

SOLID
solarinstallation+design




Solar Cooling & Process Heat for Emerging Markets and Developing Countries

j.buchinger@solid.at www.solid.at

S.O.L.I.D. Group **SOLID**
solarinstallation+design


Headquarter in Graz, Austria
Offices in USA & Singapore
Partners in many other countries



The map displays the following locations and partners:

- Phoenix, AZ** (USA): DOC, Lanta, DMHS, Hyatt
- Graz, Austria**: SOLID office
- Harvard** (USA)
- CGD** (Austria)
- Pristina** (Kosovo)
- Al Ain** (UAE)
- Qingdao** (China)
- UWC** (Singapore)
- Singapore**

Solar Cooling – the Advantage




The peak of solar radiation and the peak demand of cooling match perfectly

We can use the same radiation that creates the demand to cover the cooling demand,
cut off electricity peaks and avoid extreme operations on the **distribution grid**.

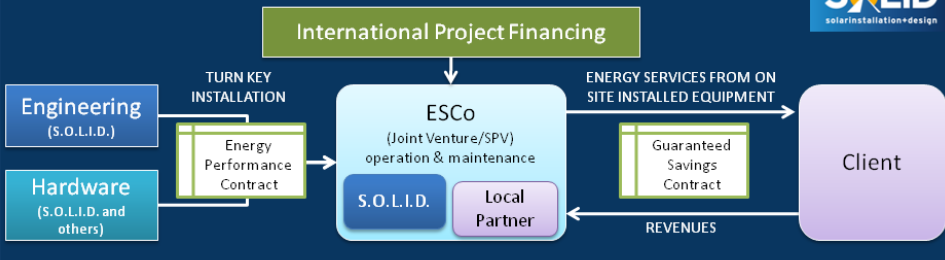
Solar Air conditioning saves the most expensive electricity !

Business models



- SOLID delivers **fixed price turn-key installations** for cash
→ Support to find financing offered to clients
- SOLID installs and finances installation, delivers **energy service based on energy service contract = ESCO**
 - Build – Own – Operate – Transfer
 - Monthly bill for energy services
 - No upfront cost & no operational risk for client

DESIGN & PROJECT DEVELOPMENT BY S.O.L.I.D.



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    graph TD
      IPF[International Project Financing] --> ESCO[ESCO  
(Joint Venture/SPV)  
operation & maintenance  
S.O.L.I.D. Local Partner]
      Eng[Engineering  
(S.O.L.I.D.)] -- "TURN KEY INSTALLATION" --> ESCO
      HW[Hardware  
(S.O.L.I.D. and others)] -- "Energy Performance Contract" --> ESCO
      ESCO -- "ENERGY SERVICES FROM ON SITE INSTALLED EQUIPMENT" --> Client[Client]
      Client -- "REVENUES" --> ESCO
      Client -- "Guaranteed Savings Contract" --> ESCO
  
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International projects



EAR Tower Pristina (2002/2003), 8th operating season



First international project of its kind for SOLID

2 LiBr absorption machines, total capacity of 70 kW

226 m² collector area

back up for peak load: electric chiller 30 kW

International projects



Olympic Sailing Village China (2008)

Solar Hot Water for Sports Center and Olympic Village

Solar Air Conditioning for Logistic Building

Solar Panels: 1296 m²/910 kW

Backup Energy Source: District heat

In operation

Asian Power award:
Best renewable plant of Asia 2006

Latest Project



United World College, Singapore

Actually under construction

3,900 m² collector field

1.4 MW cooling + all DHW for the centralized grid of the campus.

Today the world's largest Solar Cooling + Heating installation.

Financed by OeKB together with Raiffeisen Landesbank Steiermark

ESCO Model

Economics



Payback depends mainly on

- Electricity rates and peak charges (\$/kWh, \$/kW)
- Solar radiation & climate
- The bigger the better – Economy of Scale
- Incentives / Funding / Subsidies

Financing

- Not a short term investment
 - Pay back 5-10 years process heat - ESCo
 - 8-13 years solar cooling - ESCo
- Investors have significant limits in their commitment



Barriers



- **Lack of awareness**
 - Engineers & decision makers do not include solar as a possibility
- **Lack of understanding**
 - Solar Thermal (hot water) >< Photovoltaic (electricity)
- **Lack of clarity**
 - Solar Thermal = Renewable Energy or Energy Efficiency?
- **Lack of scale**
 - Solar Thermal = small scale (< € 10 million) for IFIs, carbon finance
- **Lack of equity**
 - High upfront cost
 - Weak stakeholders
 - SME

Outlook



Project developments in regions with high electric prices & excellent solar resources

→ LAC, West & South Africa, Central Asia, MENA..)

Light house projects currently under preparation:

- Montego Bay Airport, Jamaica, USD ~16 million, ESCO
IFC & OeEB ?
- CARICOM Headquarters, Guyana, USD ~2.5 million
OeKB ?
- Umbrella financing project, global, € 200 million, ESCO
IFC, .. ??

Expectations

- IFIs should have the technology in mind when financing projects

Thanks for the ADC support




ADC-Instrument: Unternehmenspartnerschaft

Solarthermal for the Carribean

with funding from

- Feasibility of reference locations
- Financing support
- Market positioning and need
- Capacity development for solar thermal systems
- Awareness raising

Austrian
 **Development Cooperation**



Contacts



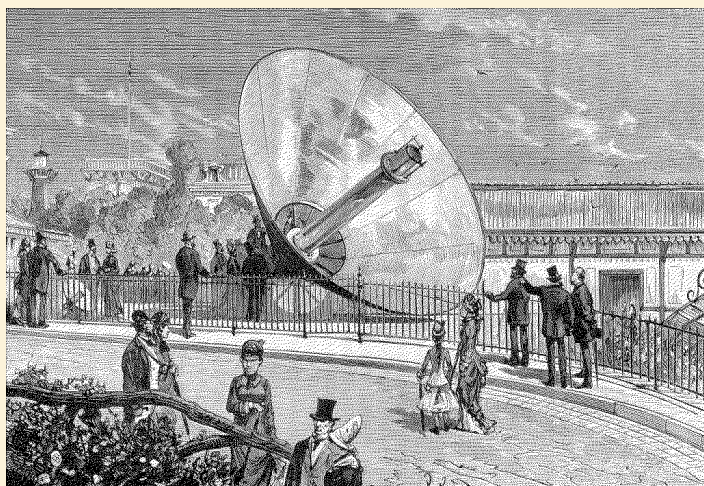
S.O.L.I.D. Gesellschaft für Solarinstallation und Design mbH

Puchstrasse 85, 8020 Graz, Austria
 CEO: Christian Holter & Franz Radovic
 Tel: +43 316 292840-0
 Fax: +43 316 292840-28
 Email: office@solid.at
<http://www.solid.at>

Josef Buchinger
 Project Development
 Middle East, Central Asia, East Africa
j.buchinger@solid.at
 Tel: +43 316 292840-28
 Skype: j.buchinger.solid



A brand new technology ?

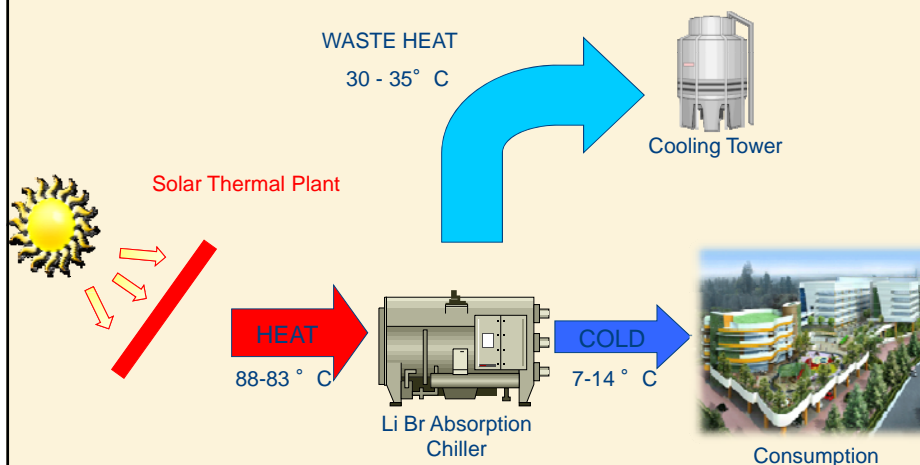


Expo 1878 in Paris, A. Mouchot produces ice with solar energy

Li Br Absorption Chiller & LST



Temperature Levels and Power Requirement at external Interfaces



Solar cooling references



Location/Project	Cooling Machine	Constr.	Cooling Power	Collector Area
Pristina – EAR Tower	LiBr-Chiller	2002/3	90 kW	226 m ²
Leutschach – Wine Cooling	Ammonia	2003	10 kW	100 m ²
Graz – office, test Plant	Ammonia	2003	2 kW	8 m ²
Stadtwerke, Crailsheim	LiBr-Chiller	2004	15 kW	500 m ²
Renewable Energy House, Brussels, Belgium	LiBr-Chiller	2005/7	35 kW	60 m ²
Desert Outdoor Center, Phoenix, USA	LiBr-Chiller	2006	70 kW	126 m ²
Olympic Village, Qingdao, China	LiBr-Chiller	2006	512 kW	638 m ²
Tampa – Estellas Restaurant	LiBr-Chiller	2007	70 kW	210 m ²
CGD Office Building, Lisbon, Portugal	LiBr-Chiller	2008	545 kW	1579 m ²
Warehouse, Lanta, Phoenix, USA	LiBr-Chiller	2008	130 kW	504 m ²
Service Center Municipality, Gleisdorf, Austria	LiBr Chiller & DEC	2008	35 kW	260 m ²
Office, Graz, Austria	Li Br Chiller	2008	17.5 kW	58 m ²
Metro MAN, Istanbul, Turkey	LiBr Chiller	2009	Study	
Sheikh Zayed Desert Learning Center, UAE	LiBr Chiller	2010	400 kW	1108 m ²
United World College, Singapore	LiBr Chiller	2010	1400 kW	3900 m ²