



ClimateWell

Shaping the Future of
Air Conditioning

Solar Cooling[®] - the much awaited
technology
.....and it is already here.



ClimateWell

The ClimateWell concept

- ClimateWell has developed a hot water powered Air Conditioner with an integrated energy storage
- The heat pump delivers air conditioning upon demand without the need of electricity
- Hot water sources suitable for the ClimateWell units include:
 - Waste heat from electrical generators
 - Solar thermal collectors
- The ClimateWell core includes no pumps or other moving parts, is completely modular for tailored power and energy storage capacity
- The technology, called Triple State absorption for its use of dry salt, salt water and water vapor, is proprietary to ClimateWell and enables a whole new generation of thermal cooling solutions



ClimateWell – the company

- Is a Swedish company, which has developed and patented a new Solar Cooling technology
- Is an Award winner at the World Economic Forum, 2007.
As a “Pioneer Technology Partner” ClimateWell’s technology, quote:
“has the capacity to change human lives in the future”
- Is, among other recognitions, awarded by the Fraunhofer Institute for its groundbreaking cooling technology.
- Will shortly finalize the construction of its first production plant in Spain, first commercial market in Europe under development.



Commercial office in Madrid



Manufacturing plant in Ólvega (Soria) - Spain

The ClimateWell technology 1

- A three phase absorption technology (liquid, vapour and solid states), which is patented worldwide
- Generates Solar Cooling and/or heating day and night
- Uses hot water from thermal solar panels at low and variable temperatures
- Produces 100% clean energy
- No electricity consumption, has no mechanical parts and is silent.
- Has an integrated energy storage
- The machine CW10 is completely modular

CW10



	Heating	Cooling
Max Power (kW)	20	10
Storage (kWh)	76	60

The ClimateWell technology 2

Triple-phase absorption heat pump system, or a
” Chemical heat pump with hybrid substance”

Using a hygroscopic salt – LiCl –
with an energy density of 300+ kWh/m³

Solid or Fluid Reactor Substance

- Fluid displays good energy charge and discharge power
- Fluid has very poor storage capacity
- Fluid needs continuous energy input.
- Solid has poor charge and discharge power
- Solid has good energy storage capacity

Triple-Phase: Solid and Fluid Reactor Substance in same process

- Has same charge and discharge power as Fluid
- Has same Energy storage as solid
- Allows salt solution to crystallize, thereby storing energy



How does the technology work?

- Fundamentally an absorption process, that converts heat to cold.
- This process was in fact used already in gas-fired refrigerators developed more than 100 years ago.
- ClimateWell has **improved this process drastically** by adding a patented energy storage solution:
 - Resulting in a de-coupling of the charging (where energy is received from the sun or the generator) from the output (where heat or cold is distributed to the house).
- The new process enables a continuous cooling/heating of the building, even with a highly volatile source of energy like the sun

We charge energy whenever it is available and use it when needed.

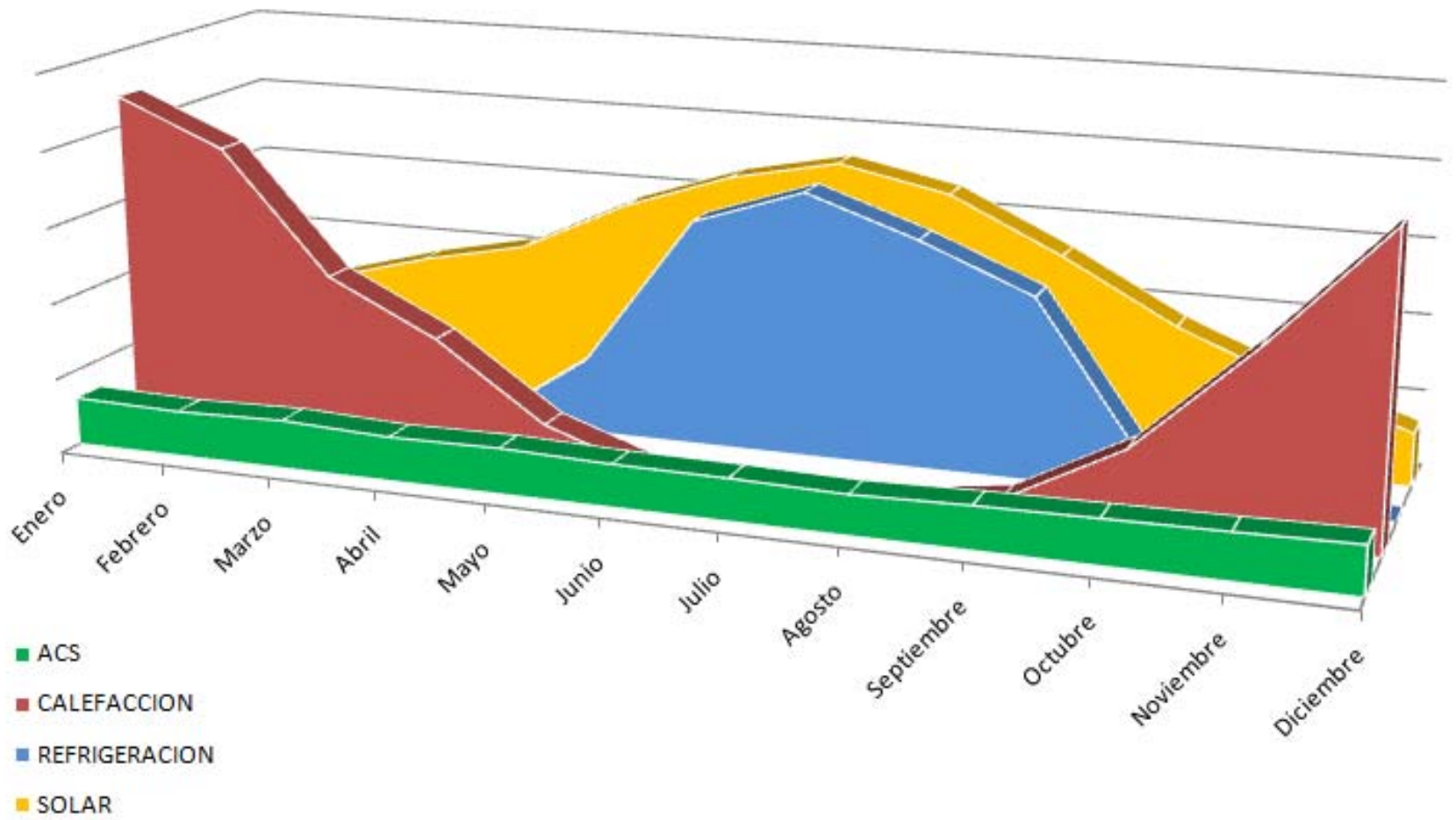


Solar Energy

- The Sun “is the Mother of all energies”
- During one month our planet receives more solar energy than what mankind has consumed throughout all history
- The consumption/production of solar energy is less than 1% in Europe.
- The thermal solar energy is cheap to produce and little exploited.
- ClimateWell’s machine, CW10, utilizes heat from thermal solar panels and produces 100% clean energy



Solar radiation and demand for heating & cooling



Why solar cooling?

- Substitutes electricly driven compressors
- Saves energy and is energy efficient
- Does not use any toxic or harmful refrigerants(CFC).
- Considerable reductions of carbon dioxide (CO2).
- Diversification of energy resources
- Reduces the dependency on energy providers (electric utilities, gas cos.)
- Usage of an unexhaustable source, completely environmentally friendly
- Reduces energy consumption during periods of peak demand of air conditioning
- Reduces the strain on electric grids, thus avoids black-outs
- Offers optimal economical results from usage of thermal solar panels

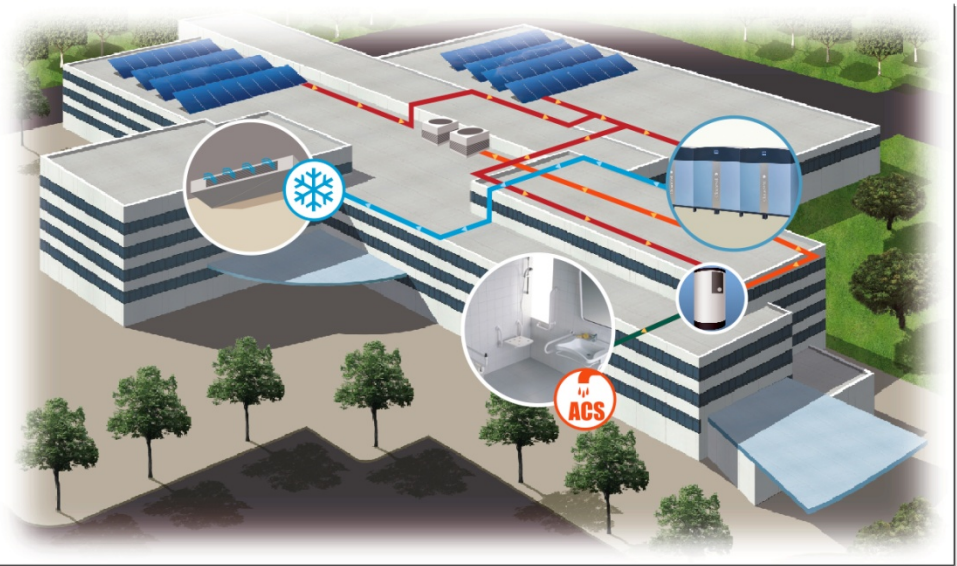


APPLICATIONS

ENERGY EFFICIENCY

Multi family housing
Hotels
Hospitals
Offices
Public buildings, etc.

...



- Integrated with existing and conventional systems for improved energy efficiency.
- Optimal usage of solar energy
- Considerable reductions of energy consumption
- Maximizing the usage of hot tap water from a clean and renewable energy source
- Reductions of the CO2 emissions

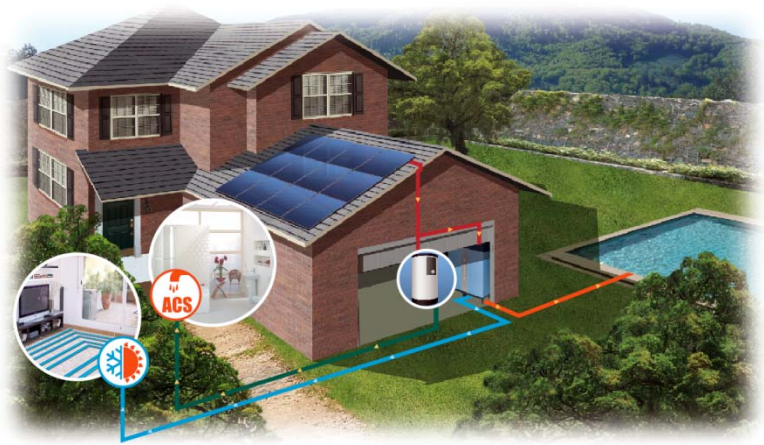


Application – hospitals and geriatric centres

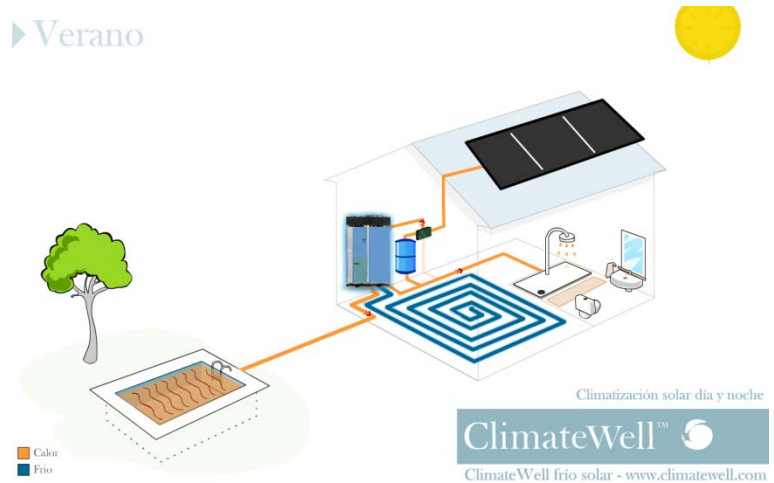
- The ClimateWell installation makes the hospital energy efficient and sustainable and can be integrated in an existing conventional a/c system (chillers)
- For a 200 bed hospital in Germany the savings are calculated to be :
 - 346 000 kg of CO₂
 - 26 000 Euros
- The double usage of the solar heat (heating and cooling) gives a 200% yield of the solar energy.



Applications – single homes



► Verano



- Powered by thermal solar panels (appr. 30m²/machine)
- Indoor cooling and heating, hot tap water and heating of swimming pool
- Integrated storage system (24 hours/day energy delivery)
- Profitable from first day with positive cash flow



ClimateWell

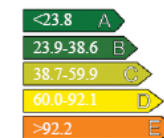
Building energy certifications - cooling and heating with ClimateWell

By installing ClimateWell machine(s) the building energy certificate passes from “E” to “A”

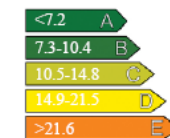
- Saves between 70% and 85% in sunny countries on cooling and heating plus domestic hot water
- Covers 100% of cooling demand
- Annual savings of about 20.000 kWh and some 13 tonnes of CO₂ per machine (South European climate conditions)

II.14 Resumen de los límites entre clases para viviendas unifamiliares en Madrid

Demanda de Calefacción (kWh/m² año)



Demanda de Refrigeración (kWh/m² año)



Detached house Without ClimateWell	
Heating load (kWh/m ² year)	Cooling load (kWh/m ² year)
85*	31*

E

Detached house With ClimateWell	
Heating load (kWh/m ² year)	Cooling load (kWh/m ² year)
17	0

A

Source: Calculations from a semi-detached housing development in Madrid (las Rozas) of 185sqm.



ClimateWell's non-solar energy applications

- The ClimateWell technology offers several further application possibilities, as:
- Transport (substituting the electric compressor for a/c).
- Energy storage from waste heat. The European (and worldwide) industry throws away unlimited amount of TWh per year.
- ClimateWell has an ongoing R&D program for the full usage of these energy application

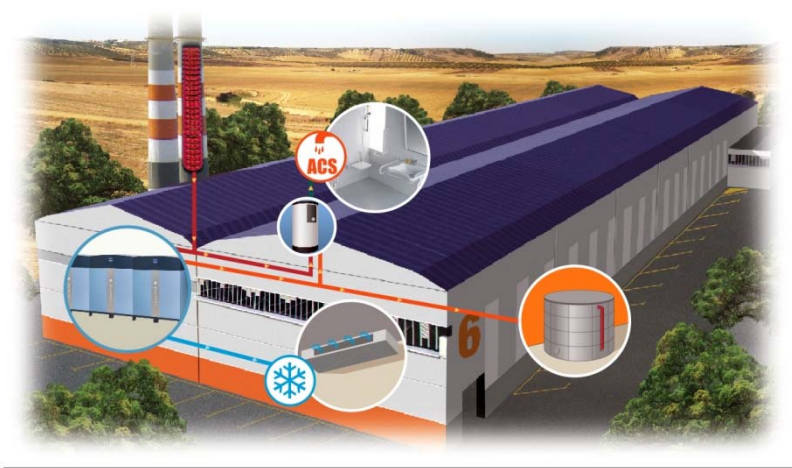


ClimateWell's technology recognised by Swedish Government

- Coalition leaders from the Swedish Government visited the ClimateWell head office in December 2007.
- ClimateWell is now investigating the possibility of building a 7MW system, which will take advantage of 50°C waste heat from a steel plant in Sweden in order to raise the temperature to 90°C and supply heating to the adjacent district heating net.



Example: Utilizing excess heat for cooling



High energy efficiency. Maximizing energy savings in existing and new installations

Utilization of residual heat (cogeneration, gas turbines,...)

Considerable economical savings with positive impact on operational costs

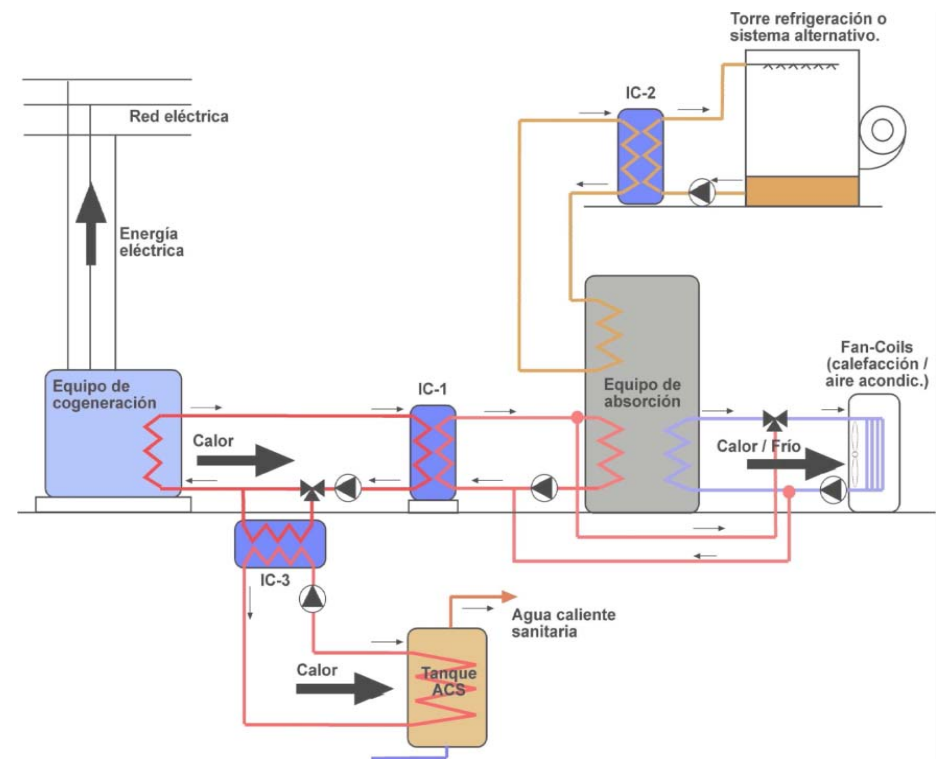
Increased independence from utility companies.



Example solar-gas: Micro-Trigeneration (existing).

The objective is to integrate solar cooling with micro-trigeneration in small installations (SMEs and small industrial plants).

1. Highly efficient
2. Reduction of CO2 emissions (approximately 40%).
3. Profitable from first day of operation



Example of existing installations - Bioclimatic building in Almería, Spain, - the Arfrisol project

Case study with CIEMAT and IDAE with the objective to achieve a 80 to 90% energy savings in comparison to conventional buildings.

The project consists of five buildings, each located in the different climate zones of Spain:

- Almería, Desert conditions
- Almería Coast
- Soria
- Madrid
- Oviedo



ClimateWell Show-House

Single house dwelling
Madrid, Spain

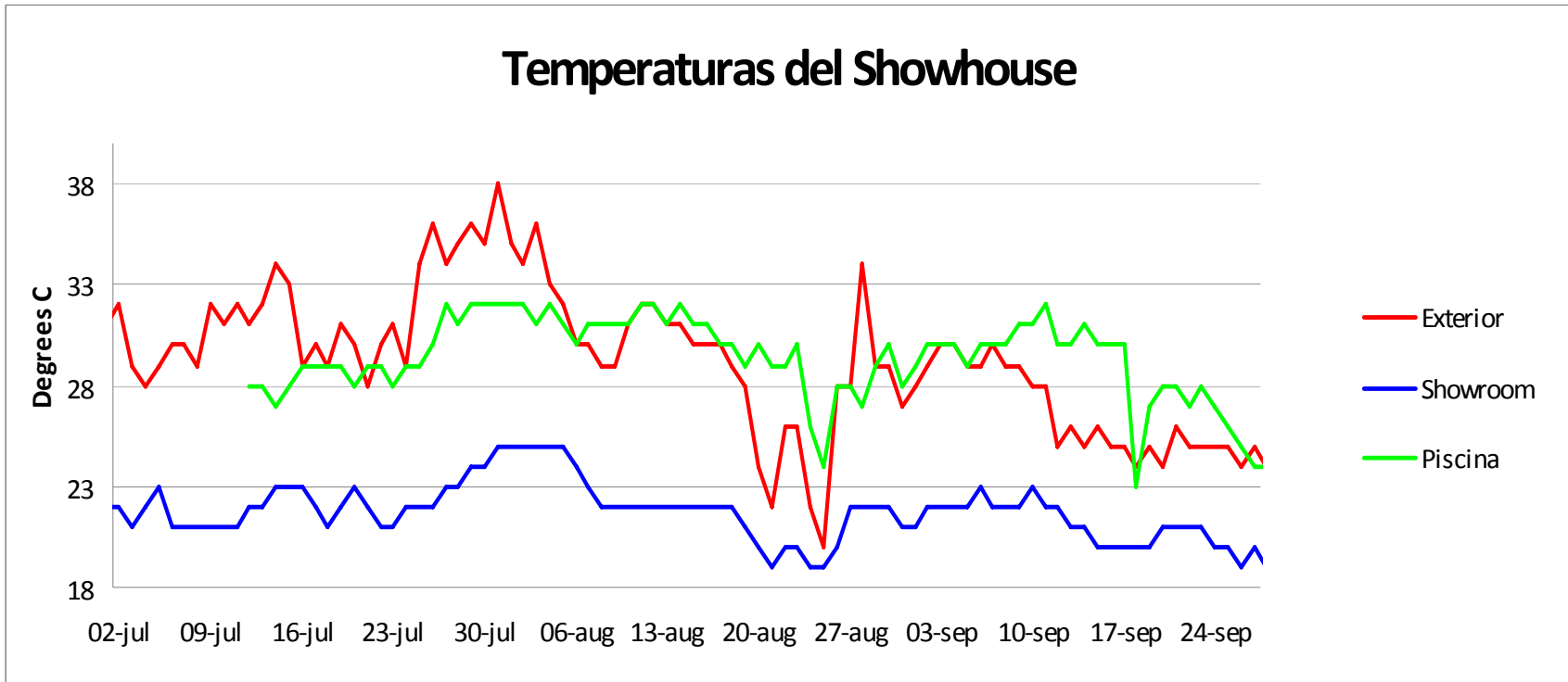
Objective: Optimize the usage of solar energy

Indoor distribution system:	Radiant floor (plastic tube circuits with water)
Thermal solar panels:	34 m ²
Heat sink:	Swimming pools (2 x 12m ²)



Show-House Madrid – temperature chart summer 07

Total cooling area 220 m².



The new production plant in Olvega, Soria, Spain



Current situation of the construction of the plant





The current Energy situation in Europe

- Overall lack of fossil energy sources
- Coal no long term alternative
- High dependency on energy imports
- No homogenous electric tariff system
- Insufficient electric grid network
- High crude oil prices, currently > 90USD/barrel

Prevailing downsides:

- High emissions of CO₂ and other polluting gases
- High risk of accelerating the Climate Change

EU and the European Renewable Energy Council



- Heating and cooling corresponds to some 50% of all energy consumption in Europe and is now proposed by the EU Commission to be included in the overall mix of renewable energy programs in order to achieve the various 2020 targets.
- Each member state has the responsibility to develop its own energy program and, by obligation, include heating and cooling.
- By 2020, 25% of all heating and cooling consumption should come out of renewable energy sources (12% of all energy consumption in EU)
- Heating can be obtained by solar, geothermal and biomass energy.
- Solar Cooling offers economical viability year round.



ClimateWell and EU administrative institutions

- The Stern report emphasises that the fight against the ongoing Climate Change can only be achieved through collaboration between Public Institutions and private enterprises.
- Best way forward is to create stable legal frame work, which guarantees increased renewable energy production and enhances (self) consumption, like:
 - **Compulsory regulation for public buildings to use renewable energy.**
 - **Compulsory regulations for housing, offices, hotels, hospitals, etc. to use renewable energy.**
 - **Access to no-limit and long lasting subsidies**



Examples of energy savings in numbers

Average solar field per installation	30 m ²
Annual captured solar energy (average Spain)	840 kWh/m ²
Captured solar energy per installation	25 200 kWh/year
Yield of solar field	79%
Annual energy savings	20 000 kWh/year
Typical reduction of CO ₂ emissions per installation	13 Tonnes/year



	2008	2009	2010	201?
Forecasted # of installations of CW10	300	3 000	12 500	100 000
Forecasted sales of Solar Thermal collectors [m ²]	9 000	90 000	375 000	3 000 000
Accumulated energy savings [kWh]	6 000 000	66 000 000	316 000 000	4 632 000 000
Accumulated reduction of CO ₂ emissions [Tonnes/year]	3 900	42 900	205 400	3 010 800
Equivalent of Mediterranean Forest (10T CO ₂ /ha) [ha]	390	4 290	20 540	602 160
Reduction of power peaks [kW]	1 500	16 500	79 000	1 158 000



ClimateWell – www.climatewell.com

Proprietary technology by *ClimateWell*, “3 phase absorption”, worldwide patents



- Stockholm, Sweden: Group Head Quarter
- Madrid, Spain: Commercial office
- Soria, Spain: Production plant



Partners and references



ClimateWell