

Solar Air Conditioning

A successful technology



S.O.L.I.D. GmbH
Austria



SOLID is specialised in large scale solar plants (>500 m²) and is...

- providing:
 - Domestic hot water
 - Solar heating
 - Solar cooling
 - District Heating
 - Industrial process heat
- focusing on:
 - Hospitals, dorms, residential building...
 - Resorts and hotels
 - Swimming pools & sporting facilities
 - Industries
- experienced in:
 - Project development
 - Engineering
 - Construction
 - Supervision
 - Operating & Maintenance

Expertise of SOLID



- Clients
 - Building project organizer, energy utilities, Biomass-operator, Industrial utilities,...

- Financing
 - Purchase of equipment
 - ESCo arrangements
 - Combination of both

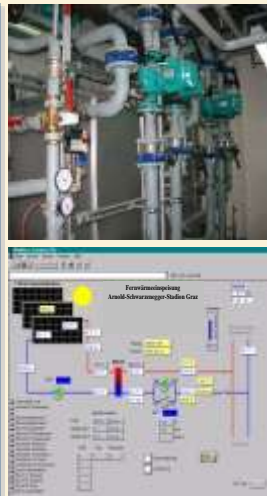
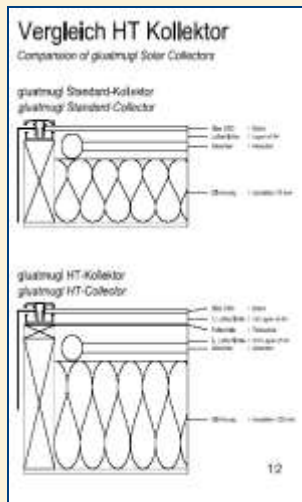
- Existing References:
 - > 200 large plants
 - 12 commercial solar cooling systems



R&D - a fundamental part of SOLID



- Exchange and extend know-how in cooperation with universities (theory) and business (practice)
- Adopting an innovative spirit and driving approach in order to
 - achieve improvements to existing products and
 - develop new products.

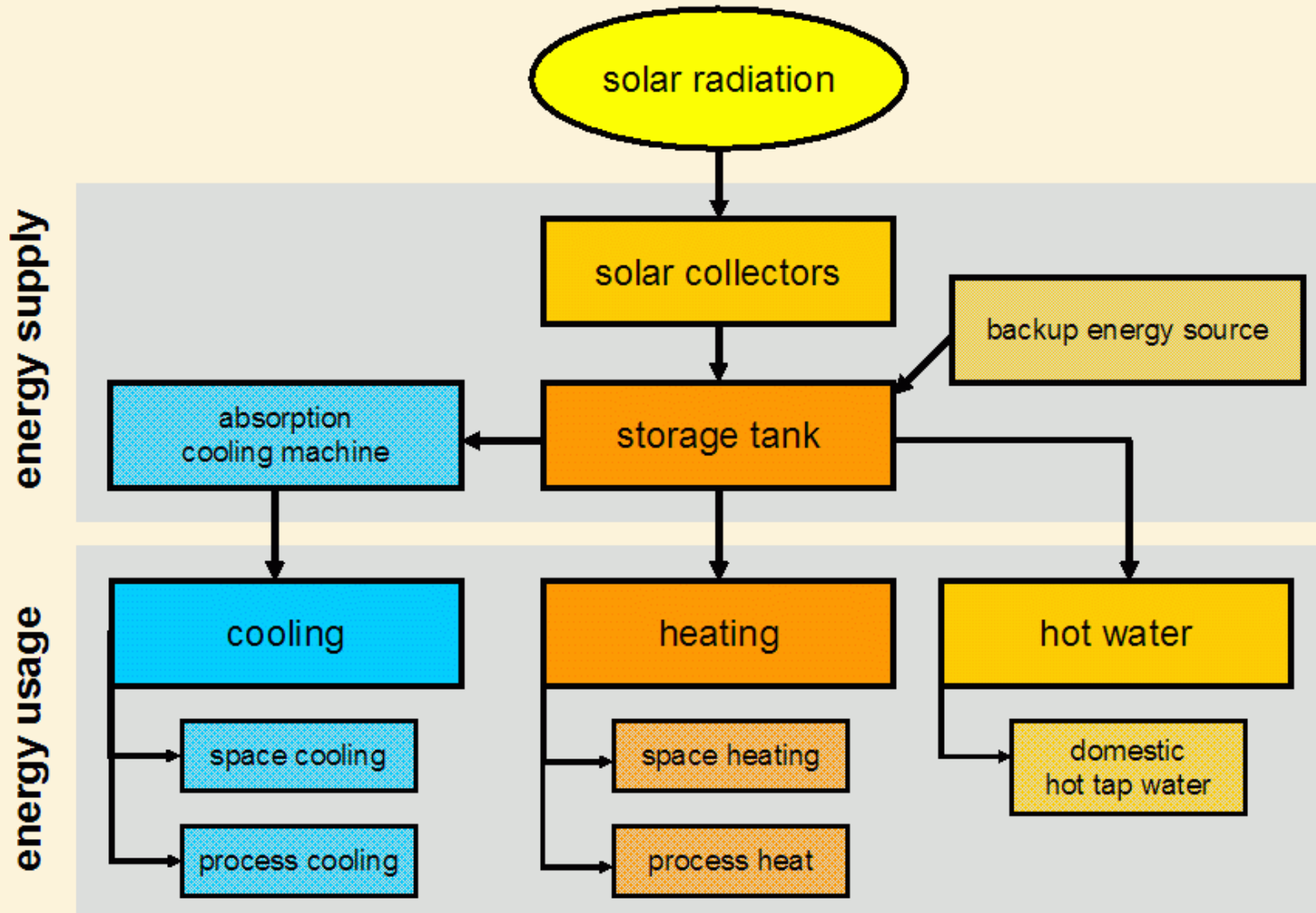


- Partner and coordinator in national and international R&D projects
- Current projects in the field of:
 - development of innovative solar control
 - solar collector development for higher temperatures
 - solar cooling applications
 - innovative business models

Hard work is awarded...



The use of Solar energy is broad



Selected solar heating project



AEVG Graz District Heating

Solar Panels
erected:
4100 m²

Solar Panels
additionally
planned:
3800 m²

Process Heat for Industry

Gatorade Pepsi Co

Solar Panels:

900 m²

Process heat

Started up 12/2008

Production of hot water for
Gatorade manufacturing



Selected solar cooling project



Olympic Sailing Village China 2008

Solar Hot Water for Sports
Center and Olympic Village

Solar Air Conditioning
for Logistic Building

Solar Panels:
1296 m²

So far, our largest Solar Cooling plant...



CGD Lisbon

(Biggest Bank of Portugal)

100.000 m² Offices

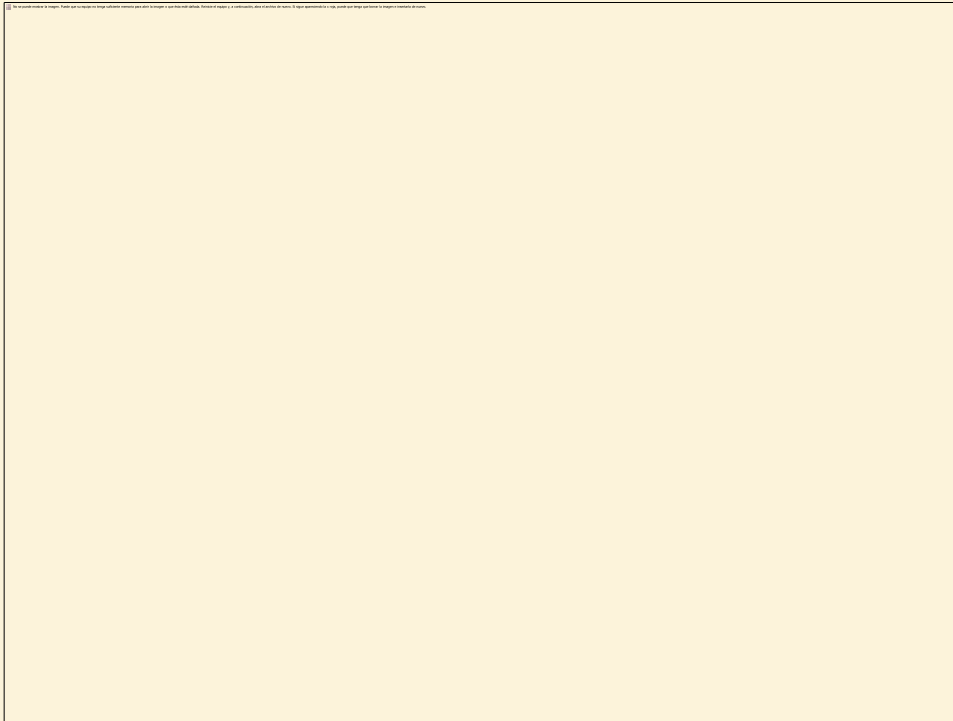
5.000 employee in
building

Theater, Hospital,
Restaurants



<http://www.cgd.pt/Institucional/Responsabilidade-Social/Ambiente/PublishingImages/Central-Solar.swf>

...the CGD Headquarter in Lisbon



Power :
Heating 800 kW
Cooling 545 kW

Cooling, Reheating, Heating,
DHW

Solar Panels 1.579 m²
Tank 11 m³ + 200 m³



Further SC Refs: Desert Outdoor Center



Phoenix Arizona

Solar Panels:
1300 ft², 124 m²

Cooling Power:
20 ton, 70 kW

Energycabin

In operation since
April 2006

Project Partner
Arizona Power Service



Further SC Refs: Lanta Self Storage



Phoenix Arizona

Solar Panels: 500 m²

In operation since April 2006

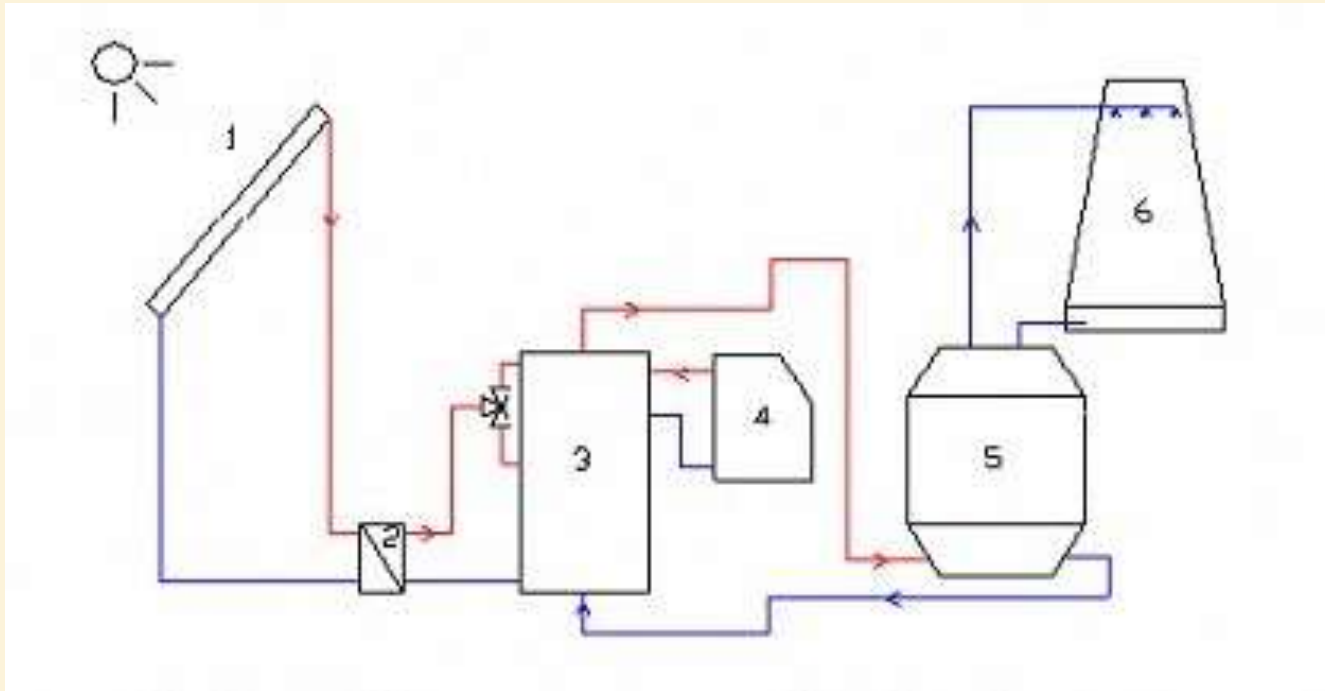
Cooling Power: 105 kW

Long track of experience

| Location/Project | Cooling Machine | Constr . | Cooling Power | Collector Area |
|--|---------------------------------|----------|---------------------------------|---------------------|
| Pristina – EAR Tower | 2 Pcs. LiBr-Chiller | 2002/3 | 70 kW | 226 m ² |
| Leutschach – Wine Cooling | Ammonia, Custom-made (Podesser) | 2003 | 15 kW | 100 m ² |
| Graz – office, test Plant | Ammonia, Custom-made (Kunze) | 2003 | 2 kW | 8 m ² |
| Stadtwerke, Crailsheim | 1 Pcs.. LiBr-Chiller | 2004 | 15 kW | Energy from boiler |
| Brussels – Renewable Energy House | 1 Pcs.. LiBr-Chiller | 2005/7 | 35 kW | 60 m ² |
| Phoenix – Desert Outdoor Center | 1 Pcs.. LiBr-Chiller | 2006 | 70 kW | 126 m ² |
| Qingdao – Olympic Village | 2 Pcs.. LiBr-Chiller | 2006 | 512 kW | 638 m ² |
| Tampa – Estellas Restaurant | 1 Pcs. LiBr-Chiller | 2007 | 70 kW | 210 m ² |
| Lisbon- CGD | 1 Pcs. LiBr-Chiller | 2008 | 545 kW | 1579 m ² |
| Phoenix-Lanta | 1 Pcs. LiBr-Chiller | 2008 | 130 kW | 504 m ² |
| Gleisdorf- Service Center Municipality | 1 Pcs. LiBr Chiller, and DEC | 2008 | 35 kW 6000 m ³ /h | 260 m ² |
| Graz, office | 1 Pcs. Li Br Chiller | 2008 | 17.5 kW | 58 m ² |

How does the system work ?

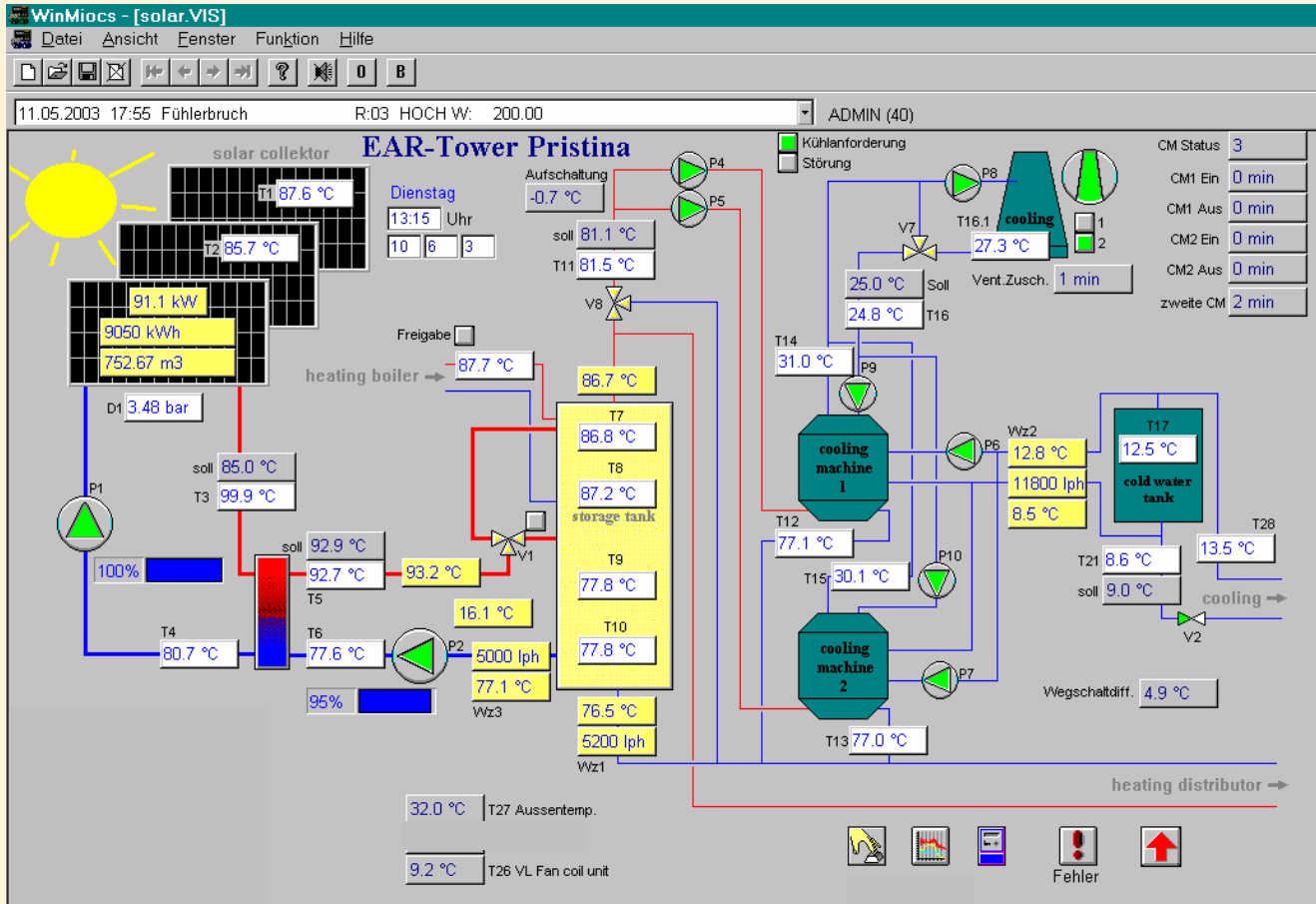
Simplified diagram of a solar cooling system:



- 1 Collector field
- 2 Heat exchanger
- 3 Buffer store

- 4 Back-up heating system
- 5 Absorption refrigerating machine
- 6 Cooling tower

Telemonitoring



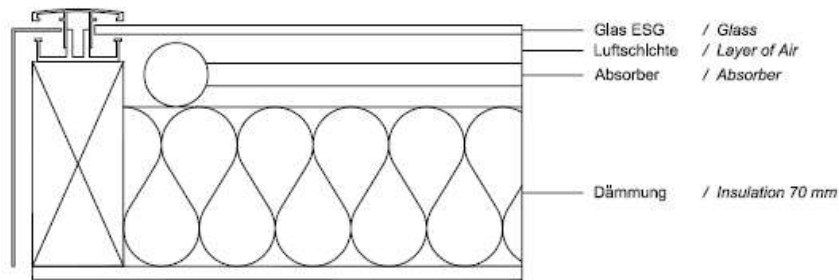
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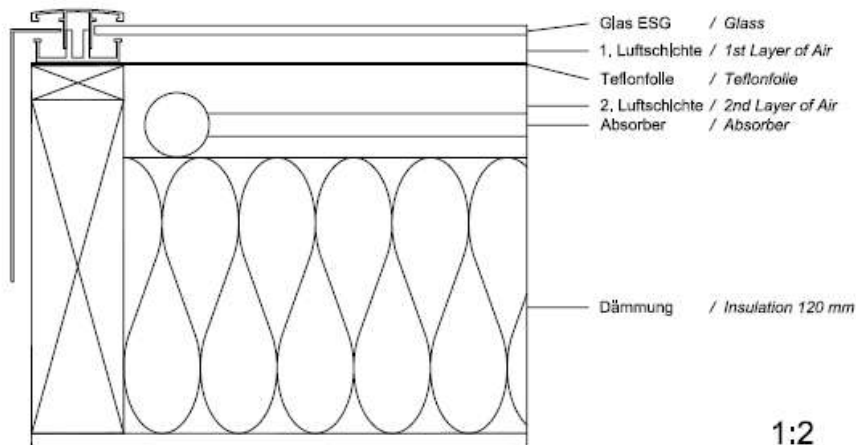
- Output solar plant: 91.1 kW
- Input cooling machines: 77,8 kW
- Output cooling machines: 59,5 kW
- Collector supplies 99.9 °C/212 F

Comparison of gluatmugl Solar Collectors

gluatmugl Standard-Kollektor gluatmugl Standard-Collector



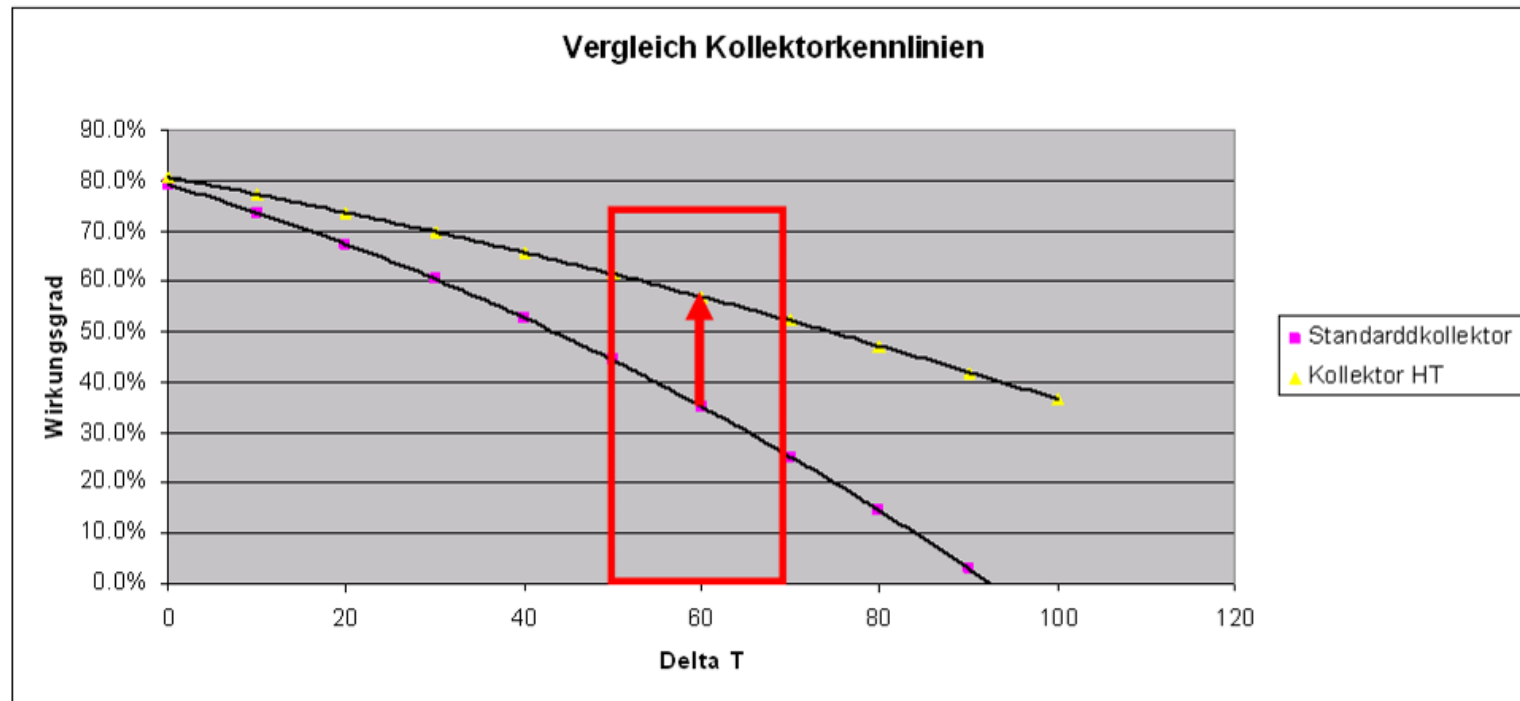
gluatmugl HT-Kollektor gluatmugl HT-Collector



1:2

- Standard-collector
 - DHW and heating support
 - operating temperatures:
30–70°C/90-160°F
- HT-collector
 - district heating grids, solar cooling
 - operating temperatures:
70–95°C/160-205°F
 - more efficiency
 - less heat losses
 - better insulation
 - additional air-layer

Comparison Solar Panels



Eta 0 80,6 %
a1 2.580 W/K*m²
a2 0.009 W/K²*m²
(Arsenal test: 2.04.00518.10, March 2008)

Advantages:

- Better space usage
- Price / output ratio

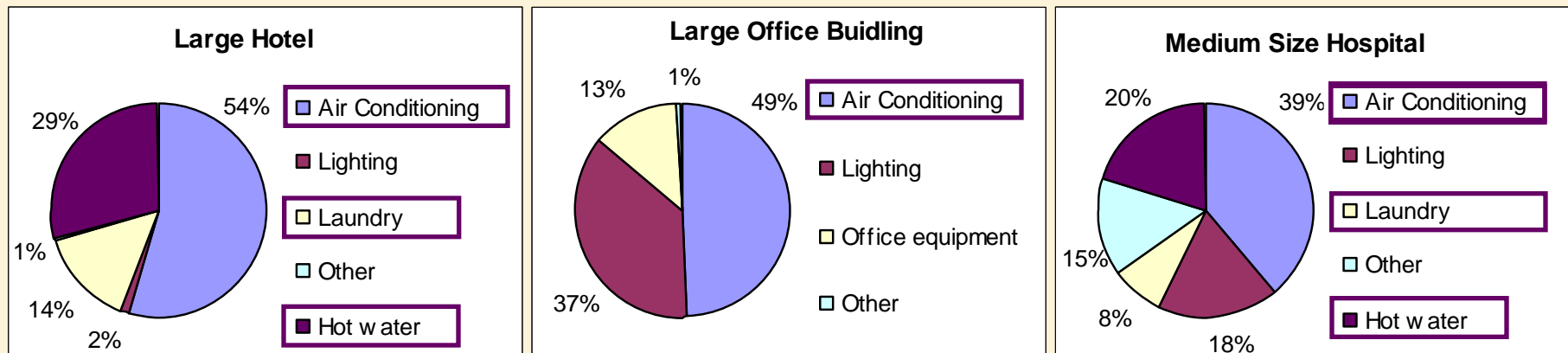
General experiences



Long lifetime of absorption chillers.
This one is > 70 years old !

Why solar air conditioning ?

- The buildings sector accounts for 42% of global electricity consumption (IEA 2007)
- Steadily increasing electricity price
- Air-Conditioning (AC) represents the biggest single energy/power consumer in public and commercial sectors
- AC key driver of electric peak power demand growth → negative impact on grid load factor, electricity price and environment



Further Solar Thermal Arguments

Technological arguments:

- Cutting high energy rates and progressive price increases
- Solar thermal systems can eliminate most of the “low COP” loads for hot water
- Solar cooling: Solar peak and peak of cooling demand are ideally corresponding
- Low maintenance costs – no moving parts, no wear

Future potential:

- From today's point of view, the potential is never ending:
The task is to serve all consumers of low temperature heat (below 210°F) and all consumers with cooling loads in air conditioning or process cooling

Business Drivers:

- High Energy Rates
- Carbon Emissions (“Greenhouse Gases”) And Regulations
- Sometimes ability to Access Incentive Payments, Tax Credits or Accelerated Depreciation
- Customer’s Motivation to Promote “Green” Image

Technological arguments:

- Successfully working all over the world.
- Control unit: Energy Cabin. Plug & play on a grand scale
- Industrial large-area collectors
- Proven success in large-area systems
- Experience in large scale Solar Cooling
- Tele-monitoring, commissioning and „fine-tuning“
- Experience in integrated systems
Biomass and Solar Thermal as a base for renewable district heat
- Result guarantees
- „Sale of Energy“ contracts – ESCo-Model

We help you feeling the sun!



Thank you!

www.solid.at