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Solar thermal in Europe: expanding markets, better political framework conditions and state-of-the-art technical solutions

by Rolf Hug
22.05.2007

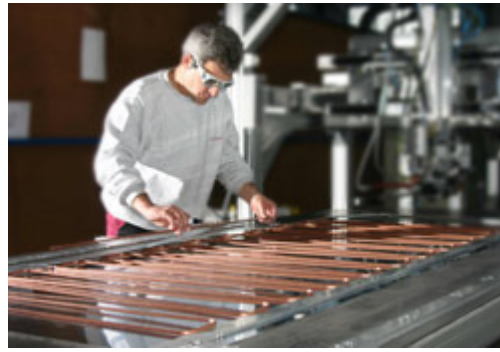
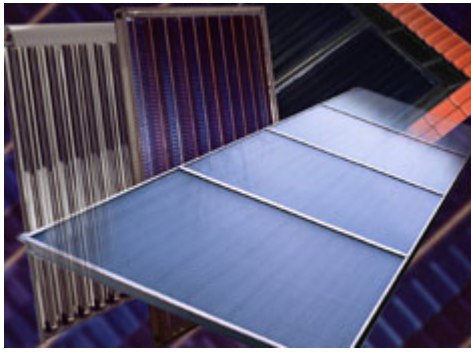
The climate report adopted in April 2007 by the United Nations Intergovernmental Panel on Climate Change (IPCC) warns about the consequences of unhindered climate changes which will lead to hundreds of millions of people suffering from a lack of water and the health of millions of people being adversely affected by global warming. Diseases and injuries through heat waves, floods, storms, fires and droughts are expected. On 30.10.2006 already, Sir Nicholas Stern, requested by the British government to conduct a comprehensive economic analysis of climate changes, estimates that the costs incurred through neglecting climate protection will equal the worldwide economic losses that were caused between 1914 and 1945 through the two World Wars and the world economic crisis.

Solar thermal: efficient technology for heating and cooling with the sun

Experts now agree that renewable energies will have to replace coal, oil and gas significantly faster in order to halt climate changes. Solar energy will assume a major share, and interest of the general population as well as the political decision-takers is currently on the rise.

Solar-Report as [PDF-Dokument](#)





Left: Solar collectors present a huge potential for climatically friendly and economic heating and cooling. Right: Production of absorbers at SunLaser AG. Photo: estec2007; SunLaser AG.

A crucial response to the dangers of global warming is the worldwide utilisation of solar heat. Solar thermal as a technology for effective, economic and decentralised heating and cooling with the sun is the topic of the International Solar Thermal Industrial Conference estec 2007 that will be held on 19 and 20 June in the run-up to the Intersolar 2007 in Freiburg, Germany. The first section of the extensive Solar Report focuses on current developments in the utilisation of solar heat in Europe and highlights new, rapidly expanding markets as well as their political dispensations. The second section reports on technical innovations and provides an insight into current research.

Ambitious action plan for solar thermal throughout Europe

"With the resolution by the European Council on 9 March to increase the share of renewable energies to 20 % by 2020, we entered a new phase of utilising solar thermal," says the new President of European Solar Thermal Industry Federation (ESTIF), Gerhard Rabensteiner. The President of this organisation will present an action plan for solar thermal in Europe at the opening of estec 2007 in which the advantages of solar heating and cooling are identified and realistic targets for the year 2020 are given. Concrete guidelines supporting solar thermal are to assist the political sector in the introduction of effective measures.



The boom still lies ahead: growth scenarios for solar thermal capacity in Europe. Source: estec2007

European manufacturers of solar thermal systems emphasise that solar thermal with clear targets and political directives can lower the costs of fossil fuels for citizens and can save millions of tons of CO₂. "Millions of Europeans already heat their water with solar thermal systems and even heat their houses in this way," Rabensteiner's predecessor Ole Pilgaard

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emphasises. "But in many countries solar thermal markets have not yet reached the critical mass for sustainable growth from its own power. For this reason we developed clear recommendations for an effective incentives policy based on the experiences of many countries," Pilgaard comments on the action plan.

One square metre of solar collector surface per resident by 2020 will amount to a total of 320 Gigawatt of solar thermal output

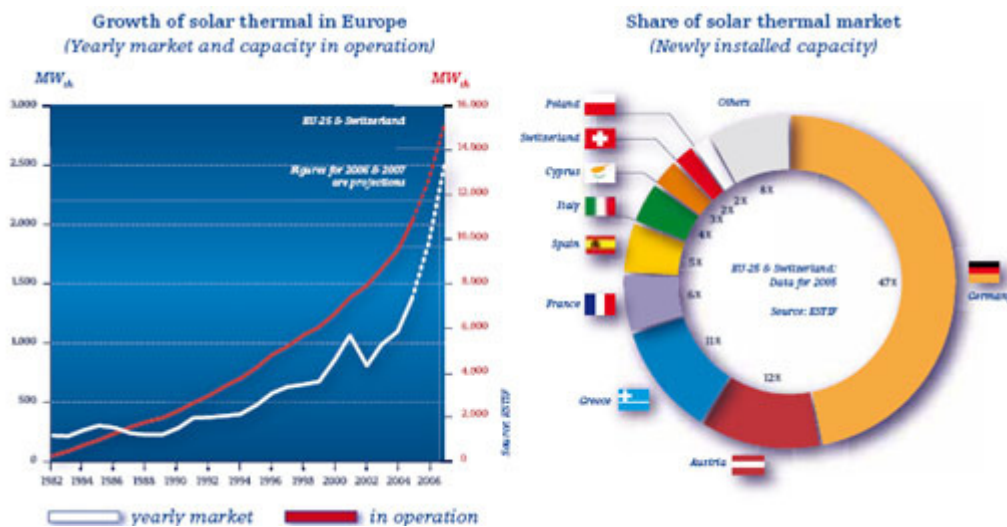
ESTIF has set itself an ambitious goal: by 2020 one square metre of solar collector surface per EU resident is to be installed, which corresponds to an installed solar thermal output of 320 Gigawatt (GWth). This would allow an annual production of solar heat output exceeding that of over 19 million tons of oil. This oil equivalent could replace precious mineral oil, gas and electricity, ESTIF emphasises.

Binding directives for the construction of new buildings and the renovation of existing buildings

The 26-page action plan shows in detail how reliable framework conditions can be created to ensure that the ambitious goal be achieved: not any single initiative but a coherent combination of incentive measures has proven to be effective, the authors emphasise. They demand binding directives for the utilisation of solar thermal in new buildings and in large-scale renovations. Financial incentives are to speed up the introduction of solar thermal in existing buildings. In addition, public relations and education of important role players in the sector as well as the promotion of research and development were the pre-conditions for the long-term success in solar thermal markets.

Successful market developments in Germany, France, Spain and Italy

Sales of solar thermal systems in Europe increased by over 35 % during 2006 to a solar thermal output of approx. 1 900 Megawatt (MW). The most dynamic markets were France, Great Britain and Germany, with growth rates varying between 40 % and 70 %. Motivated by this success, industry and research developed a joint vision for the utilisation of solar thermal in 2030 and established the European Solar Thermal Technology Platform (ESTTP) for its implementation. This platform commenced its work on 6 December 2006.



Growth curve of European solar thermal installations; solar thermal market shares. Graphs: estec2007

According to figures released by the German Association of Solar Economics (Bundesverbandes Solarwirtschaft e. V. - BSW-Solar) the German solar thermal market

and the sector turnover with solar thermal systems increased by 58 % last year in comparison to the previous year and reached two billion Euro. The German solar sector welcomes the declaration by the government on future energy policies of the Federal Republic of Germany dated 26.04.2007 and particularly the law announced by Sigmar Gabriel on regenerative heat. This law envisages that in new buildings and in the complete renovation of old buildings, a certain percentage of the heat requirements must be covered by renewable energies. "The road ahead as announced by the Minister for the Environment is an important measure to further explore the enormous potentials of regenerative energy sources," says BSW Managing Director Carsten Körnig.

Tax reductions and solar obligations allow markets in France, Spain and Italy to catch up

In the expansion of solar thermal within the successful support programme "Plan Soleil", France focuses on tax reductions and particularly on quality. 40 % of all material costs of a solar thermal system can be deducted from income tax since the beginning of 2005. At the turn of the millennium a mere 21.7 Megawatt solar thermal output had been installed; in the meantime this output has grown to 315 MW, i.e. 450 000 m² of collector surface. More importantly, according to Richard Loyen from the French Solar Industry Association Enerplan, the sector has during this time developed into a professional economic sector "with over 9 000 qualified fitters". Together with Plan Soleil, the governmental energy agency ADEME launched the qualification programme Qualisol to train fitters for the installation of solar thermal systems. Since January 2006 the new organisation Qualit'EnR offers training courses. In 2007 the sector is planning to install the same number of solar collectors as the six preceding years. At the estec2007 Richard Loyen will be introducing the Qualisol programme.



Solar thermal systems in France. Source: Enerplan

Solar obligations in Spain and Italy

With their legal regulations the governments of Spain and Italy accelerated the expansion of solar thermal and thereby allowed the markets to record strong growth. One of the latest studies on the Italian solar thermal market has shown that in 2006 approx. 130 Megawatt solar thermal output, i.e. 186 000 m² collector surface were newly installed. This led to the largely under-estimated solar thermal market of Italy to become the fifth largest in Europe.



For 2007 the Italian solar thermal industry association Assolterm is expecting the boom to continue: a national building regulation is to ensure that solar thermal systems are installed in all new buildings and in all extensively renovated buildings for the heating of utilisable water; in addition, tax reductions are guaranteed and amount to 55 % for every solar thermal system sold.

Source: ESTIF; Assolterm

"This could be an extremely successful measure," comments Riccardo Battisti, Secretary-General of the Italian solar thermal industry association Assolterm. In Spain the regulation "Código Técnico de la Edificación" (CTE) that was passed in 2006 and that prescribes the installation of solar technology in new buildings and extensively renovated buildings, significantly boosted the market. The CTE goes a lot further than EU regulations and provides for an obligatory solar covering degree of 30 – 70 % for the generation of hot water. For large buildings in the tertiary sector solar power plants are also envisaged. According to figures of the ASIT association, the market grew by 122 MW in 2006.

Up until 2020 the Spanish "Renewable Energy Plan" envisages to have a solar thermal output of 3 430 MWth, i.e. 4.9 million square metres of collector surface installed. This would imply that in the coming four years approx. three MW need to be newly installed.



Solar thermal systems on a sports hall in Ugena (Toledo) and a hotel in Almería. Photos: ASIT Solar (AURA SOLAR; SNELL SERVICIOS GLOBALES)

Technology trends: solar thermal for heating, cooling and process heat

The estec2007 will start on 19 June with a workshop of the European Solar Thermal Technology Platform (ESTTP) that is to discuss the most important technological developments in central working fields, including solar thermal systems for the production of industrial process heat, solar cooling, solar thermal systems for private buildings as well as components and system design. The ESTTP was established in 2006. Experts from the whole of Europe are jointly working on a vision for solar thermal technology for the year 2030. Their task is the development of a strategic research agenda as well as a strategy for the future development of European solar thermal markets. First results of the working groups will be presented at the estec2007, participation in the technology platform is free of cost and open for all. However, prior registration is required at www.esttp.org

Cooling with solar heat: solar-assisted cooling systems on their way into the market

Solar-assisted cooling and air-conditioning (SAC), that is already one of the focus points of estec2007, is again assuming a central position because an increase in demand and an improvement of the systems can be clearly noted. Christian Stadler, head of Solar Thermal Group of Conergy AG and chairperson of the ESTIF Solar Cooling Experts' Group comments on the possibilities to create better framework conditions for SAC and on the practical implementation of SAC systems. Conergy, for example, developed a complete SAC solution for the German School in Barcelona. Besides roof surface area for 40 Conergy-F 6000 collectors this space-saving system only requires a container of about 42 m³ for the entire cooling and control technology.

Complete solar cooling solution by SunTechnics in front of a company building in La Coruña (Spain).

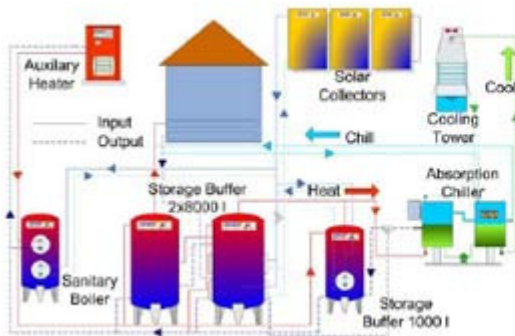


The container for the absorption, cooling and control system is located below the stands for the flat solar heat panels.

Photo: Conergy AG

Combination system for heating and cooling

A Combi+ System for residential buildings and smaller commercial applications will be presented by the Institute for Renewable Energy of the European Academy of Bozen at the estec2007. This combination system heats a building with a surface area of 1 000 m² and covers the demand for air-conditioning of a surface area of 400 m². The required energy is provided by 150 m² flat solar collectors that also supply the absorption chiller used for air-conditioning (15 kW).



System concept of the combination system with flat solar heat panels (right hand side in image), collectors and absorption chiller; Graphics and photo: Eurac research.

Kai Thomas Witte will be elucidating the optimised Solar Combi+ System at the estec2007 by way of a poster presentation that is to speed up the introduction into the market of smaller-scale solar heating and cooling systems.

Solar process heat for the industry

Besides the utilisation of solar thermal for heating and cooling of residential and office buildings, solar heat is particularly suitable for use in industrial and commercial processes. In some countries these processes require more energy than the heating of buildings. Solar process heat with temperatures up to 250 °C can, for example, be used in the chemical and textile industries, in the manufacturing of paper or foodstuffs as well as in all other processes where hot water is used for washing, boiling or drying. In addition, factory floors can be cooled or heated with solar heat.

Solar collectors of a pharmaceutical company for biological medicine in the Black Forest. For the production of its homeopathic products, the company used approx. 6 000 litres of hot water at 60 °C per day. The continuous demand in hot water presents virtually ideal conditions for the utilisation of solar energy. 12



diagonally fed flat panels with a collector surface of 2.3 m² each, supply solar heat free of charge.

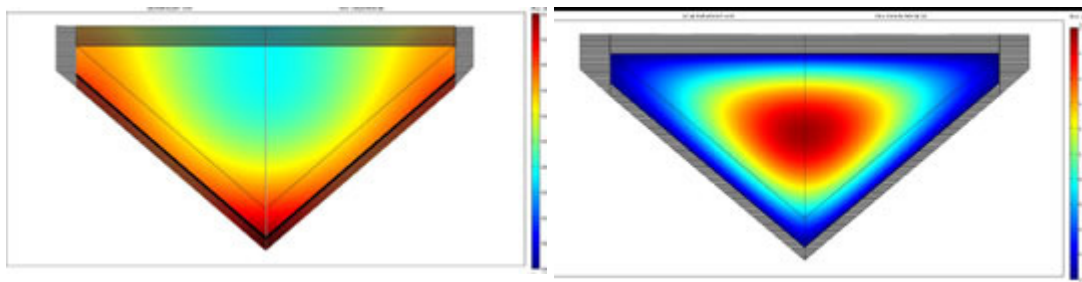
Photo source: Pro Solar GmbH

Within the framework of the IEA SHC Programme currently about 85 large-scale solar thermal systems for industrial process heat are being studied. They have a total output of 24 MW, the largest being located in the USA. Generally flat solar heat panels are used. At the estec2007 Claudia Vannoni from the University of Rome will report on this field of application that could open the European solar thermal industry a world market volume of up to 112 GW, which corresponds to a newly installed collector surface of 160 million square meters.

Polymers instead of expensive metals: plastics for solar collectors

Solar collectors that are made only of plastics are currently being researched by the Fraunhofer Institute for Solar Energy Systems (ISE) in Freiburg since October 2006. Scientists in Freiburg are expecting significant cost advantages if metal and glass used so far can be replaced. Polymer collectors will be significantly lighter than their predecessors of copper, aluminium and glass. However, a suitable material still needs to be found that will fulfil the optical and mechanical requirements of high-performance solar collectors. This means that the classical materials cannot simply be replaced by plastics, but that the entire system will have to be adapted to the new material.

A look into the research laboratory: both images from simulations of a solar collector made of polymers show sections of an absorber pipe; for reasons of symmetry and efficiency calculations were only done for half the pipe. Water was taken to be the heat transfer medium; insulation materials, glass covers etc. were not taken into consideration.



The left-hand image shows the temperature curve in the different materials. The thick line represents the absorber layer from which heat is derived. The right-hand image illustrates the distribution of the flow speed of the heat transfer fluid in the same section. The outer layers with a low flow speed can be clearly seen; these correspond with the warmest regions of the left-hand image.

Within the framework of the IEA Task 39 the Freiburg researchers are working on an entirely new system design to achieve optimum system performance. Central issues are the absorption of solar radiation, thermal conductivity and thermal capacity. In addition, new challenges such as the impact of UV radiation, high temperatures and mechanical stresses on the material need to be overcome.

Solar thermal façade integrated into buildings for the heating of utilisable water and the support of heating

A solar thermal façade of 600 m² of non-glazed collectors was integrated by the company Energie Solaire S.A. into the south-eastern side of the national roads maintenance centre CeRN (Centre d'entretien des routes nationales) in Bursins close to Geneva. The selectively coated stainless steel solar collectors supply heat for a low-temperature heating system and also heat the utilisable water for the washing of vehicles. The absorbers with a pillow geometry and full-surface flow are selectively coated with black chrome.



Solar façade with non-glazed stainless steel collectors (in the pictures bottom left and right in the foreground). Photos: Energie Solaire S.A.

The collectors installed in Bursins are no additional elements but form an integral part of the building shell. The project shows how non-glazed solar collectors can be used as aesthetic construction elements and received the "MINERGIE ECO Label". At the estec2007 Bernard Thissen from Energie Solaire will introduce the project and will show that solar thermal systems integrated into façades today fulfil all requirements for sustainable construction.

Exemplary large-scale solar thermal systems

Standardised concepts for large-scale solar thermal systems with a collector surface exceeding 50 m² were studied by the EU project NEGST. Jan Schindl from the Austrian centre "Arsenal research" will present the results of this study at the estec. This study includes the assessment of good practice systems in Austria, Germany, Greece, the Netherlands, Norway, Sweden and Spain and experts were questioned on their experiences with various system concepts.

Further information on the conference is available at <http://www.estec2007.org>
Information on Intersolar 2007 at www.intersolar.de

On this topic also read the Solar interview with the new ESTIF President Gerhard Rabensteiner: "[Binding targets of the EU will have a major impact on solar thermal energy](#)"

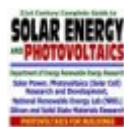
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