility, 2010

Evacuated Tube Collector



(a)

(c)

Courtesy: Gerardo Diaz, School of Engineering, University of California Merced

Army Residence Community, Texas

Courtesy: Apricus North America

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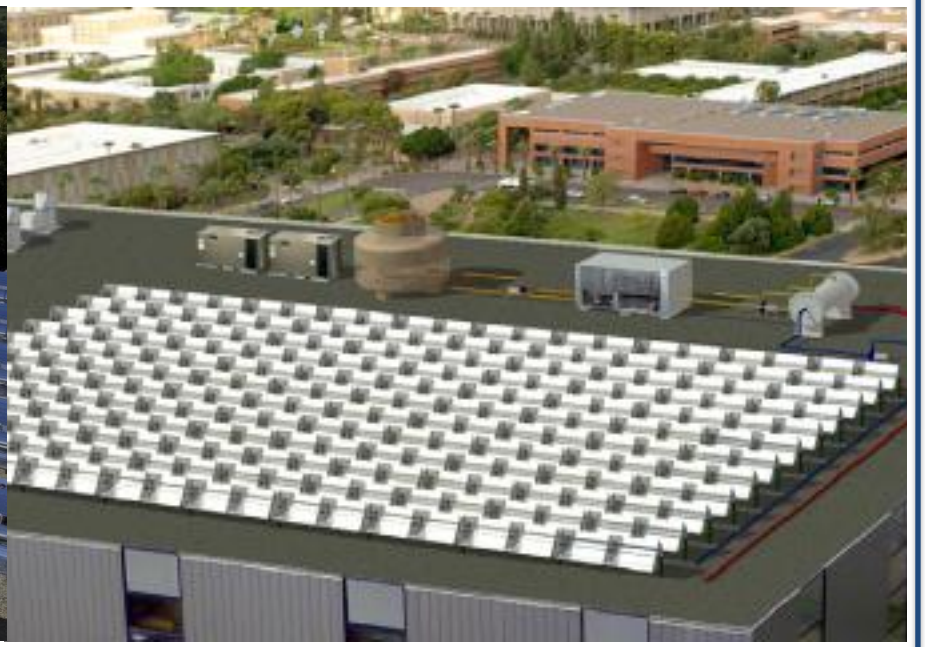
Micro-CST (Concentrating Solar Thermal)



Sonoma Winery by Cogenra
(Water heating and electricity production)

Solar Air Conditioning by Sopogy
(Solar heating for absorption chilling)

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Thank You!

Les Nelson
Western Renewables Group
30012 Aventura, Ste. A
Rancho Santa Margarita, CA 92688
(949) 713-3500
lnelson@westernrenewables.com