

*1st International Conference on
BioInspired Materials for Solar Energy Utilization*

presentation

**MARKET ANALYSIS AND APPLICATIONS OF SOLAR THERMAL
SYSTEMS IN GREECE (1970-2011)**

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Market Analysis: Experience in Greece

- The mid-70s started a new era for solar thermal systems in Greece. As the typical Greek household used electric heaters, so the rising price of electricity supported development of the ST market. Most existing companies were founded then.
- Olympic Sun was founded in 1979.

The manufacturing facilities are located in Crete .



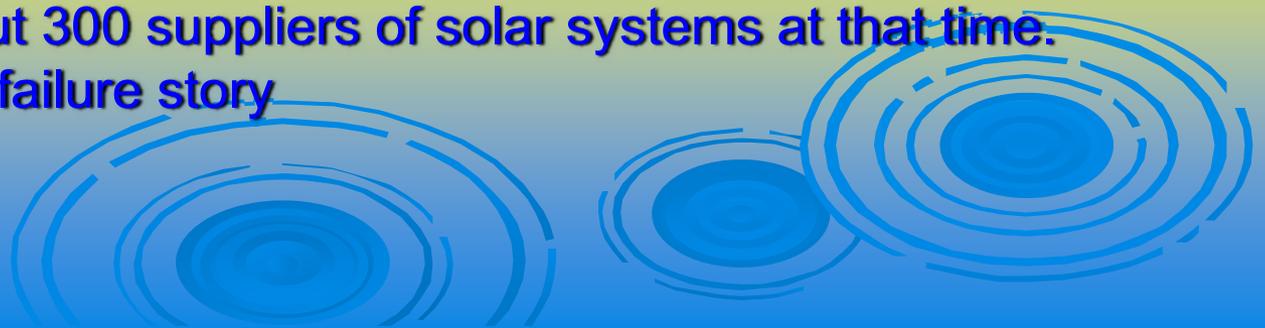
- Since then the solar heating market developed and evolved to the point where Greece has become one of the most successful countries worldwide in the use of solar energy for the DHW.



Reasons for the success of Solar Thermal Systems in Greece are

summarised below:

- High solar radiation, appropriate climatic conditions and morphology of the country.
- Successful marketing campaigns. In 1982-1986 the Greek State supported a broad dissemination of the technology (advertisements, information brochures, demonstration projects, exhibitions).
- Legislative support and incentives at early stage. Low-interest loans and tax credits were also available during this period.
- Continuous effort from the manufacturers for better and cheaper products.
- The first steps toward achieving credibility and confidence among potential clients was achieved leading to public acceptance. Information and professionalism are indispensable qualities, combined with high trained installers.
- Easy access to solar thermal products.
- There were about 300 suppliers of solar systems at that time.
- Success story vs failure story



- End of 80's the market slightly decreased due principally to:
 - • the decrease in oil prices after the end of the oil crisis;
 - • reduced electricity tariffs, influenced by governmental social policy, that have decreased the competitiveness of solar systems;
 - • financial constraints that have slowed down the construction rate of new buildings;
 - • the removal of all existing incentives and the lack of support of solar systems in the future;
 - • the limited budget available for promotion campaigns and development because manufacturers have suffered from sales decrease and a lack of funds.
- Industry standards were introduced on the national level by the end of the 80's which decreased the number of certified manufacturers.
- Mid 90's the solar thermal market approached maturity and is consolidated between 150,000–200,000 m² of collectors/yr, depending on the number of new built dwellings, electricity prices, financial incentives etc



ΠΡΟΙΟΝΤΑ-ΥΠΗΡΕΣΙΕΣ products-services

- ΗΛΙΑΚΟΙ ΘΕΡΜΟΣΙΦΩΝΕΣ ΟΙΚΙΑΚΟΥ ΤΥΠΟΥ - thermosiphonic water heaters
- ΗΛΕΚΤΡΙΚΟΙ ΘΕΡΜΟΣΙΦΩΝΕΣ electric water heaters
- ΕΠΙΠΕΔΟΙ ΗΛΙΑΚΟΙ ΣΥΛΛΕΚΤΕΣ flat plate solar collectors
- ΔΟΧΕΙΑ ΑΠΟΘΗΚΕΥΣΗΣ ΘΕΡΜΟΥ ΝΕΡΟΥ 500-5000 ΛΤ DHW STORAGE TANKS 500-5000 LT
- ΕΓΚΑΤΑΣΤΑΣΕΙΣ ΚΕΝΤΡΙΚΩΝ ΣΥΣΤΗΜΑΤΩΝ (BMS) Large collective solar installation mainly in hotels for hot water production
- ΗΛΙΑΚΗ ΥΠΟΒΟΗΘΗΣΗ ΚΕΝΤΡΙΚΗΣ ΘΕΡΜΑΝΣΗΣ- ΨΥΞΗΣ Space heating, district heating, Solar air conditioning
- ΣΥΝΕΡΓΑΣΙΑ ΜΕ ΕΚΠΑΙΔΕΥΤΙΚΟΥΣ ΦΟΡΕΙΣ

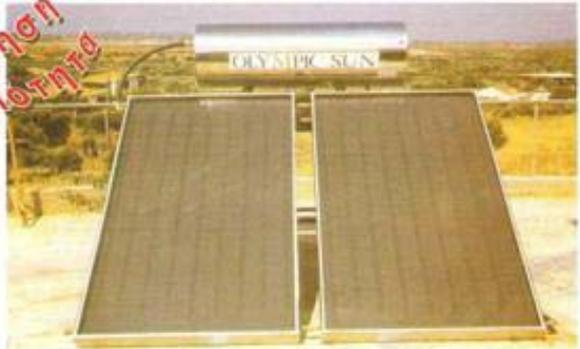
Από το 1978

ΗΛΙΑΚΟΙ ΘΕΡΜΟΣΙΦΩΝΕΣ

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ΜΕ ΕΓΓΥΗΘΗ
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Involvement and cooperation with the local technical institutions. Prototype solar powered unit for the production of biodiesel using kitchen oils.



ΣΥΜΜΕΤΟΧΗ ΣΕ ΕΚΘΕΣΕΙΣ



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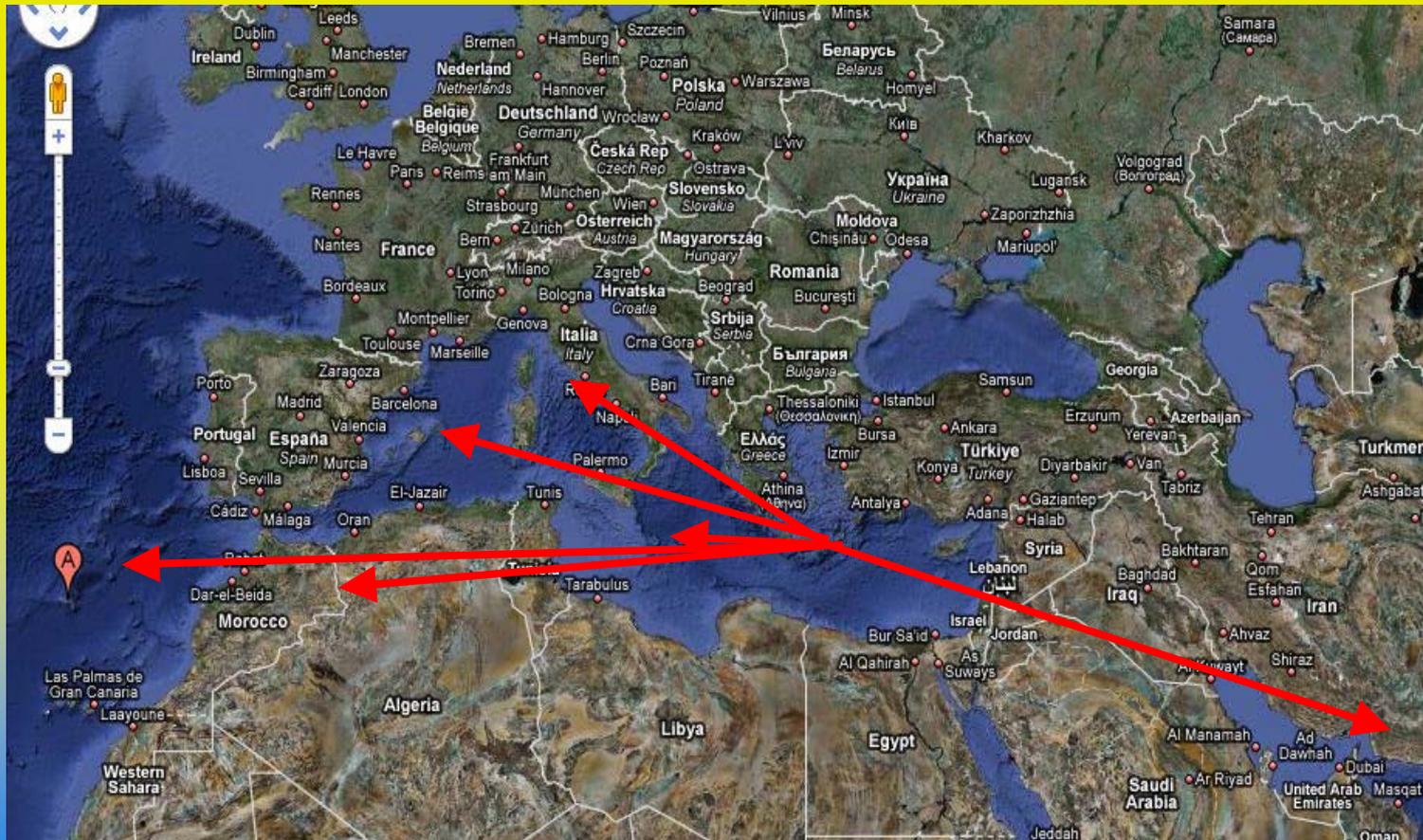
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- notwithstanding high transportation costs, our products are being distributed to several countries, mainly within the Mediterranean basin: [Italy, Spain, Morocco, Malta, UAE, Madeira/Portugal]



INDUSTRY STANDARDS are the *Certification and Quality Assurance* and acted as the most important management tool for the Greek manufacturers *Olympic Sun applies a product and service quality system* to all stages of production from the raw materials to packing and delivery, in accordance with the demands of the International **ISO 9001** standards.

The Greek Standardization Organization provides working guidelines and instructions, which analytically describes the means, criteria and corrective actions required in order to avoid producing any non-conforming products. This certificate and including the product test reports from a certified laboratory, constitute the **EC CONFORMITY DECLARATION** - the well known CE we see on every product.

In June 2005 a new Certification Board was established in the European Union, eliminating unevenness in regulations and norms amongst the member states of the EU, issuing the **SOLAR KEYMARK** certificate which is the quality label for solar thermal products in Europe. The certification body issuing the SOLAR KEY MARK in Greece is ELOT in lieu of the solar test laboratory of Demokritos (National Center for Scientific Research).



ISO 9001 & Solar Key Mark



Rooftop 30 kWp PV installation



CURRENT MARKET STRUCTURE AND SEGMENTATION

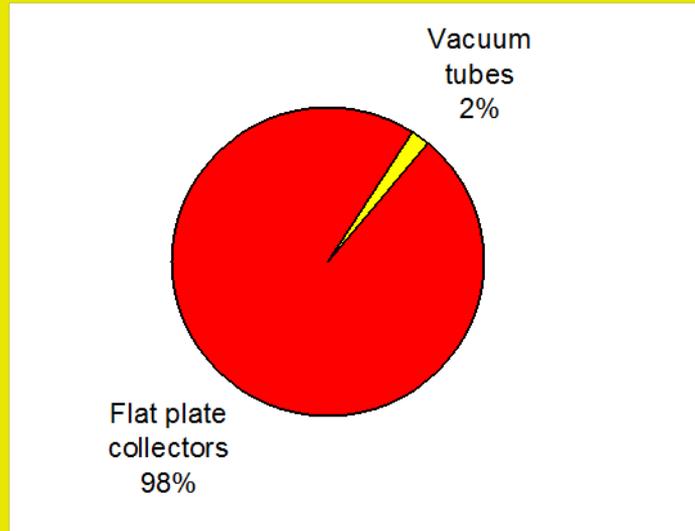
- Most solar systems installed in Greece have flat plate collectors (black paint or selective coating).
- The most common storage tank range is between 160-200 litres with 3-4 m² flat plate collector area. These systems are adequately satisfying an average household's hot water demand (based on 3-4 persons per household).
- The Greek solar thermal market depends heavily on the residential sector, which accounts for 88% of the total market in 2007/2008, due to the long tradition of using solar systems for provision of sanitary hot water in households.



- Since recently (2001/2002) there are some solar thermal systems in the market which utilise vacuum tube collectors; however, the penetration of these systems is still very small. Their performance in thermosifonic systems are inversely proportional to that of the forced circulation one.
- Working on force circulation can produce very high temps above 100C making them appropriate for certain applications such as solar air-conditioning and other industrial applications.
- A major disadvantage is that they still need to prove their longevity.



- Flat plate collectors account for around 98% of the total market by volume. These collectors are in most cases a synonym for the solar thermal industry.



Reasons of the flat plate collector dominance in the market:

- Large flat plate industry with currently more than 30 local producers
- A long tradition of using flat plate collectors (since 1970's)
- Collectors with vacuum tubes are still new in the market and the end users are not very familiar with them
- Lower prices than vacuum tubes (lower initial investment)
- Less fragile than vacuum tubes and have longer life span
- Easy installation and maintenance
- tomorrows technology vs todays technology ???????

Stoned Building (solar heater integration)



Tiled roof installation (south oriented roof)



A different approach (east-west oriented roof)



Solar assisted space heating installation (Genova)





PANEL INSTALLATION 25°



Synopsis of the current situation

- The share of new built installations in the residential sector is expecting to experience some modest decrease since 2008, which has been mainly attributed to the global recession, slow growth of the construction industry, widespread delays in project completion, insufficient private investment and bureaucracy. However and from my point of view I would anticipate that the Greek market is not expected to suffer a meltdown but neither is it expected that it will achieve a breakthrough of increased volumes in the near future.

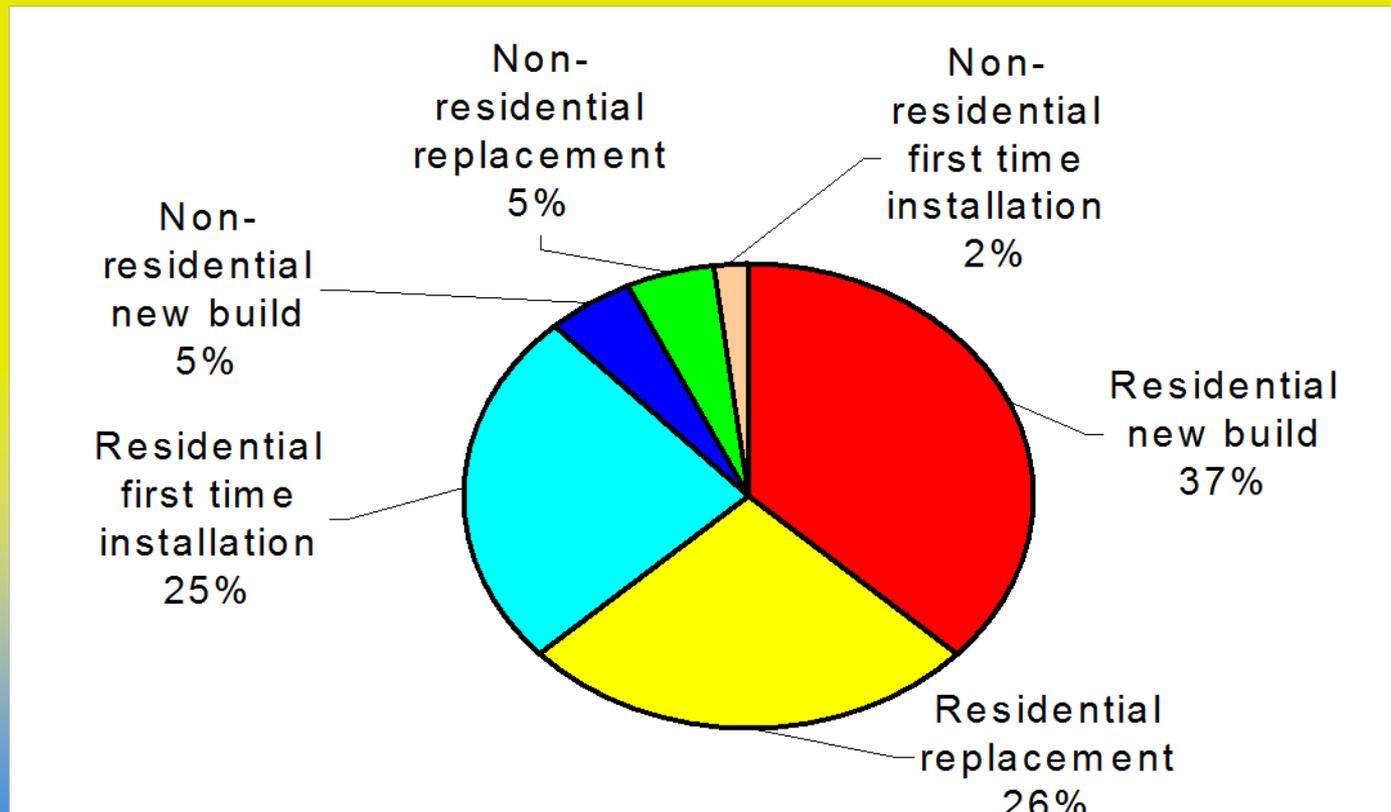


Figure 1 Solar collectors by end-user sector, volume %, 2008

➤ Other tertiary sectors and promising sub-sectors for the application of Large Scale STS are:

➤ 1. Hotels

➤ 2. Hospitals

➤ 3. Care buildings

➤ 4. Sport Centers

➤ 5. Large scale solar A/C projects

➤ 6. Solar assisted space heating

➤ 7. Industrial Sector

➤ Four main industrial sectors can be distinguished, promising a good acceptance of large solar thermal systems.

➤ Industries with relatively low energy consumptions, where the fraction of energy provided by the solar thermal system to the industry's energy load is quite significant. Solar thermal systems are particularly effective in industries that require water temperatures in the range 40 – 80 °C.

➤ The most promising industrial sub-sectors for the application of Large Scale STS are:

➤ 1. **Food industry** (Dairy products, cold cut and process meat factories, pastry and cake confectioneries, olive oil refineries, tinned goods, slaughter houses)

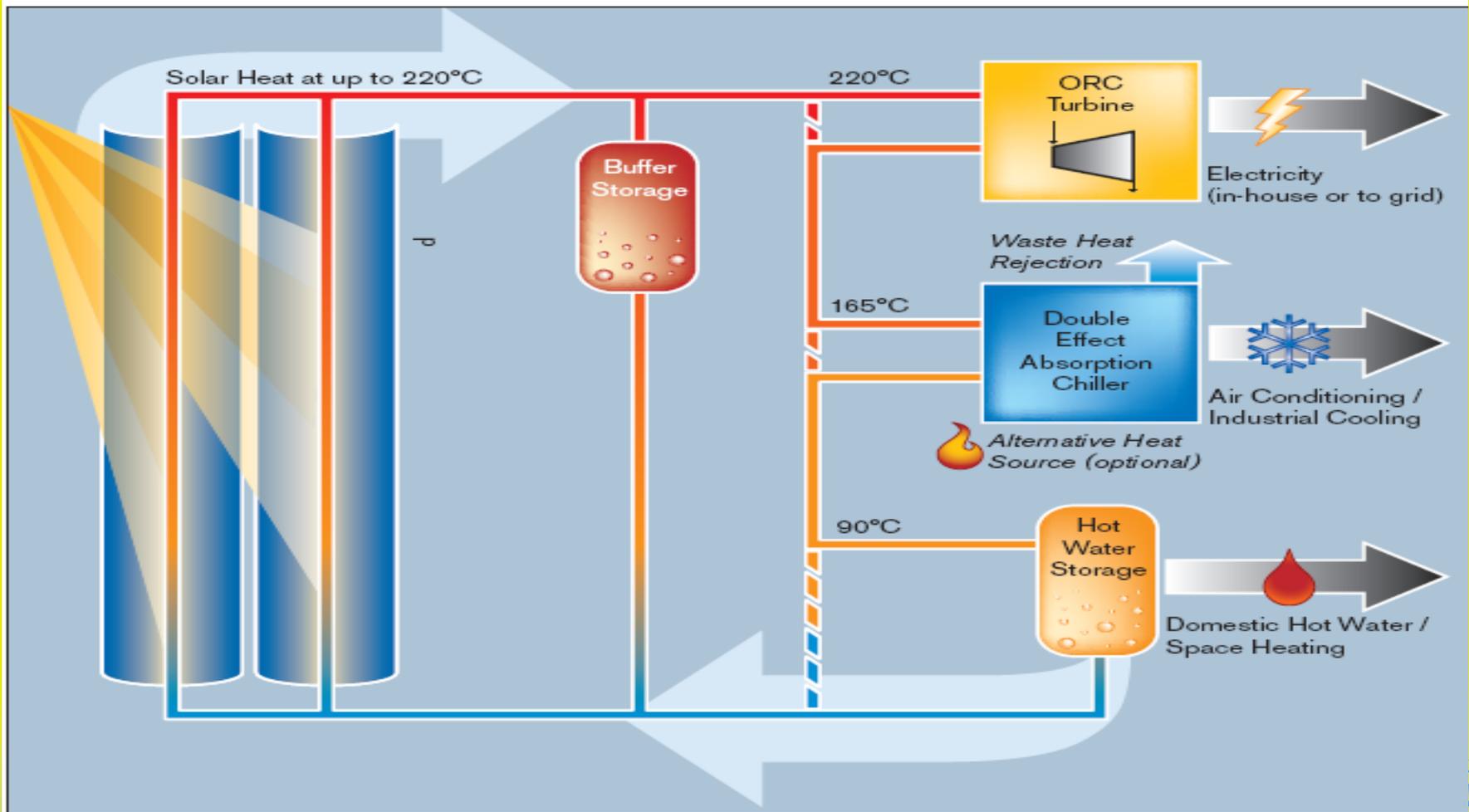
➤ 2. **Agro-industries** (Solar drying, horticulture-nursery greenhouses, slaughterhouses, meat processing, livestock landings)

➤ 3. **Chemical industry** (Cosmetics, detergents, pharmaceuticals, wax, distilleries)

➤ 4. **Beverage industry** (Wineries, liquor and wine distilleries, breweries, soft drinks)



The future of solar thermal



Multi-Generation

The use of the solar heat is maximized by cascading applications at different temperature levels.

The 220°C solar heat drives an Organic Rankine Cycle (ORC turbine) to generate electricity.

An absorption chiller next uses the heat at 165°C for cold production.

The remaining temperature level can be used for hot water production and space heating.

Other combinations are possible, e.g. production of high quality drinking water with a solar-driven flash desalination system.

Thank you for your attention



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