

Solar Field CANDIA MARIS TEAB SA



Solar Field and Energy Saving for Hotels, case study: Candia
Maris Hotel

Motivations to implement energy-saving solutions in reference with hospitality in Greek Islands

- *Large thermal loads (swimming pools, spa, athletic facilities...)*
- *Availability of sites for solar panels*
- *Significant loads of air conditioning (common rooms and resident rooms)*
- *Remarkable synchronisation between energy demand and energy supply (during summer)*
- *Increasing cost of conventional energy sources*
- *More environmentally friendly attitude of the people versus ecological solutions*

Implementation of central solar plants

Small Hotels:

- Very common
- Rather simple
- Limited in production of usable hot water

Large Hotels:

- Not so common and more difficult
- Independence of their energy subsystems
- Presence of loads in different thermal levels
- Safe energy supply without operational problems
- Need for aggregate energy design
- Reliable and economically vital technical solutions

The case of CANDIA MARIS HOTEL



The Hotel:

- Runs all year
- 257 rooms
- ≈ 110.000 nights/year, 1 restaurant, 3 taverns, 1 snack-bar
- Conference center of 1.780 places
- Thalassotherapy
- Hydro massage
- Football and tennis fields

The case of CANDIA MARIS: Before the project (1)



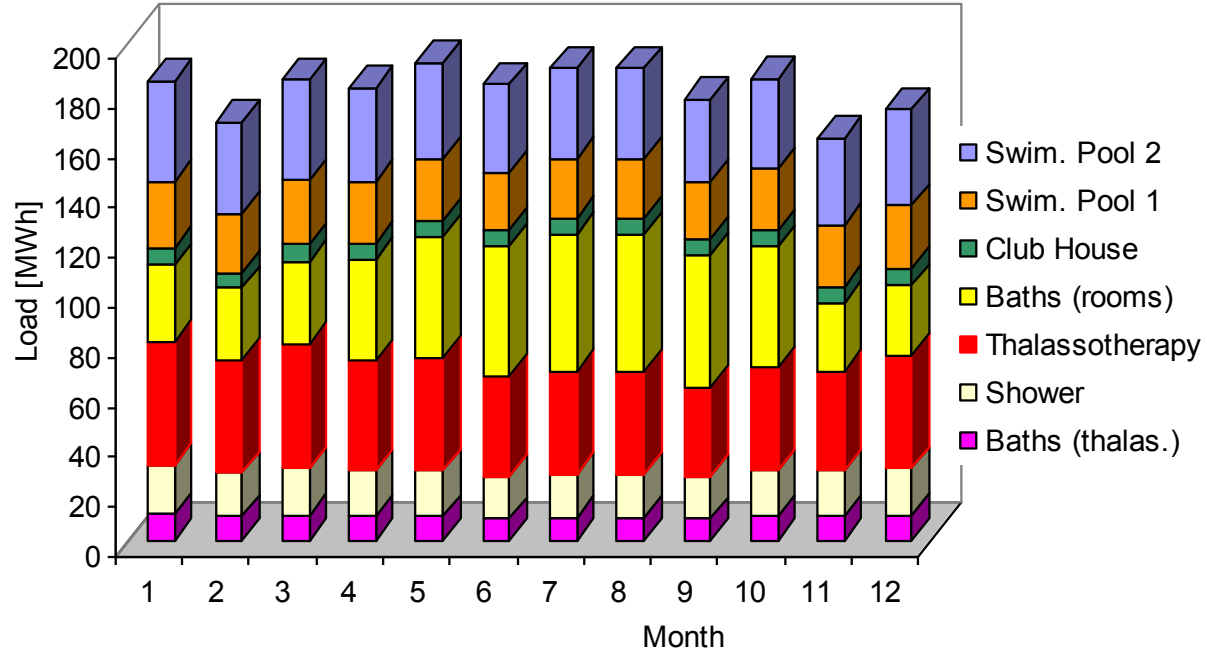
Energy loads:

- Rooms, kitchen and restaurants: 30 m³ of usable hot water at 48° - 55°C
- Spa (1): 3 indoor swimming pools with heating systems and one semi-closed, 500 m³ sea water, 32 - 35°C, 10% renewal/day
- Spa (2): 8 bath tubs 300 lt each, 53 m³/day hot sea and fresh water at 35°-40°C
- Hydro massage & sea water jet: 6 m³, 27 m³/day hot water at 38°C
- Football and tennis: 14 showers, 5 m³/day hot water at 48°- 55°C
- Air-conditioning: 2 water cooled units (300 RT)

The case of CANDIA MARIS: Before the project (2)

Energy loads: evaluations (historical data)

- Thermal loads 2.166 MWh
- 3 boiler- rooms
- 6 boilers
- 47.630 lt of oil
- 449.651 lt of gas (LPG)
- Problem: water supply
3 tanks (500 m³)
municipality water supply,
bore, transfer with trucks



The case of CANDIA MARIS: applications of solutions in solar and energy saving systems

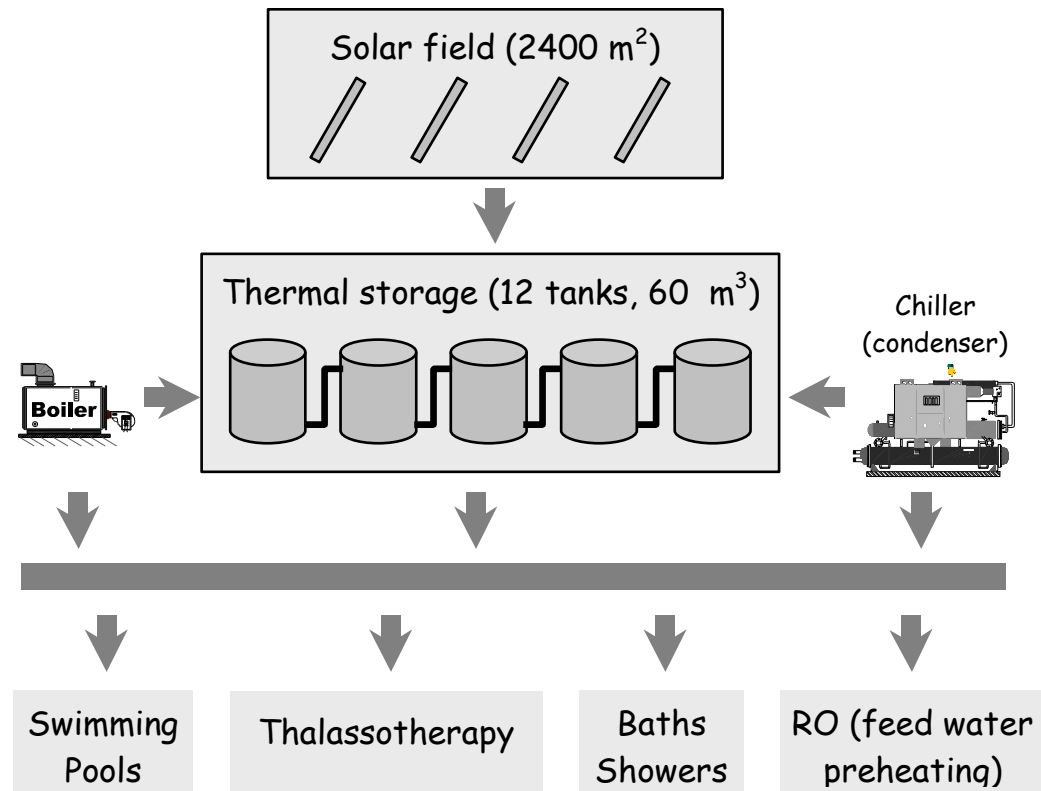
Study and realisation

- Sol Energy Hellas S.A.

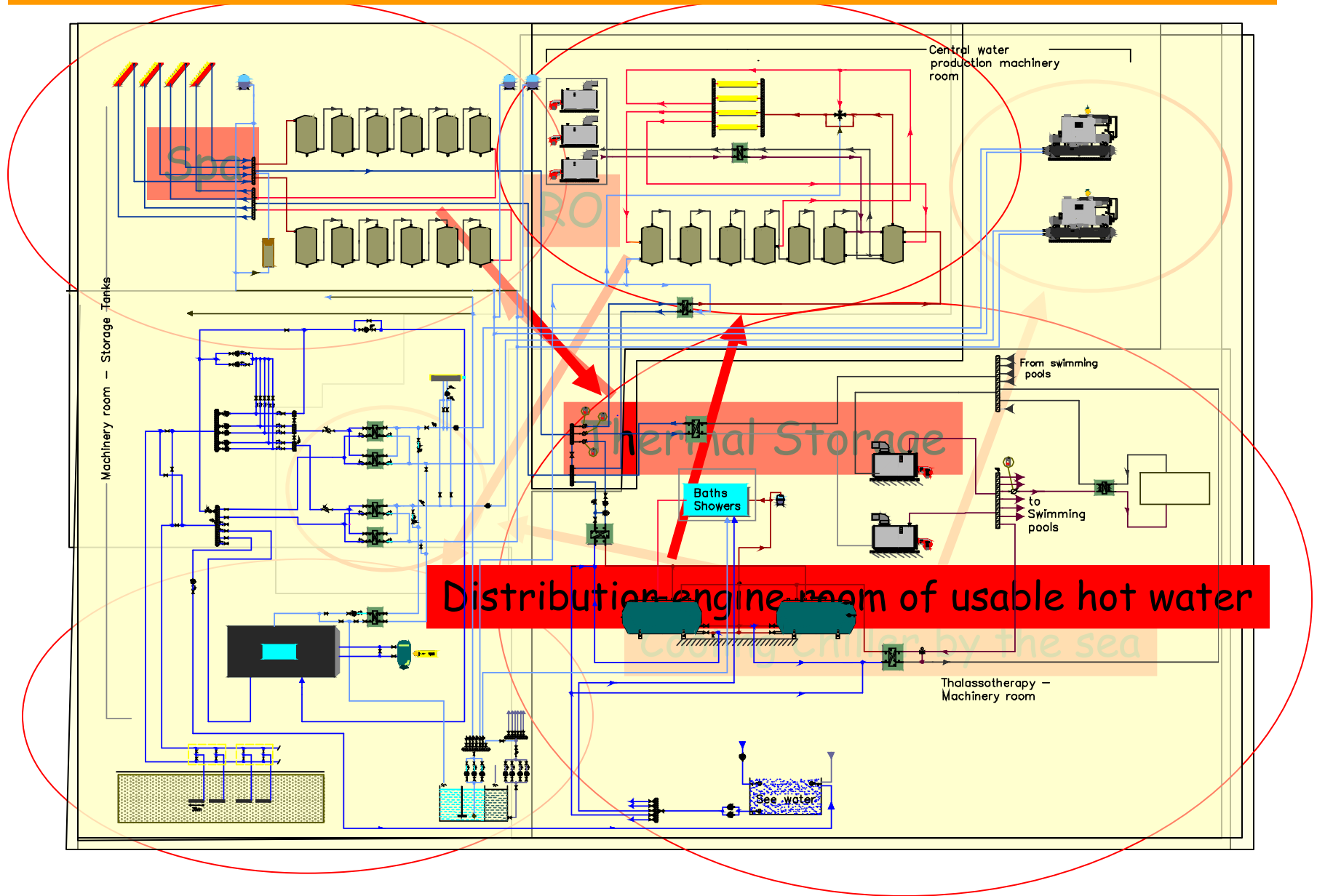
(URL: www.solenergy.gr)

General views:

- Central active solar system of heating water
- Disposal thermal energy from chillers in sea and partial recovery
- New engine rooms
- Reverse Osmosis
- Building Management System and better control strategy

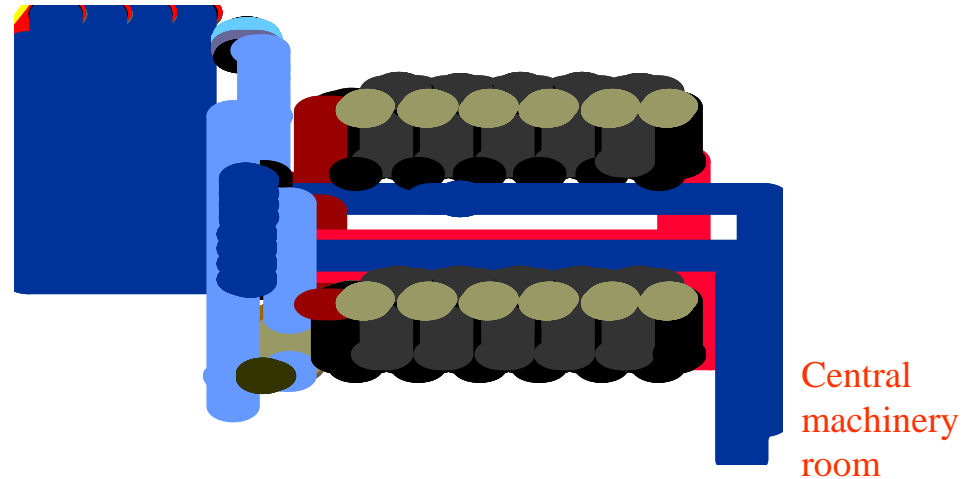


The case of CANDIA MARIS HOTEL: General view



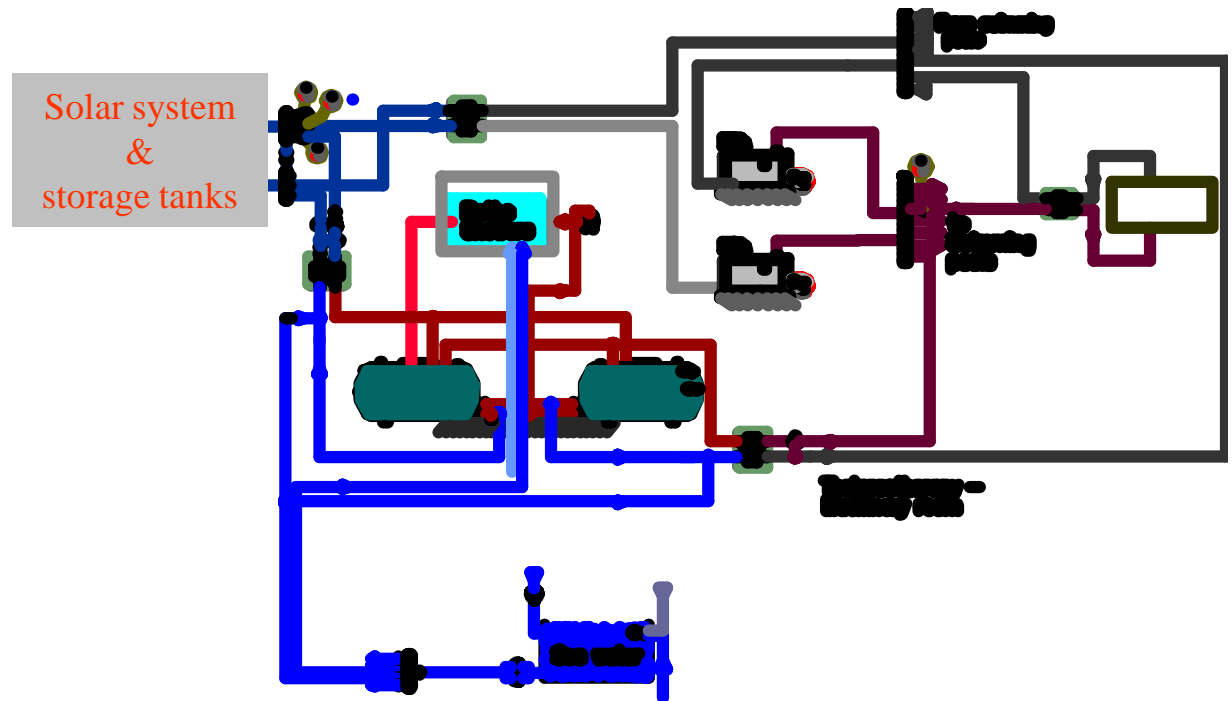
The case of CANDIA MARIS: Solar System

- 4 solar fields
- 850 collectors of high performance (2.397 m²)
- 12 new storage tanks (60 m³)
- New engine room
- 3 plate heat exchangers
- 3 uses: hot water (Central engine room), heating of sea water, heating system of swimming pools



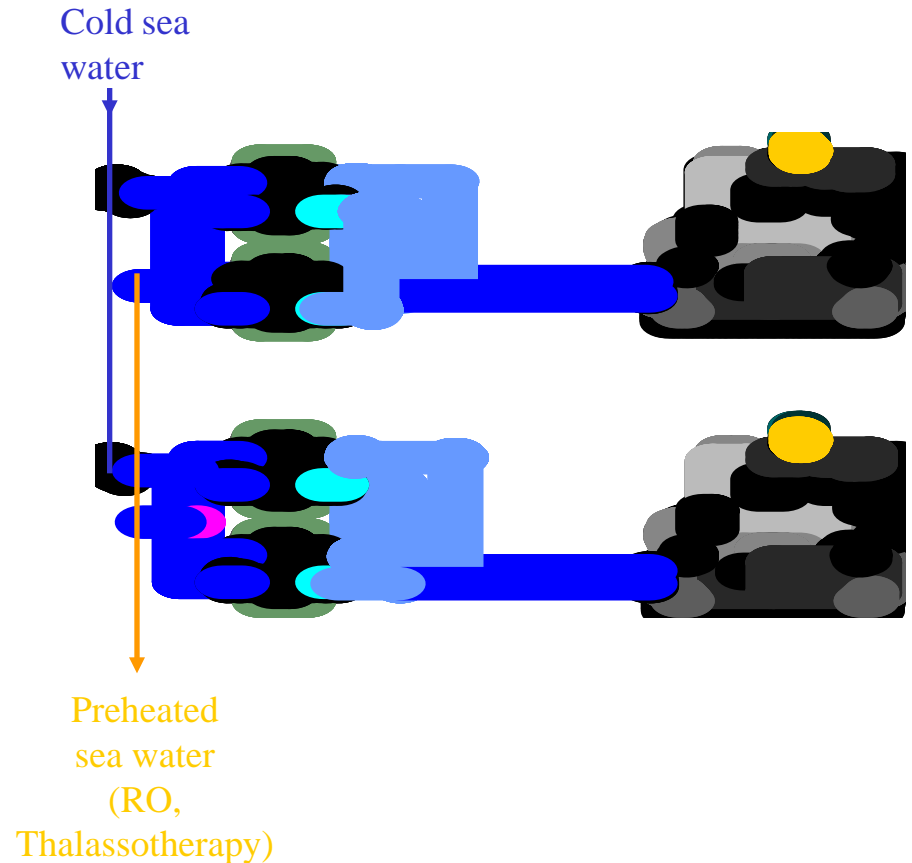
The case of CANDIA MARIS: Thalassotherapy

- 10 m³ storage tanks of sea water, stored at 40° – 45°C
- Boilers (back up)
- Refurbished plumping



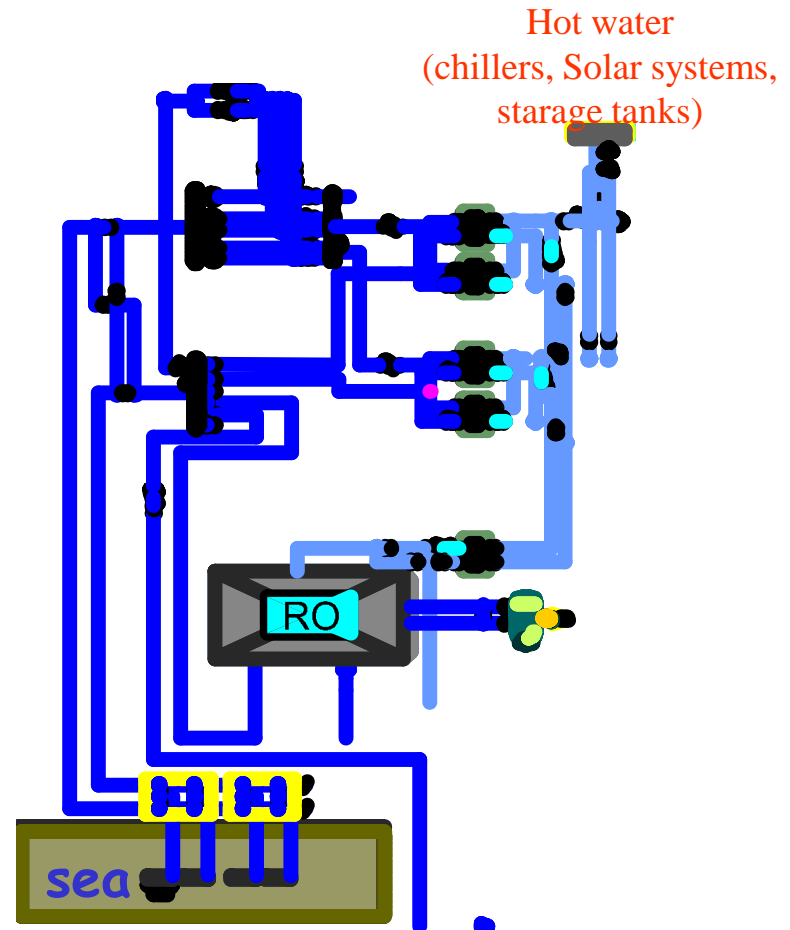
The case of CANDIA MARIS: Partial heat recovery and disposal of the balance of the sea (chiller)

- Replacement of cooling towers by 4 plate heat exchangers (made by titanium) which are cooled by sea water
- Temperature controlled delivery (water flow)
- Recovery of heat (hot water for desalination)
- Highest COP
- Higher cooling capacity



The case of CANDIA MARIS: Desalination plant

- R.O. unit of 3rd generation
- 120 m³ per day
- pressure exchanger
- supply of preheated water for higher performance



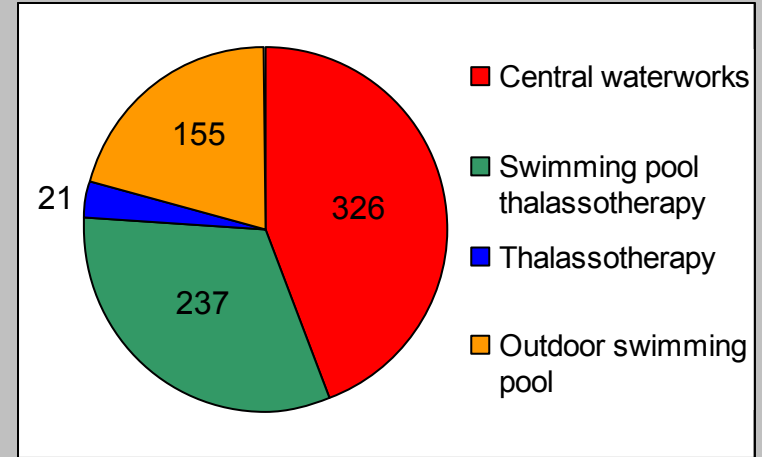
The case of CANDIA MARIS HOTEL: Central control

- Building Management System (BMS)
- Check all plants producing thermal energy and energy saving
- Supervision and remote monitoring system
- Schematic
- Databases of measurements (heat meters, temperatures, hot water supply, Βάσεις δεδομένων μετρήσεων (θερμιδόμετρα, θερμοκρασίες, Παροχές ζεστού νερού, operation hours and electricity consumption)

The case of CANDIA MARIS: Primary results

- Measurement of actual energy savings: fundamental conditions for further penetration of solar thermal technology and energy efficiency in the market.
- Candia Maris Hotel: Commitment of guaranteed performance
- The operation of the system began gradually on 1st of August in 2002
- After measurements it was revealed that for a period of 8 months (July to February) there was a significant energy gain of about 740 MWh of actual savings (equivalent to 115.529 lt oil), although the region of Heraklion sunshine during this period was lower than the average of the last 10 years.

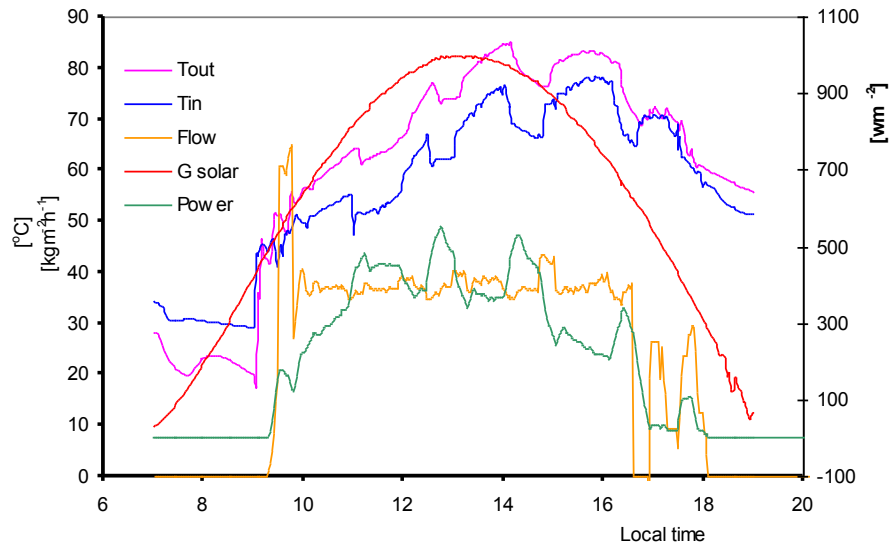
Solar system



Heat recovery (chillers)

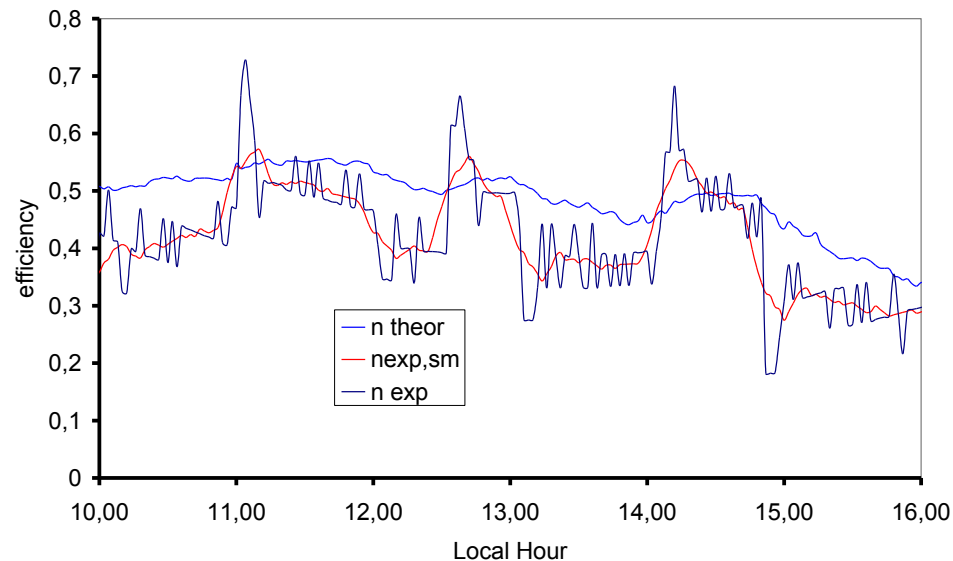
Typical conditions of coolers operation			
	Before (without heat recovery)		After (with heat recovery)
Cold water temperature	8-13 °C		8-13 °C
Condenser leaving temperature	40 °C (spring - autumn)	45 °C (summer)	30 °C
Cooling power delivered	683 kW	654 kW	757 kW
Absorbed power	178 kW	189 kW	153 kW
COP	3,84	3,41	4,94

The case of CANDIA MARIS: Evaluation by others



- Measurements using calibrated tools under actual operating conditions
- Laboratory will propose potential interventions, based on analysis of measurements
- Optimizing the system to maximize energy benefits

- Objective assessment
- Independent third party: Solar & Other Energy Systems Laboratory NCSR "DIMOKRITOS"
- Accredited quality control laboratory, performance and durability of thermal collectors and systems



The case of CANDIA MARIS: Conclusion

- Thermal solar systems and energy savings in major hotel groups: a challenge for investors, engineers and builders
- The success of such projects shall be the final energy and financial results
- **Technology**: central solar systems, recover from the condensers of central air conditioning units, central control for monitoring and energy management of all energy subsystems
- **Methodology**: proper design of facilities, integrated management of different energy needs, quality of used products from third objective assessment of actual energy charges.
- Candia Maris: experience shows that results can be really positive for investors in the field of solar thermal systems in general.



The case of TERRA MARIS : Summary

The Hotel:

- Operates seasonal
- 141 room and suites. Also has Bungalows. The total number of bed served is 750

The case of TERRA MARIS : Summary

- **2 solar fields** consisting of **390 panels Chromagen-CR120 central high performance** total area of **1.100 m²** located in the southwest part of the surroundings of the hotel (Solar park)
- Thermogalvanised clamping brackets on the concrete structure which will be created. Consolidated construction of holders for panels on the building created by thermogalvanised supports shaped L or I
- Components for connecting collectors (taps, valves, fittings, automatic vents, etc.)
- Regulatory valves, thermometers for **56 arrays**.
- Supply and installation of capture oxygen system (oxy-free) for the protection of solar fields closed circuit
- Installing the panels on the platforms and connecting them in arrays with the necessary components
- Full hydraulic design, supervision and technical support of the entire plant

The case of TERRA MARIS : Summary

- Adjustment and balancing flows per array through regulatory valves using a microcomputer, recording each valve's regulator setting and numbered per array
- Boiler with a manhole **10 X 5.000lt = 50.000lt** by DIN4801-2-3-4, Italian origin, insulated with 10cm insulation
- Corrosion protection of Boilers with imposed current cathodic protection Guldager Denmark
- 2 pumps for solar fields, WILO inline.
- 2 pumps for Boiler- solar fields, WILO inline.
- 2 pumps Back-up WILO primary- secondary inline.
- 2 solar exchangers (plate - ORW 3)
- 1 Back-up exchanger (plate - ORW 3)

The case of TERRA MARIS : Summary

- 8 electro valves **δίοδες** (trunk , μοχλισμός , engine) Siemens
- 2 **Θερμομικτικές τετράοδες** valves Tour & Anderson, Sweden
- Regulatory valves Tour & Anderson, Sweden
- 1 Calorimeter (trunk and electronic components of connection) Techem, Germany
- Complete plumbing installation for the interconnection of arrays of panels on the concrete structure which will be created and interface with existing equipment
- Provision of all ancillary equipment and installation
- Insulation of all new networks

Presentation of energy benefits

- Total number of nights: 110.000
- Needful thermal load: 989MWh
- Needful LPG quantity: ~104.000lt
- Load covered by solar field up to 85%
- Total LPG quantity saved: ~88.000lt