

Experiences and strategies in commercial installations for Solar Air Conditioning

Christian Holter



c.holter@solid.at

8020 Graz

Austria

+43/316/202840

www.solid.at



EAR Tower Pristina Kosovo 226 m²/160 kW/
Solar Air conditioning

SOLID Group- What we do

➤ Large scale solar plants

- district heating nets
- Hospitals, prisons,...
- office buildings and hotels
- swimming pools
- Solar cooling
- app. **200 plants > 100 m²!**
- **10 commercial solar cooling systems**

- Project Development
- Engineering
- Construction
- Supervision
- O & M

➤ Third Party Financing models & guarantee contracts

➤ R&D activities in the field of solar thermal



Orust Sweden, 768 m² 540 kW

Why solar cooling ?

Cooling is dramatically increasing

The same solar radiation creating the need of cooling is used for powering the cooling system-

A perfect match between demand and supply

Limits of electric grids and power plants are reach in many places

Successful cooling Projects

Renewable Energy House Brussels



Renewable energy house
Brussels

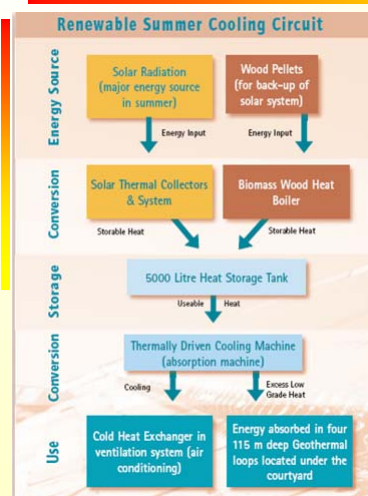
Headquarter for all Renewable
Energy Associations

The showcase for European
Union

Solar Cooling and Heating

Many Renewables combined in
a retrofit !

Renewable Energy House Brussels

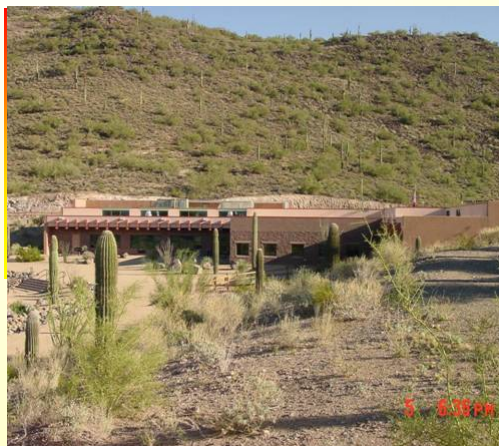


- 2.000 m² Office Areas
- 80 kW Biomass boiler
- 42 kW Solar collectors
 - 21 kW Flat plates Gluatmugl Advanced
 - 21 kW Vacuum Tubes
- Ground loop for Backcooling (Used for Heat Pump in Winter)
- 35 kW Chiller (WFC 10)

Renewable Energy House Brussels



Desert Outdoor Center



Desert Outdoor Center
Phoenix Arizona

First recent
Solar Air-Conditioning
Project in United States

Project Partner
Arizona Power Service

Desert Outdoor Center



- 1.500 m² National Park Center
- 70 kW WFC 20
- 126 m² Gluatmugl Advanced
- Prefabricated Energy Cabin
- System far away from Electric Grid

Desert Outdoor Center



Olympic Sailing Village



Olympic Sailing Village
China 2008

Solar Hot Water for
Sports Center and
Olympic Village

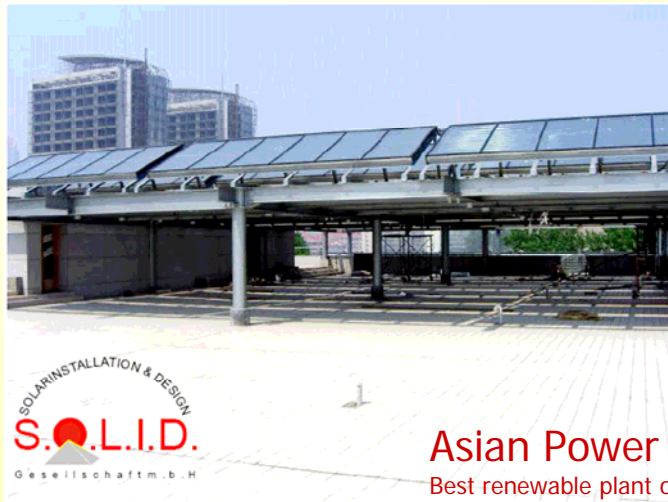
Solar Air Conditioning
for Logistic Building

Olympic Sailing Village



- 4000 m² used area
- 900 kW peak load
 -according to chinese Norm
- 500 kW chiller (Sanyo)
 - 250 kW to be covered by solar system
 - district heating for back up
- 631 m² Gluatmugl Advanced
- System started up August 2006

Olympic Sailing Village



Pay back
10 years-
compared to district heat
driven cooling

SOLARINSTALLATION & DESIGN
S.O.L.I.D.
Gesellschaft m.b.H

Asian Power award
Best renewable plant of Asia 2006

Operating Projects

EAR Tower Pristina 5th season

- 2 thermal driven absorption cooling machines with total load of 90 kW/ 20 tons
- 226 m²/2450 sqft/160 kW solar collectors
- 4 m³/1050 gal storage tank
- back cooling unit 220 kW
- back up for peak load: compressor chiller 30 kW.



Payback 12 years-

replacement of competitive investment, peak power rate, energy saving
12 EURct/kWh

Operating Projects

Winery Peitler 4th season

- 1 thermal driven ammonium absorption cooling machines with total load of 12 kW
- 100 m²/70 kW solar collectors
- 4 m³/1050 gal storage tank



Ongoing Projects



CGD
Headquarter
Lisboa

100.000 m²
Office Area



545 kW Cooling,
Reheating,
Heating, DHW
1620 m² panels

Payback 14 years
Electricity rate 7 ct, VSP added

Ongoing Projects



Lanta
Warehouse

105 kW Cooling, Heating,
500 m² panels, 20 m³ tank

General experiences

- Challenging design phase
 - Difference to conventional approach
 - Much more precision needed than in electric driven projects
 - Both advanced knowledge of large solar and thermal cooling needed
 - Good understanding of solar system needs
 - Interfaces with "old" system to be worked out carefully
 - Annual profile (Summer- shoulder- winter) to be checked

General experiences

- Construction
 - Many costs include fear rates
 - Special parts needed for high temperatures
- Start up
 - Telemonitoring support needed urgently
- Operation
 - Backcooling situation could be improved (Ground loops, river water,...)
 - Temperatures in collector circuit app. 90- 100° C often
 - Performance okay and reliable if supervised and adjusted

General experiences

- Long life time of chillers
- This one is 70 years old !



Strategies for the future

Chiller replacement from old style direct to solar AC helps

- CFC- Replacement
- Electric Peak reduction- Utilities save money !
 - Peak costs savings
 - Less troubles for power plants
 - Less black outs
- Saving of fossil fuels
 - CO₂ Emission reduced
 - Avoiding of energy imports

Strategies for the future- Economy

- Pay Back depending on electricity rates, solar radiation and project size
 - The bigger the quicker (> 100 ton/ 350 KW for "real"winners)
 - The more sun the better
 - The higher the electricity rate... (>10 ct/kWh all inclusive)
 - Reduced pay back with combined projects on efficiency
- Case study: Airport, south Europe, 12-14 year pay back (electricity. app. 10 ct/kWh)
- Same project in Jamaica: 5-7 years (20 ct/kWh)

And here in Graz/Styria ?

- Smaller cooling demand than in the south...
- Integrated systems with heating- cooling
- Use of district heating & solar

- Several projects designed and in development
- 2008 will see first installations here !



Large scale solar plants

