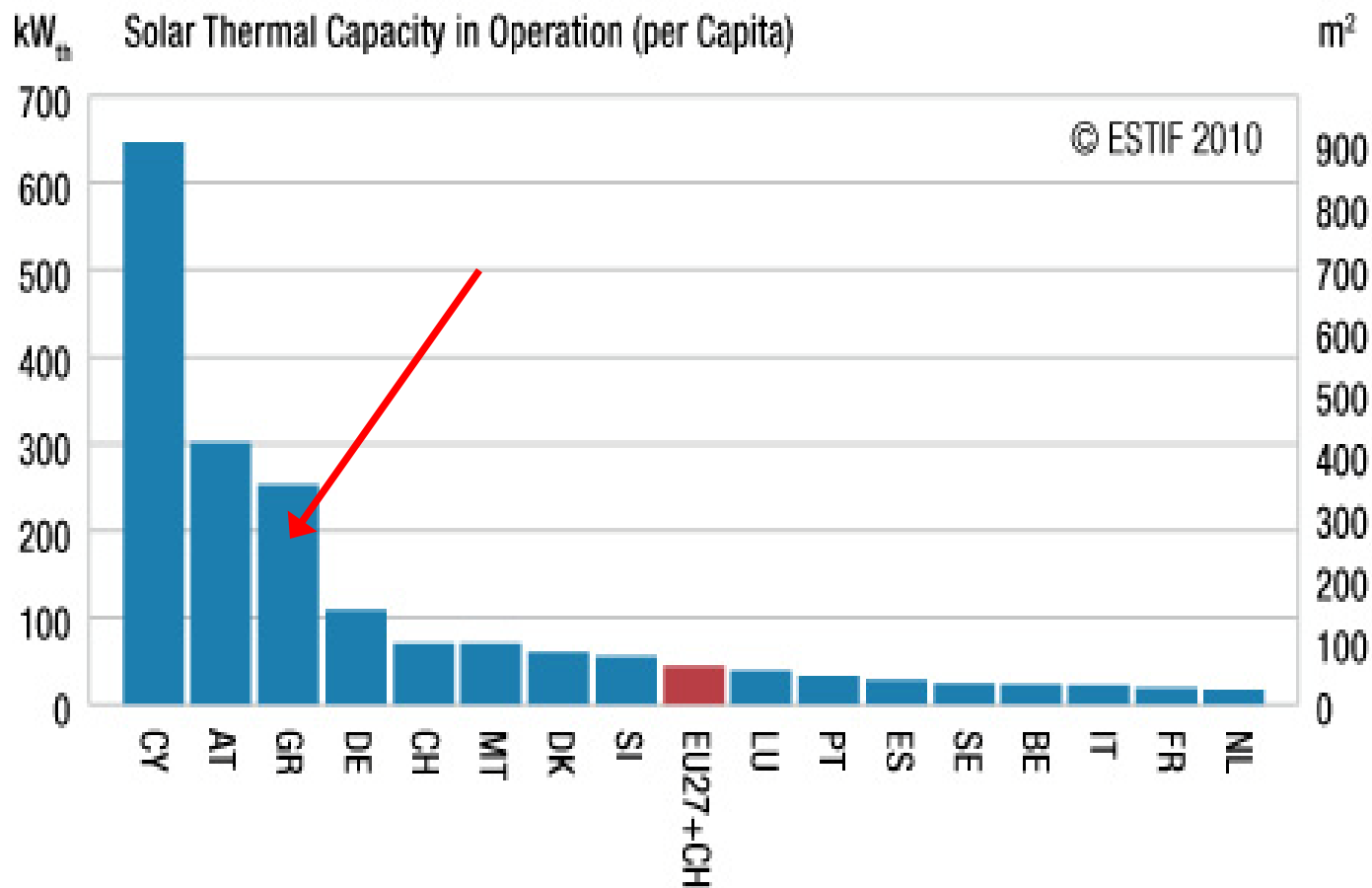


The Greek Solar Thermal Market and Industrial Applications

Overview of the market situation

*Costas Travasaros,
Greek Solar Industry Association*



Solar thermal capacity per capita in operation at the end of 2009, in KWth, per 1000 inhabitants , in Europe (source: ESTIF)

Products in Greece

- ❑ Solar water heater -Thermosyphon systems 95%
Private customers

 - ❑ Central pump systems
Mainly professional customers
 - Hot water for hotels, industries, hospitals, etc
 - Process hot water
 - Solar cooling

 - ❑ Technologies
 - ❑ Closed loop, electric back up (95%)
 - ❑ Selective surface
 - ❑ Flat plate, compact, roof mounted, heat pipe, vacuum tubes
-

Thermosyphon systems in Greece



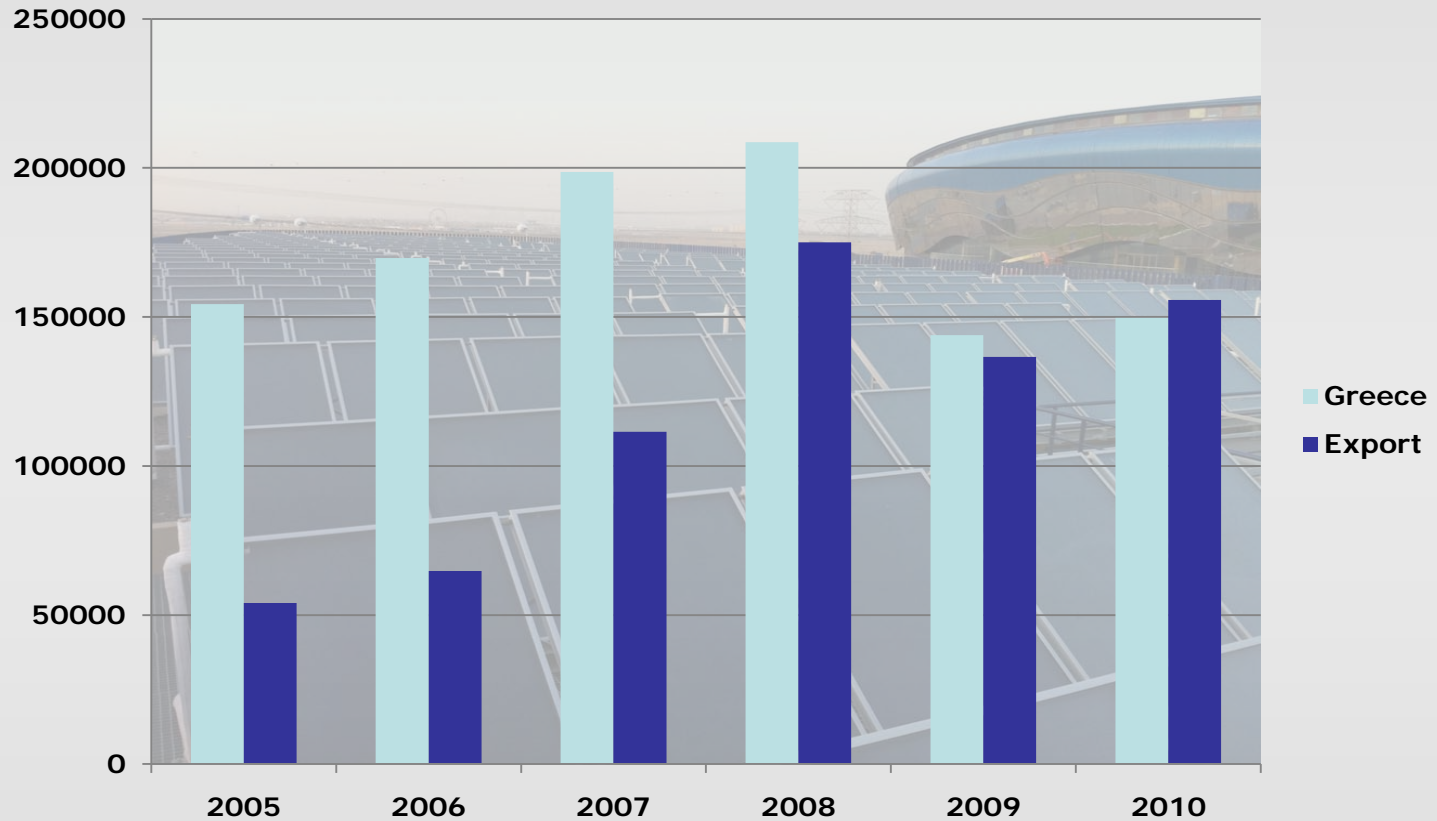
Average system

- 2.4 m²
- 150 l
- single family
- yield to user : 1200 kWh/year

Advantages of the product

- Low price (1000 €/2,4 m² -150 l system)
 - Easy to install (No special training for installers)
 - Low maintenance (no control, pump etc.)
 - Good quality (long experience)
-

Greek Production MWth



Energy production from EBHE members solar collectors, installed in Greece and exported, at the end of 2010, in MWth (source: EBHE)



Supporting framework

- ❑ **National Center for Scientific Research "DEMOKRITOS"**
(Testing facilities, technical support)
 - ❑ **Center for Renewable Energy Sources - CRES** (Studies, Marketing, Conferences etc.)
 - ❑ **EU Funding for Demonstration and Research Projects**
-

Reasons for solar thermal success in Greece

- ❑ The conventional source of water heating is electricity, with higher costs than fuel oil or gas, leading to shorter payback periods for solar systems.
 - ❑ Most houses have a flat roof, enabling the easy installation of an inexpensive thermosiphon water heater.
 - ❑ Favourable climatic conditions.
 - ❑ State support during the start-up phase of solar thermal.
 - ❑ Involvement of dedicated individuals at the early stages of solar thermal.
-

Likovrissi Solar Village



435 households

1200 inhabitants

**1005 m² of solar
collectors**

**601 MWh/year of energy
savings**

Solar systems for process heat in Greece

- ❑ **Food industry** (dairy products, tinned fruits and vegetables, cold cut and process meat factories, pastry and cake confectioneries, olive oil refineries)
 - ❑ **Agriculture** (solar drying, horticulture-nursery greenhouses, slaughterhouses, meat processing, livestock landings)
 - ❑ **Textiles** (tanneries, leather treatment, cloth refineries, textile treatment workshops)
 - ❑ **Chemical industry** (cosmetics, detergents, wax, pharmaceuticals)
 - ❑ **Beverage industry** (wineries, liquor and wine distilleries, breweries, fruit juices and soft drinks)
-

- 4.100.000 m² Collector area in operation
 - 2.255.000 MWh Energy production
 - 2.255.000 t CO₂ avoided emissions
-

Achaia Clauss S.A



- Year of installation: 1993
- Type: Winery
- Needs: 1000m³/day, 60–75 C, 3,000 l storage
- System: 308 m² FPC

Other info: GSR contract, operation for 6 years yielding a mean performance of 300 kWh/year/m²

Alegro S.A.

- Year of installation: 1993
- Type: Clothing industry
- Needs: 0.7m³/day, 40–90 C and steam, 1500 l storage
- System: 55 m² FPC

Other info: The system is still operational

Alpino S.A.



- Year of installation: 2000
- Type: Dairy
- Needs: 40m³/day steam
- System: 324 m² + 252 m² FPC for pre-heating the water entering to the steam boilers, 25,000 l storage

Other info: GSR contract

Kastrinogiannis



- Year of installation: 1993
- Type: Textile industry
- Needs: 10m³/day steam
- System: 180 m² FPC for pre-heating the water entering to the steam boilers, 10,000 l storage

Other info: Still operational

Kozani Greenhouses S.A.

- Year of installation: 1994
 - Type: Greenhouses
 - Needs: depending on the outdoor conditions
 - System: 80 m² FPC, 4,400 l storage
- Other info: Still operational
-

Mandrekas S.A.



- Year of installation: 1993
 - Type: Dairy
 - Needs: 15m³/day steam
 - System: 170 m² FPC, 2,000 l storage
- Other info: Still operational

Mevgal S.A.



- Year of installation: 2000
- Type: Dairy
- Needs: 150m³/day
- System 1: 216 m² FPC + 111m² CPC, 5,000 l storage
- System 2: 398 m² FPC, 5,000 l storage

Other info: Still operational, TPF Contract

Plektemboriki S.A.

- Year of installation: 1999
- Type: Textile
- Needs: 90 C hot water
- System : 50 m² FPC , 2,000 l storage

Other info: Still operational

SARANTIS S.A.



- Year of installation: 1999
- Type: Cosmetics industry
- Needs: 70-75 C hot water for the two adsorption chillers, for AC needs
- System: 2664 m² FPC, 2,000 l storage, only for the start-up

Other info: Still operational, 50% funding by National Operational Program

Tripou-Katsouri S.A.

- Year of installation: 1993
- Type: Tannery
- Needs: 15 m³, 40-90 C hot water
- System: 308 m² FPC, 13,500 l storage

Other info: The system operated for 4 years

Suggested measures

- ❑ Financial incentives
 - ❑ Implementation of industrial energy standards in the form of a Presidential Ordinance
 - ❑ Enforcement of a mandatory share of RES to the total houses have a flat roof, enabling the easy installation of an inexpensive thermosiphon water heater.
 - ❑ Favorable legislative framework to allow easy integration of solar system
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