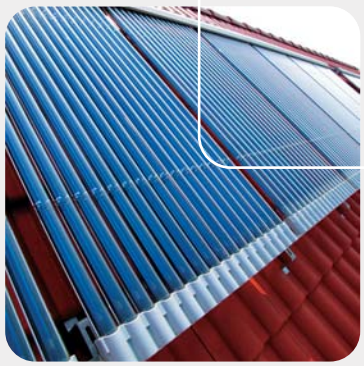
SOLARGE

Solar Heat for Large Buildings

Solar Thermal Systems in Apartment Buildings, Public Buildings and Hotels in Europe



Contents

- Foreword → 3
- The SOLARGE Project → 3
- Time to Act → 4
- Climate Protection in Europe → 5
- Welcome to the Solar Age → 6
- Reliable and Rewarding → 7
- The Sun: A Multitalent → 8
- Solar Thermal Systems: Tried, Tested and Proven → 10
- The Future → 11
- Energy: Support for Your Commitment → 12
- Time to Go Solar → 14
- Your Knowledge Pool → 15
- Publisher`s Information → 16

Enlarging Solar Thermal Systems

This publication is produced as part of the EU-assisted SOLARGE project, which among other things documents the experience gathered in about 100 large solar thermal projects across Europe.

These projects show that solar thermal energy is a real alternative to oil and gas – not only for detached or semi-detached houses, but also in larger buildings such as apartment blocks, public buildings and hotels.

Using solar thermal energy helps slow climate change and conserve the environment. It also cuts energy costs on a lasting basis. Solar thermal energy is a boon for tenants and users and an image boost in the eyes of customers and guests.

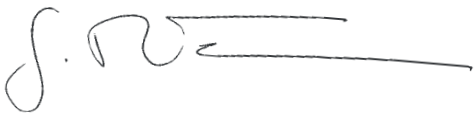
Foreword

Effective action against climate change is a key societal challenge for Europe. Carbon emissions must quickly and permanently decrease if we are still to prevent a drastic rise in global temperatures.

Europe's countries have pledged to reduce greenhouse gas emissions, both in the Kyoto Protocol and in endorsing the fourth European Council meeting 2007. As fossil fuels reserves run short, investment to cut dependance on oil and gas is essential for a secure supply of heating energy. The task now is to turn the targets into action, as quickly and efficiently as possible.

The greatest climate change mitigation potential is harboured by the buildings we use: Space and water heating account for about a third of Europe's total energy consumption. Thermal insulation and the use of solar energy in buildings are effective ways of securing lasting cuts in greenhouse gas emissions.

Experience with pilot projects shows that solar thermal systems can contribute a major share of building heat supply, even in large installations. Building owners and operators also profit financially, with ongoing reductions in operating costs and a resulting boost to the value of their property.



Gerhard Rabensteiner
President of European Solar Thermal Industry Federation (ESTIF)

SOLARGE

The SOLARGE Project

SOLARGE was started in January 2005 with funding from the EU's Intelligent Energy – Europe (IEE) Programme. The project aims to open up markets for large solar thermal systems serving the residential, hotel and public building sectors.

Progress towards this aim is achieved by training system designers and installers, conducting information campaigns, and making available a good practice database showcasing exemplary projects in Europe.

→ **www.solarge.org**

Time to Act

With oil prices spiralling, global temperatures rising and energy resources becoming increasingly depleted, Europe's energy supply is under threat.

Burning fossil fuels releases carbon dioxide, a greenhouse gas. The consequences for the global climate and environment are dramatic, and they are already making themselves felt.

The challenge now is to stop global warming and reduce its impacts to a minimum. This can only be achieved by saving energy on a huge scale and systematically deploying renewables.

About a third of Europe's final energy consumption is accounted for by space and water heating in the buildings we use. This presents us with an opportunity to achieve an effective, rapid and sustained contribution towards stopping climate change using available technology.

"Slowing global warming now with currently available technology will cost only a fraction of what it would to put right the damage later on."

Sir Nicolas Stern, former Chief Economist of the World Bank and author of the Stern Report

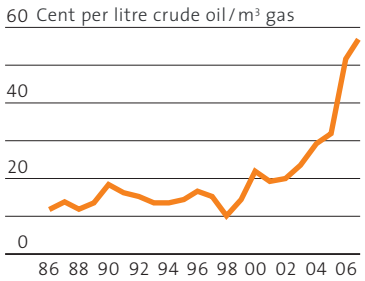
Picture: ddp

Hurricane Katrina, New Orleans 2005:
Climate change is already causing massive damage. Even banks and insurance companies now warn of the impacts of global warming

Climate Protection in Europe

↓ Oil prices are spiralling – with no end in sight

Source: International Energy Agency 2006



Europe is preparing the way for sustainable energy policies. Under the Kyoto Protocol, EU member states committed to cut greenhouse gases by an average of 8% across the Community by 2012 from the 1990 base year. And under the Conclusions of the EU Spring Council 2007, carbon dioxide emissions are to be reduced by 20% and the share of renewable energy in overall consumption increased from 6.5% today to 20% in 2020.

National law to follow

These commitments will be enacted in specific directives and placed on the statute books in the individual EU member states.

For the buildings sector, this means new standards will be established for both new and existing buildings. Meeting these standards will be a challenging task for all building owners and operators in Europe.

Climate Protection and Regulations

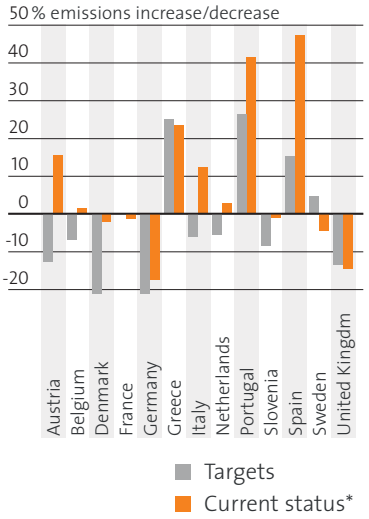
Building owners already have to comply with various pieces of primary and secondary legislation relating to climate change.

Energy certificates to be made obliged

Implementation of the European Energy Performance of Buildings Directice in national law will lead to many changes: Energy performance diagnostic for apartments and homes, the ongoing evolution of thermal energy regulation with stricter requirements concerning total energy consumption, and the instruction of energy economy labels for buildings.

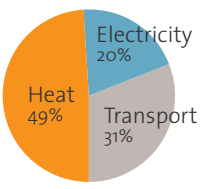
Mandatory solar regulations

More and more countries or regions are adopting mandatory solar regulations, for example the new building code in Spain and the inclusion of solar thermal systems in thermal energy regulations for new buildings in France.

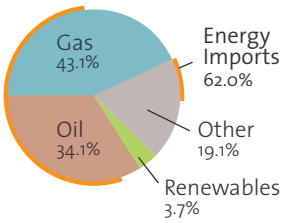


↑ Greenhouse gas emissions
Most of the EU member states miss their climate targets in 2012

Source: European Environmental Agency 2006
*(2004)



About half of final energy consumption is used in generating heat, most of it for buildings



Europe currently uses energy imports for 62% of its heating needs

Welcome to the Solar Age

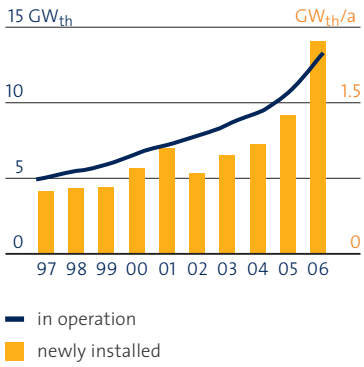
Solar energy is booming, large solar thermal systems gain market share.

Solar energy is on the advance: Ever more people are opting for solar thermal systems as a real alternative to oil and gas. Today, over 19 million square metres of solar collectors are installed on Europe's roofs, most of them on detached and semi-detached homes.

Large solar thermal systems are gaining market share. Increasingly, solar thermal systems are becoming popular in applications such as apartment buildings, public buildings and hotels. These need a lot of heat in summer as well as winter. And large solar thermal systems are more cost-effective than smaller ones.

With a large collector area, major cost savings can be achieved in such buildings. And solar thermal systems are also a safe investment: While oil and gas prices will go on rising, the cost of solar thermal energy will remain steady for the long term.

Growth of solar thermal energy in Europe
Solar thermal energy is booming. Over 19 million square metres (13.3 GW_{th}) of solar collectors were in operation across Europe by 2006
Source: ESTIF



↓ Van Melle, Breda, Netherlands
Picture: Zensolar / ESTIF

Solar thermal systems are an image winner for businesses and hotels, signposting a corporate culture in touch with the times.

Reliable and Rewarding

Proven thousands of times over
Solar thermal energy is a mature technology that has been proven thousands of times over. Solar thermal systems have a lifetime of 20 years or more and have no disadvantages compared with conventional heating systems.

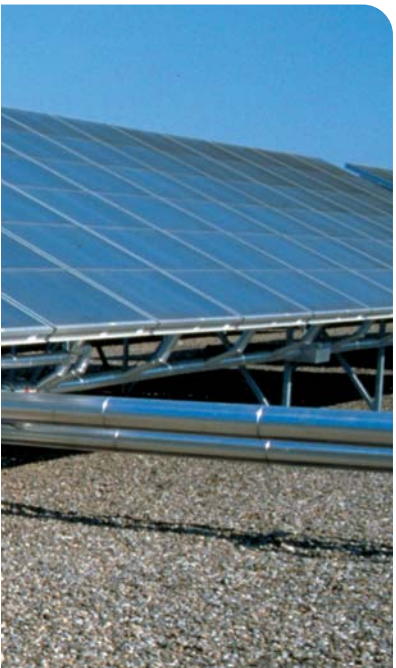
A durable investment
Solar thermal systems are an enduring investment. They help secure high energy standards for the long term and therefore help a building keep its value.
Solar thermal energy never runs out and makes fuel shortages a thing of the past. Solar thermal energy will keep energy costs at manageable levels far into the future.

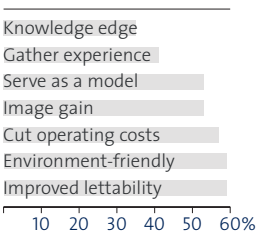
The solar image factor
Alongside economic aspects, another compelling factor in favour of solar thermal energy is its positive image. Installing a solar thermal system can help enhance tenant loyalty and reduce vacancy rates.

For many hotels, solar collectors on the roof have long become a symbol of environmental responsibility and hence a useful marketing tool.

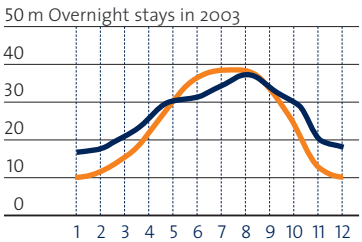
Solar thermal energy as a legal requirement
Many European countries are already adopting statutory requirements to use solar thermal energy in new residential buildings.

National energy saving regulations, energy certificates for buildings and of course the EU's Energy Performance of Buildings Directive (EPBD) mean high standards will apply Europe-wide in the foreseeable future.





The solar marketing factor
A survey of German housing associations showed improved lettability to be a common reason for installing solar thermal systems.
About 60 % of interviewed owners installed solar thermal systems to improve their lettability
(Chart: multiple answers possible)
Source: GDW Arbeitshilfe 48; Juli 2005



Bed occupancy and solar power
In many hotels, as shown in this chart for Germany, hot water consumption tracks solar energy availability over the year
Source: Federal Statistical Office 2005

↑ Hotels and public buildings in Slovenia (left page) Spain, Ireland and France: Solar thermal energy is firmly established in the tourism industry
Pictures: Solvis, Thermomax / ESTIF, Giordano Industries

The Sun: A Multitalent

Applications for large solar thermal systems

Apartment buildings in Rostock, Germany (↗) and Sliedrecht, Netherlands (→)

Pictures:
Solvis, Tabliswonen

Besides providing hot water for washing and similar purposes, solar thermal energy can be usefully deployed wherever there is a need for temperatures up to 120 °C – and especially where heat is still needed in the summer months, for example in:

- *Residential buildings*
- *Hotels and public sports facilities*
- *Hospitals and old people's homes*
- *Laundries, cold stores, etc.*

Hot water supply
The great majority of solar thermal systems in operation today are used exclusively to supply hot water. They comply with all hygiene and frostproofing standards, and can save up to 60% of the energy needed for water heating.

Supplementary heating
Every second newly installed solar thermal system today is also used to provide supplementary space heating. A well-designed system combined with good thermal insulation can cut building energy consumption by up to 50%, and in very well insulated buildings can reduce it to zero.

↖ Apartment building, Esslingen (Germany)
Picture: Wagner Solar

← Entire residential developments can meet a major share of their heat needs using large solar thermal systems (Denmark)
Picture: Arcon / ESTIF

→ Solar thermal systems enhance a building facade (Germany)
Picture: Schüco

District heating

Solar district heating networks have existed in Europe since the 1990s. Solar heat can be fed into such a network on a centralised or decentralised basis. Using solar thermal systems can cut district heating network energy consumption by up to half. A network of this kind can meet the heating needs of an entire community.

Solar refrigeration and cooling

In tomorrow's buildings, air conditioning will be increasingly important. Cleverly thought-out architecture and efficient thermal insulation will again help reduce energy consumption to a minimum.

Facilities such as clinics, homes and canteens have their own specific refrigeration requirements. Solar thermal energy can be used to run refrigeration equipment.

There are already over 100 such systems across Europe.

Solar Thermal Systems: Tried, Tested and Proven

State of the Art of Solar Systems

Most modern solar thermal systems use flat plate (↗) or vacuum tube collectors (→).

Suncatchers
Solar collectors capture direct and diffuse solar irridiation and convert it straight into heat.
Collectors can be installed on the roof of a building, integreated into the roof skin, or integrated vertically into a facade.
They are practically maintenance-free and have a lifetime of over 20 years.

Solar heat storage
Solar heat storage systems buffer timing differences between solar energy supply and heat demand. They can make up for several days of cloudy weather.
Supplementary heating sources of all kinds can be integrated into the overall system, ensuring sufficient heat at any time of day and night.

Hygiene and system safety
Solar heat is transferred to the heating circuit by a heat exchanger. The hydraulic separation ensures that all hygiene requirements are met.

A winner in any combination
Solar thermal systems combine well with other renewable heating technologies as well as with virtually any conventional heating technology.
A solar thermal heat circuit can be connected at various points in an existing system.

Solar facade
Picture:
GREENoneTEC / ESTIF

Integral collectors convert incident light into heat and shade the interior in summer from too much heat and glare.
Picture: Robin Sun

The Future

Market growth
High-efficiency architecture with solar thermal systems will be the standard for new buildings in the near future. This is a result of the current upward trend in energy prices and impending legislation.

In a growing number of regions and countries there is already an obligation to meet part of energy supply needs using solar thermal energy.
In many buildings, solar thermal systems already account for over 50% of total heat supply. By 2030, buildings that run exclusively on solar energy will be the technical and environmental standard.

Researchers, system designers and industry associations are working towards this goal under the framework of the European Solar Thermal Industry Federation (ESTIF).

As a result, the market for solar thermal systems is set to grow rapidly, with the installed total collector surface area predicted to continue expanding by at least 30% a year for the long term.

Technology outlook
Although solar thermal technology is mature and well proven, researchers and manufacturers work constantly to improve it:

- Solar heat storage systems will attain ever higher storage densities.
- Total system efficiency will continue to rise and system costs to fall.
- Solar thermal systems will become simpler, cutting maintenance to a minimum.
- Architects and engineers are increasingly taking an integrated approach to building design, making optimum use of incident light, efficient thermal insulation and natural ventilation. This adds to the scope for using solar thermal systems.

The future is solar: With full thermal insulation and high-efficiency solar thermal systems, 100% solar buildings will soon be standard.
Picture: GREENoneTEC

↑ Factory building with solar cooling, Audi, Ingolstadt, Germany
Picture:
Solahart/ESTIF

← District Heating Lienz, Austria
Picture:
S.O.L.I.D./ESTIF

Energy: Support for Your Commitment

Regulations, Grant Aid and Campaigns

Grant aid websites

France
www.ademe.fr

Germany
www.solarfoerderung.de

Italy
www.minambiente.it

Netherlands
www.vrom.nl

Slovenia
www.aure.si

Spain
www.idae.es

Regulations

European countries set national regulations on minimum requirements for thermal insulation and limits for primary energy consumption in new and existing buildings.

An energy certificate for buildings will be introduced in all European countries in the near future, as required by the EU's Energy Performance of Buildings Directive (EPBD).

The EPBD favours the use of solar thermal systems because they have a positive impact on overall building energy performance.

Grant aid

Under the IEE programme and the Sixth and Seventh Framework Programmes, the EU has assisted research activities to improve solar thermal system quality and output. These and various national research grants have played a major part in enabling large solar thermal systems to reach the advanced technological stage they are at today.

Customer Insights

"Large solar thermal systems operate efficiently, profitably and with predictable performance provided they are incorporated into plans with professional help from the outset."
Volker Ries, Building Service Project Manger, DEWEGO AG, Berlin (Germany)

"Although living conditions and comfort have been significantly improved, the net cost to our tenants has stayed the same. All the feedback we get is positive."
Andy Bijkerk, Head of Real Estate, Tablis Wonen, Sliedrecht (Netherlands)

"Our solar thermal system was ... built with the aim of serving sustainable development and further enhancing our brand image."
Laurant Gabel, Director, Novotel Sophia Antipolis, Valbonne (Frankreich)

"The solar thermal system at our public swimming pool shows that the technology is mature and offers many benefits. The demonstration project has also attracted great public interest."
Giulietta Paglaccio, Environmental Councillor, Melegnano (Italy)

←←←
Pignano, Italy
Picture: Solvis

←← Kungälv, Sweden
Picture: Arcon / ESTIF

← Facade collectors, Denmark
Picture: Batec / ESTIF

Further training
Investors also receive support in the form of training for system design staff.
Some system manufacturers already offer courses on the use of solar systems in rented apartment buildings.
Manufacture-independent training courses are also available.

Campaigns
Numerous solar campaigns have been conducted in several European countries to help foster a positive public image for solar thermal energy.
Politicians of all parties and at all levels of government are sensitised to the need to promote the use of solar thermal energy.

Workshops, congresses and fairs
Numerous workshops, congresses and fairs are dedicated to the use of renewable energy and solar thermal energy. These events help to foster a positive image of solar energy and successful implementation.

"The project is part of our ongoing efforts to make buildings more environmentally friendly. To date, we have fitted 800 apartments – 20% of our portfolio – with solar thermal systems."
A.L. Bijkerk, Head of Real estate, Sliedrecht (Netherlands)

"Our experience shows that a solar upgrade to the hot water system enhances living conditions and the indoor climate, without any rise in the building's running costs."
W. van Koert, Manager New Construction, WonenBreburg, Tilburg (Netherlands)

"Now that the solar system is up and running and energy costs have dropped by twice the amount of the rent increase, all tenants are happy. Woon Veste will go on fitting more of its buildings with renewable energy systems."
J. Dekkers, Technical Development Manager, 's-Hertogenbosch, De Grevelingen (Netherlands)

"Our experience with the technology is so good that we recommend anyone who needs hot water to install a solar system."
Ludvik Span, Director Spann d.o.o., Ljubiljani (Slovenia)

"A well-planned and installed solar thermal system cuts running costs because hot water consumption in hotels can be relied on to exceed a certain minimum quantity."
Manfred Meder, Owner, Hotel Fortuna, Kirchzarten (Germany)

"The municipality was required to have the system under solar regulations. The positive experience gathered in installing it gave us confidence to invest in solar thermal systems on future buildings."
Rafael Lopez Romera, Vèrtix, Barcelona (Spain)

↑↑ Strasbourg, France
Picture: Le Kircheld

↑ District Heating UPC-Arena Graz, Austria
Picture: S.O.L.I.D. / ESTIF

← Sliedrecht, Netherlands
Picture: Tablis Wonen

←← Sport Centre Pusteria, Italia
Picture: Solvis

← Bach building Tilburg, Netherlands
Picture: SenterNovem

Time to Go Solar

Making Your Building Future-ready

A refurbishment project or a new building presents an excellent opportunity to fit a solar thermal system. Including the system in the plans from the outset ensures its optimum integration into other building systems, and additional cost-saving synergies can be taken advantage of during installation.
Careful system design based on needs analysis is critical. Planned savings will only be achieved if the heating and solar systems are optimally configured to work together.
Investors' system design goal is usually minimum heat production cost. This requires a simple solar system and maximum utilisation. The precise energy savings can be plotted out in advance.

Making your building future-ready
Other system design goals can include saving as much gas, oil or electricity as possible to secure sustained cuts in carbon emissions and a permanent reduction in building energy costs.

A checklist for investors and system designers

→ Before designing a solar thermal system, do a careful building energy audit and use all options (thermal insulation, technical systems, etc.) to cut primary energy consumption. This ensures that the solar thermal system will be economically viable when it is up and running.

→ If you are refurbishing an existing building, tell tenants about your plans to install a solar thermal system and involve them from the system design phase.

→ Be sure to use experienced system designers and installers. They have the necessary training and expertise.

→ Ask the system design or installation company to guarantee the projected output and savings. Fit metering equipment for billing and system monitoring purposes. This removes uncertainties for both tenants and operators.

Regional planners and installers are available throughout Europe.
Picture: Arcon / ESTIF

Your Knowledge Pool

The SOLARGE project has generated a large pool of useful information for building owners and designers of large solar thermal systems.

Information and training
Information material and training courses for system designers and installers assure high quality work. Manufacturers also offer training on solar thermal systems, in some cases free of charge.

Best practice examples
What projects have been successful in Europe? What needs to be watched in system design? The SOLARGE Good Practice Database gives designers and investors an overview of successful large solar thermal systems.

Independent networks
The SOLARGE project has grown to become a forum for experts, investors and decision makers. This provides an easy way for you to meet project partners and exchange information and experience.

www.solarge.org
The project website has a wide range of further information and material on large solar thermal systems.

Further information

SOLARGE project website
www.solarge.org

European Solar Thermal Industry Federation ESTIF
www.estif.org

EPBD Buildings Platform
www.buildingsplatform.org

Meeting the EPBD requirements with solar thermal energy

→ Solar thermal systems reduce a building´s system input/output ratio as defined in the European Energy Performance of Buildings Directive (EPBD) and so present an elegant way of meeting buildings standards.

Schalkwijk, Netherlands
Picture: Bruinse / Eneco

Front and rear cover pictures:
Upmann, Berlin
Schott Solar
Corona Solar

SOLARGE

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