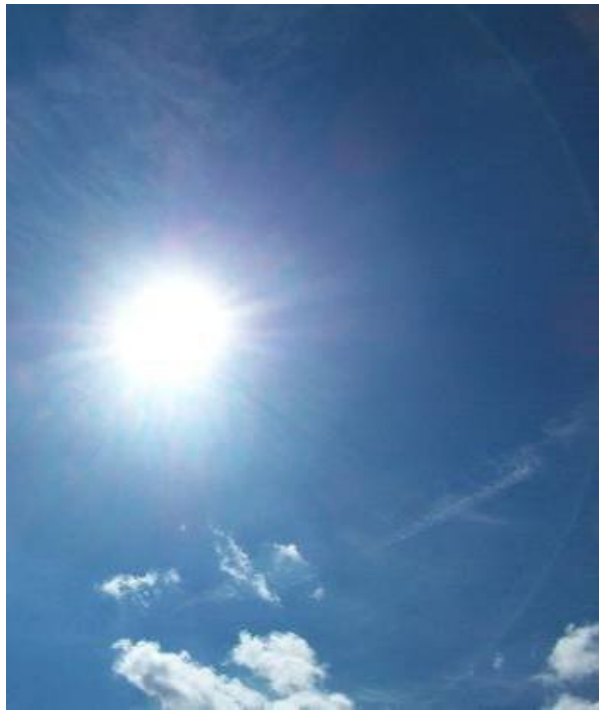
RENEWABLE ENERGY SOURCES

Solar cooling

Index

THE SUN DOESN´T ISSUE BILLS!



SOLAR COOLING

- Hidria IMP Klima
- Renewable energy sources, usage of energy
- Thermo solar systems
- Photovoltaics
- Solar cooling, case Hidria Inštitut Klima
- Optimum case for solar cooling system
- Summary

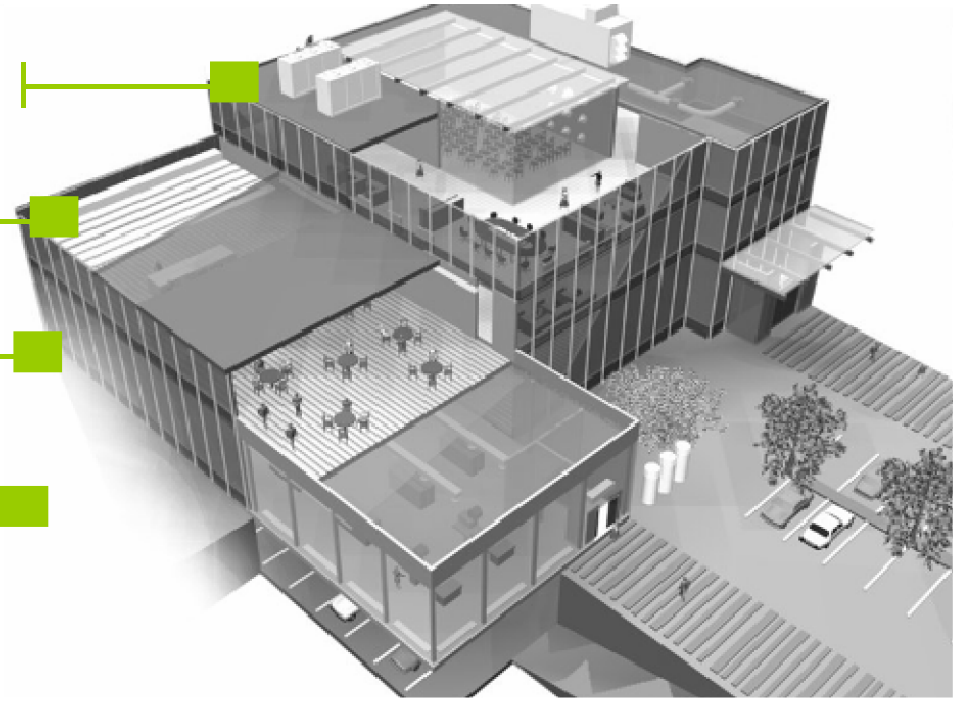
Energy efficiant solutions for compleete buildings:

Heating and cooling

Ventilation and Fire protection

Building management system

Renewable sources of energy



Our Advantages/Key Customer Benefits

- **International provider of systems solutions**
  - HVAC and Energy Management Systems, Renewable Energy Sources
  - Superior technical competencies
  - An innovative culture and infrastructure
- **Innovation leader**
  - HVAC R&D centre with modern laboratory facilities
- **Distinguished international partners and references**
- **Key customer benefits**
  - **A complete range of products,** comprehensive range of products and services
  - **Flexibility,** solutions for different premises and needs
  - **Excellent price/performance ratio,** all the necessary certificates, including Eurovent
- **Services**
  - **Local pre-sales support,** (consulting and technical support for designers)
  - **After-sales support,** (technical support for contractors, maintenance and servicing)

Solutions for all types of objects

Business buildings

Public buildings

Shopping centres

Hotels & Restaurants

Clean rooms

Sport objects

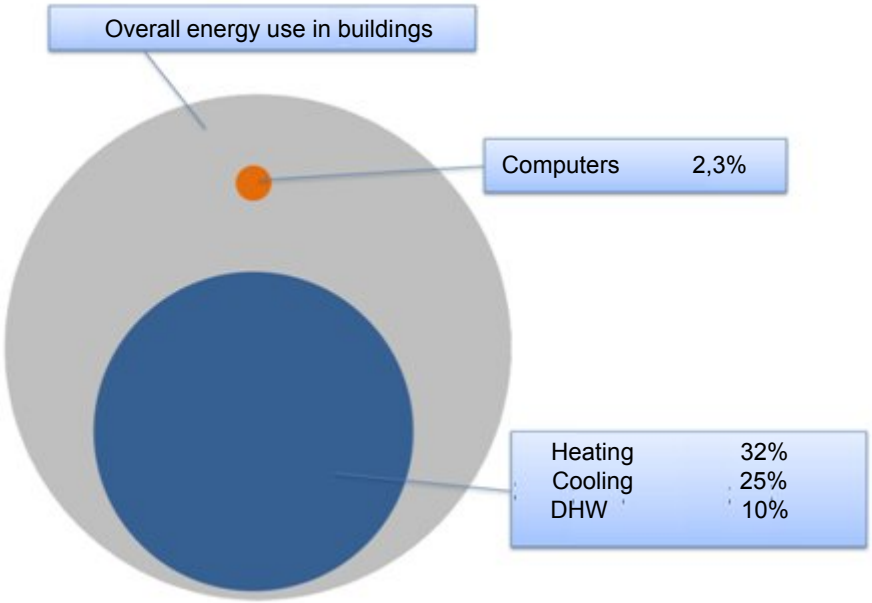
Residential buildings

Industrial buildings

Renewable energy sources, usage of energy

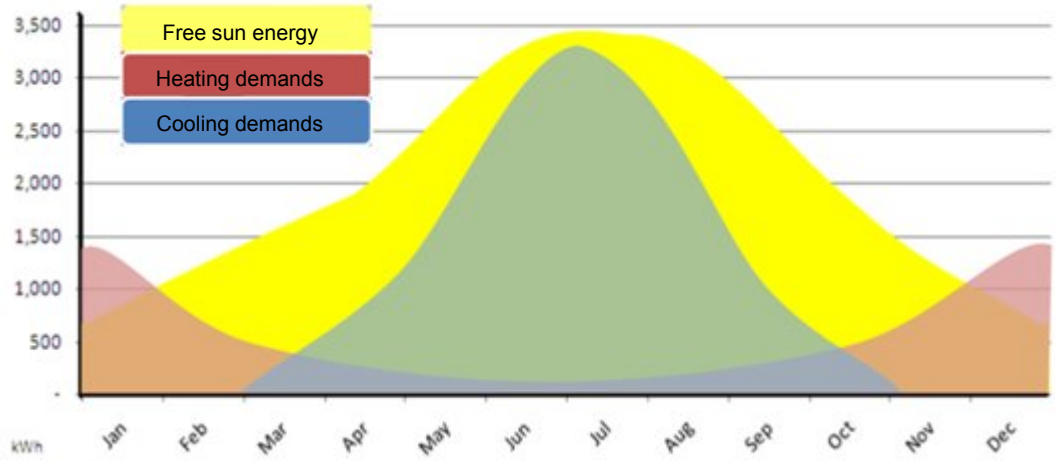
Thermal comfort in buildings which we enjoy where we spend most of our time, is demanding a high environmental price. Heating, cooling and hot water account for 67% of energy consumed in buildings, produced in most case with burning of fossil fuels, a process releasing environmentally harmful emissions.

It is unrealistic to expect (demand) from consumers to lower the requirement of comfort level, with a view to slowing down the process of climate change. Also, the increasing environmental consciousness does not help, since the main guidance are convenience, comfort and price.



Renewable energy sources, usage of energy

Sun is the largest source of energy, which we have currently available. Earth's surface receives in 45 seconds as much solar energy as energy consumption in the world in one day.
Solar technology has enormous potential, but remains stored energy accumulated for the dark time of the day and longer periods when no solar radiation is avabile, the major challenge of commercial technologies today.
The sun provides us, enough energy for heating in summer, a period in which we have a small requirement even for domestic hot water. The period of the year when you need more cooling, is the same time period in which we have maximum solar radiation. Thus, the potential use of solar energy for cooling is much more effective.
An innovative combination of technologies for heating, domestic hot water and cooling is the optimal solution. Using solar energy for reheating in winter and cooling in summer exploits the potential of the sun throughout the year.



Solar thermal systems

Solar collectors are used for heating sanitary water, water in indoor and outdoor swimming pools, in greenhouses, for drying agricultural products, timber and the like as well as for low-temperature building heating (floor warming) or for combined heating with other energy sources (classical heating systems, heat pumps).

AN INNOVATIVE FLOW-TROUGH PREPARATION OF HOT SANITARY WATER

Almost no maintenance

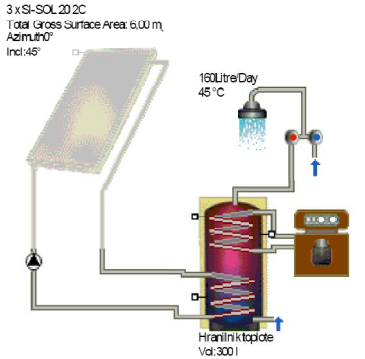
A well thought trough compact module assembly. Due to lower water temperatures, there is no accumulation of lime stone.

Quick and economic assembly

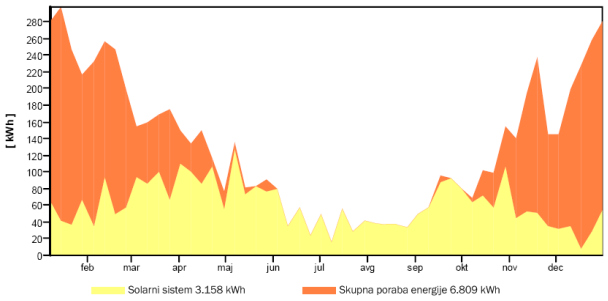
Due to compact turn-key implementation the assembly in guick and simple

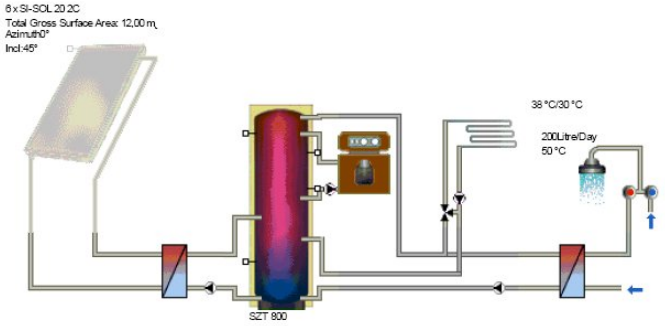
Optimal enrergy usage

The water returning to the storage tank cools down to almost cold-water temperatures. This enabled thermal layering in storage tnak and optimal energy usage.



Solar system for Domestic hot water





Combined solar system for Domestic hot water and heating of building

Solar thermal systems

System for DHW and heating.

- 30 pcs SSE SI-SOL 20 2C
- Absorption area: 55,2 m²
- Installed power: 38 kW

Športna dvorana Mokronog is example of low power multi-purpose facility whose operation benefits of renewable energy sources.

System for domestic hot water and kitchen, peak heat for pool water preheating.

- 58 kos SSE SI-SOL 2.0 TI
- Absorption area116 m²

Youth resort of Rdeči Križ Slovenije: 34 rooms, indoor swimming pool with sea water, restaurant, spa, conference room, physiotherapy

System for domestic hot water for room and swimming pool water preheating

- 191 pcs SSE SI-SOL 20 2C

Absorbtion area352 m²

Hotel Svoboda is among the first-class hotel Terme Krka. The extension has earned an indoor swimming pool with sea water.

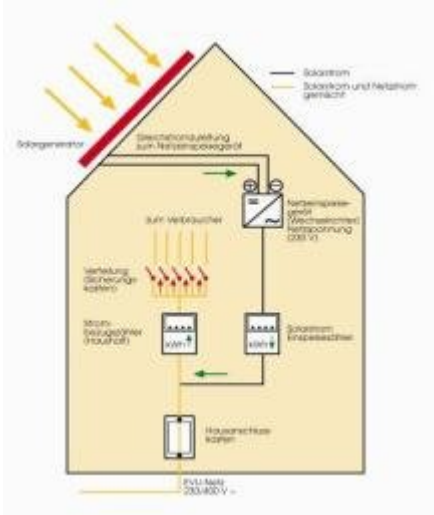
System for hot sanitary water

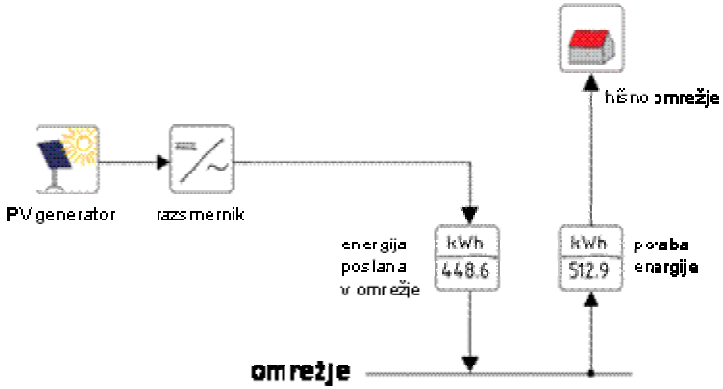
- 80 pcs SSE SI-SOL 20 2C
- Absorbtion area147,2 m²

Photovoltaics

On grid PV system

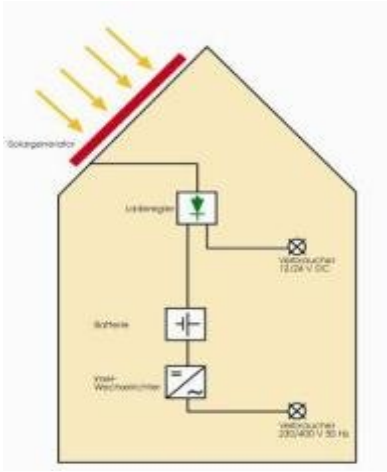
- as generator of electrical energy
- network connection
- feeding public network
- public network acts as a reservoir

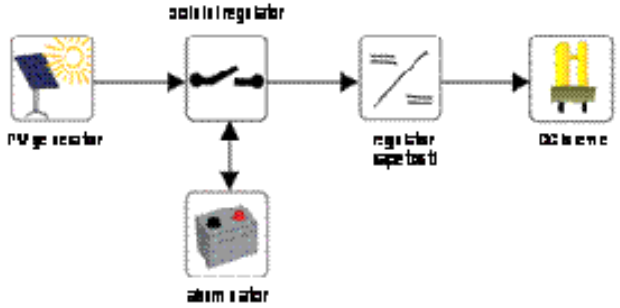




Off grid PV system

- used when no public network
- batteries serve as collectors energy and power network
- combinations of PV components and generator





Photovoltaics

Building Kristalna palača

- Investor BTC
- Fasade integrated PV modules
- Power: 87 kWp
- Surface area: 635 m^2

Building GEN - e

- Investor: GEN - e
- Pv modules on flate roof
- Power: 40,32 kWp
- Surface area: 591m^2

Building Movia

- Investor: Movia
- PV modules on roof, without frame
- Power: 23,20 kWp
- Surface area: 173 m^2

Building ERA - Goodcenter

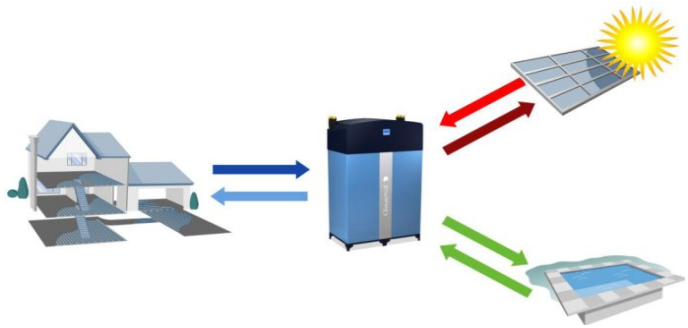
- Investor ERA
- PV moduls on flate roof
- Power: 49,2 kWp
- Surface area: 1033 m^2

Solar cooling

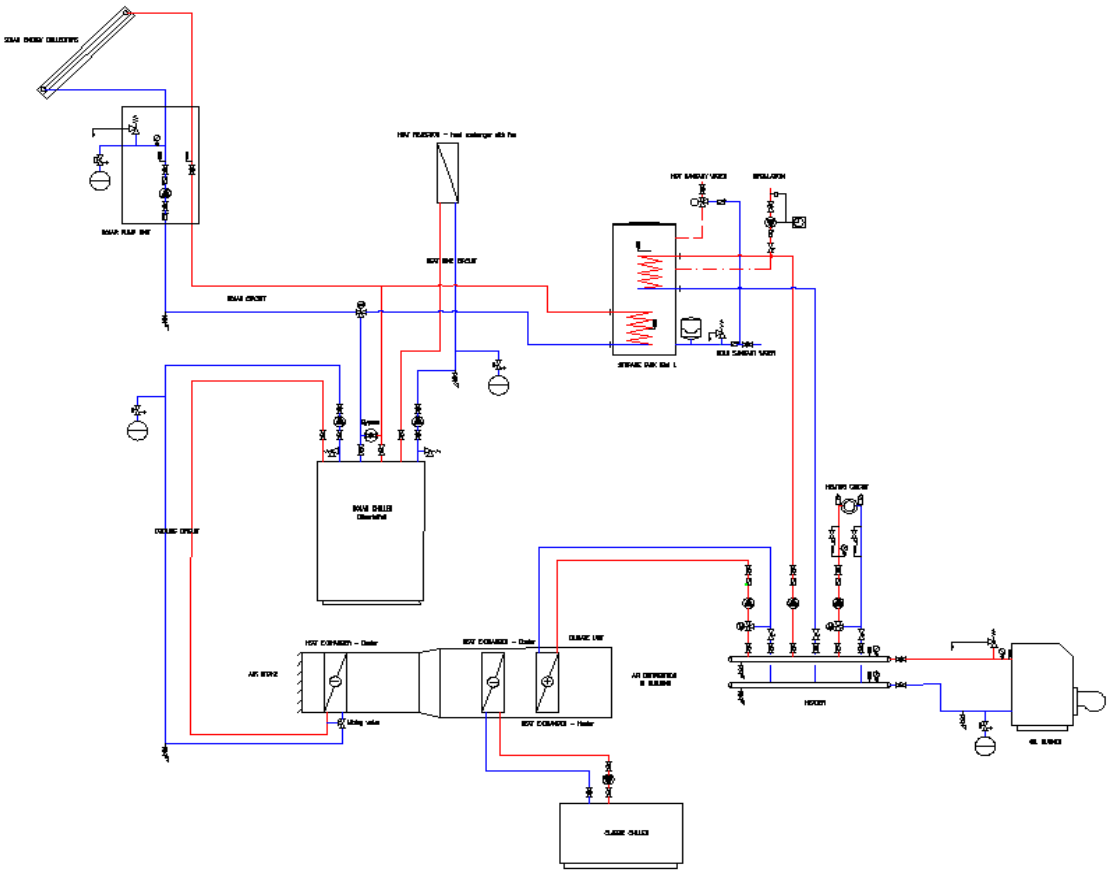
For solar cooling are key elements of the system:

- Thermal solar energy collector, source to supply the necessary heat. SC uses so-called three-stage absorption cycle, with the required propellant medium temperature 85-110 ° C. High temperatures accelerate the process of regeneration of the absorbent charging the SC.
- Distribution circuit for cold water. Cold water circuite is just as important as the process of absorption of heat input to the regeneration of the absorbent. As water is used as a refrigerant, temperature below freezing are not possible. Optimum temperature level of activity is 10-16 ° C, as it shows the high temperature cooling.
- Circuit of waste heat sink. Constantly in the process of SC generates surplus heat from a heat source (solar system) and the installation of cold, so we need extra heat sink system. Designed to be a way to return the temperature of the SC does not exceed 35 ° C.

All three circuits must be properly sized to the system as a whole performs optimally. Very important, in addition to medium flows (a mixture of water and propylene glycol), the temperature levels of all three circuits (the heat source - sun, cold sink - building, sink waste heat - cooling tower) as a very strong impact on the efficiency of the SC.



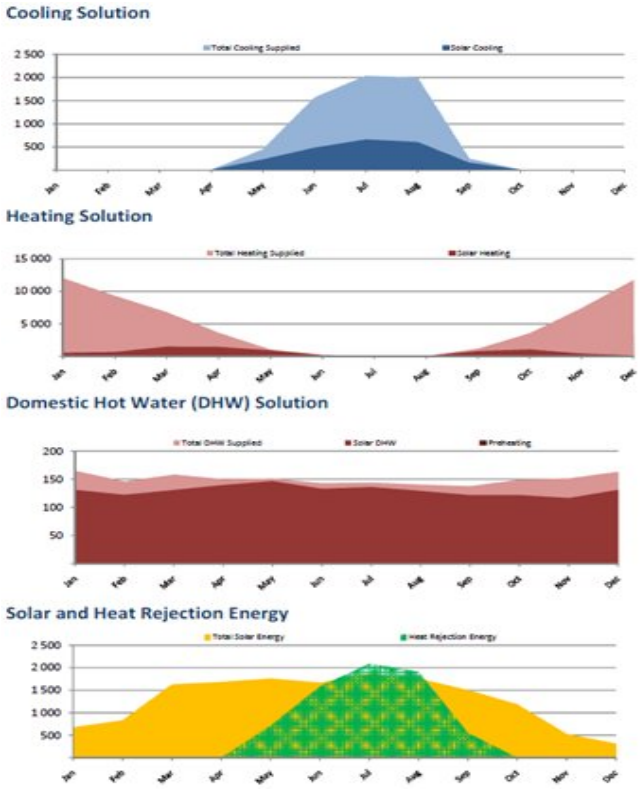
Solar cooling, case Hidria Inštitut Klima



The system is designed in a way that through the channel inlet of fresh air we precool-down air for air handling unit for conditioning the building. Source of heat are highly selective flat solar panels installed on the terrace. For the extraction of waste heat is also installed on the terrace a dry cooler.

Solar cooling, case Hidria Inštitut Klima

	Standar chiller		Solar cooling	
INVESTMENT (15 kW of cooling power)				
Spec. investicija	150 €/kW		2000 €/kW	
Skupaj	2.500,00 €		30.000,00 €	
COSTS/SAVEING				
El. energy consumption	4 kW		0,36 kW	
No. of working hours		2000 letno		
Price for el. energy		0,09 €/kWh		
CO2 coupons		40 €/t		
Price for oil		0,8 €/l		
				Delta
Cooling (calculation)	720		65	**655,00 €**
Heating (calculation)	70 MWh		7 MWh	**560,00 €**
DHW (calculation)	1063 l		0	**850,00 €**
CO2 (calculation)	0		3500 kg	**90,00 €**
				2.155,00 €



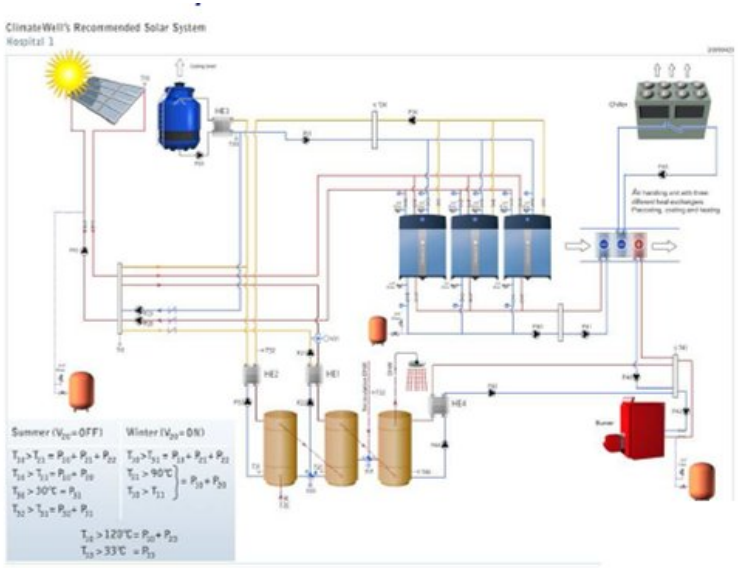
It turns out that the planned savings are € 2,155.00/year and difference in investment between classical solutions and solar cooling is 13 years.
It also appears that the system is very suitable for buildings, which have a greater need for hot water (hotels, retirement homes, hospitals ...), where the savings come more pronounced and hence shorten the repayment period of investment.

Optimum case for solar cooling system

As example of ideal building for usage of solar cooling system is nursing home; with demand for cooling in summer time, big hot water consumption trough whole year and preaheating with solar system in winter time, we present simulation for one case;

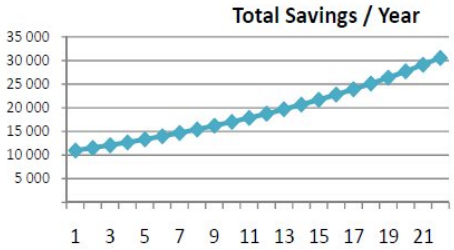
Nursing home

- 2000 m2 of heating/cooling area
- 5600 m3 daily hot water consumption
- 45 kW installed power of solar cooling chiller
- 115 m2 instaled collector surface area



Financial Study

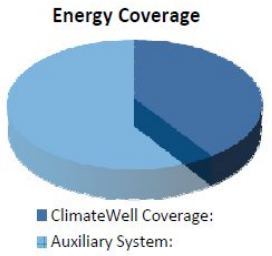
Annual Savings:	10 967 EUR
Average Monthly Savings:	914 EUR
Payback Time:	4 years
Monthly Cash Flow Year 1:	451 EUR
Monthly Cash Flow Year 10:	1 026 EUR



Breakdown Summary

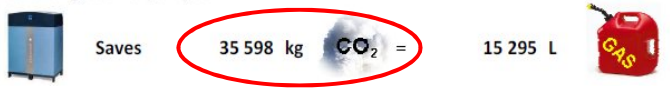
	Energy Saved (kWh)	Reductions (%)	Savings EUR
Cooling	22 425	26%	2 467
Heating	3 614	16%	465
Domestic Hot Water	62 499	57%	8 036
Total		**41%**	**10 967**

ClimateWell Coverage:	41%
Auxiliary System:	59%



Environmental Impact

By choosing the ClimateWell system, you will save 35 598 kg of carbon dioxide annually which is the equivalent of 15 295 liters of gasoline per year.



Summary

The main arguments for decision in favor or solar cooling, highlights:

- Case by case, each object is an example for itrself, the more suitable are those with greater needs for cooling nad heat in the summer months, as both come to the fore more savings with the solar system

- The field of solar energy for heat supply solar chiller is used for domestic hot water and/or preheating of the building.

- The possibility of cascading system expansion - depending on the requirements (needs) increase the number of solar refrigeration units.

- With the growth in energy prices will reduce recovery period investments in solar cooling (currently in Slovenia price el. energy is on 65% of the average price of el. energy in the EU)

- Reducing CO2 emissions: in 2013, lays down quotas for CO2 emissions (estimated € 40 / t)

- Environmental awareness, increased emphasis on renewable energy, reducing energy consumption in buildings