

Next step



SUNMARK®

SUSTAINABLE SOLAR SOLUTIONS

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What is next step?

Changing from increasing and unpredictable energy costs to:

- Fixed low energy prices
- Attractive and secure return on investment
- Turn-key solutions and after sales service
- Proven and optimized technology
- Environmentally sound and sustainable energy production



Large scale solar thermal energy is an important future source of energy

The fact is conventional energy resources are limited; sources are running out while demand is increasing and price rises remain unpredictable. Economic and political uncertainties call for a reliable and stable energy source. Moreover environmental issues are becoming much more apparent, particularly climate change.

Next step is a renewable energy solution that is competitive to existing energy sources and a viable alternative. Solar thermal energy is such a solution. It's a known technology, tried and tested for decades and now taken to the next level in large scale solar installations. Though the enormous potential has not yet been fully realized.

The solar thermal solutions by Sunmark are not just environmentally sound and sustainable. They also secure an attractive return on investment and fixed energy prices for more than 25 years without the aid of subsidies.

Sunmark offers next step

- An economically and environmentally attractive energy solution based on solar thermal energy.
- Fixed low energy prices for more than 25 years, reducing dependency from fluctuating and increasing fossil fuel prices.
- Long term stable energy supply reducing dependency on energy from politically unstable areas.
- Customized turn-key solutions based on leading technology for heating, hot water and cooling.
- Attractive and secure return on your investment without subsidies.
- Extensive and reliable after-sales services.





The age of the fossils is over

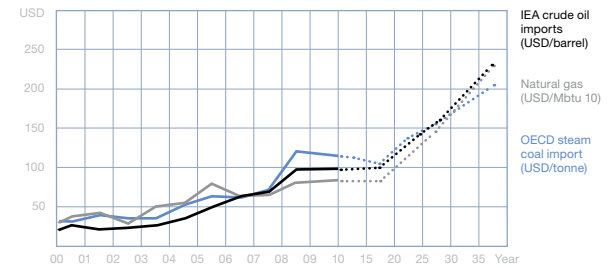
Energy demand is increasing. So is climate change. At the same time, supplies are running out and prices will soar.

Supplies are running out and prices will soar

Fossil fuel energy sources are limited. Most of the world's oil, gas and coal come from areas of the world that cannot be considered as politically stable. Experts may disagree on the level of reserves, but resources are being depleted and new sources are not being found at the same rate. Also the rapid development of emerging economies is adding to the energy demands of limited fossil fuels. This reality is now causing pressure on traditional energy

resources and with increasing demand, it's predicted to see continuing price rises. At the same time, the consumption of fossil fuels inevitably leads not only to pollution, but also to ever increasing CO₂ emissions. The impact of this on the global climate is now at the very top of political agendas all over the world.

The oil price is projected to reach 132 \$/barrel by 2020.



Source: International Energy Agency "World Outlook 2009"



The energy map of the future is taking shape

New sustainable steps need to be taken. New sources of energy must now play their part and help restore the balance. Though, in this process, it is important to choose realistic and economically viable solutions.

Today much of green energy is subsidized to compete with existing fossil fuels. But with political instability, the continuing financial crises, combined with the increasing lack of taxes from fossil fuels and the shift towards renewable energy, public subsidy will ultimately be affected in the future. Favor will be on those energy alternatives that are sustainable from both a financial and environmental point of view – solar thermal energy meets both requirements.

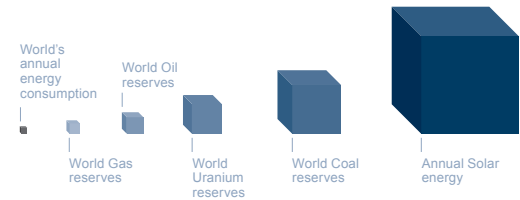


The energy supply of the future will not rely on oil, gas or coal. The energy landscape will be a mix of energy solutions. In the coming years, fossil fuel solutions will be optimized and combined with sustainable alternative sources. Intensified development of known and new green energy sources will continue at a high pace until they can compete with fossil fuels without the aid of subsidies.

However, solar thermal energy will continue to excel in this rapidly changing market place. Economically, solar thermal energy is already out-performing all other forms of energy and is truly environmentally sustainable being CO₂ free.



In just 30 minutes the sun delivers sufficient energy, to cover the entire global energy consumption for a whole year.



Source: New Renewable Energy Sources, Norway







Next step

Think 'Large Scale'

Expert analysis has proven: Large and medium scale solar energy installations are 4-6 times more efficient, compared to solar thermal installations on individual homes, generating a pay-back time of 3-4 years in Asia and 6-9 years in Northern Europe.

Solar thermal energy – a global technology catching the sun locally

Solar energy is energy in its purest form. But this renewable resource is not just about protecting our environment and our future climate. It is also very much about economy, and making sound and feasible investments in clean energy production.

**Energy Plan
Denmark suggests
to increase the area
of solar thermal
installations with
8 mill. m² by 2030
in Denmark.**

water, heating and cooling has been known, tested and developed for decades.

So why has the potential of solar thermal energy not yet been used to its full advantage? The technology of transforming the energy of the sun into hot

Traditional thinking, established patterns of existing energy production and reluctance in making new investments are factors that have slowed down progress. Now change is needed to sustain the global balance, economically and environmentally.

Today the economical advantages of solar thermal energy and large production facilities make solar energy even more competitive and sustainable. Already large scale solar thermal energy solutions are included in many national and international energy plans for the future. Solar thermal energy will provide a rapidly increasing share of the energy production in the coming years, so now is the time to take the next step.



'Hot & Cool' – energy for the future

Solar thermal technology provides energy for hot water, heating and cooling for district energy distribution as well as larger private/industrial installations.

A valuable part of a total plan

All over the world, solar energy plants are already supplying sustainable energy to the benefit of the economy and the environment. In some cases it is complimented by other sources of energy. During the summertime, the solar plant produces more energy and covers most of the hot water, heating and cooling demand, while other energy sources provide a larger share during the wintertime.



Hot water

The solar field generates hot water for household use, hotels as well as processing heat in the industry with up to 98° Celsius.



Heating

The energy for heating is used in residential homes, hotels, office buildings as well as process heating for industry.



Cooling

The solar technology combined with an absorption chiller provides cooling/air-conditioning for e.g. hotels, apartment/office buildings, as well as for district cooling.



Storage

Opposed to other alternative energy sources, the energy in hot water can be stored and used for day/night variation as well as seasonal storage so extending the use of energy from the sun.



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Next step

Fixed low energy price

The investment in a solar thermal plant and running operation costs can be calculated and financed to ensure a reliable fixed competitive energy price without subsidies for more than 25 years. The resources from the sun are free and there is no need for substitute fuel.

A sound investment – guaranteeing a predictable low energy price

The sun saves money from day one. The savings will increase progressively as the prices of conventional energy continue to rise.

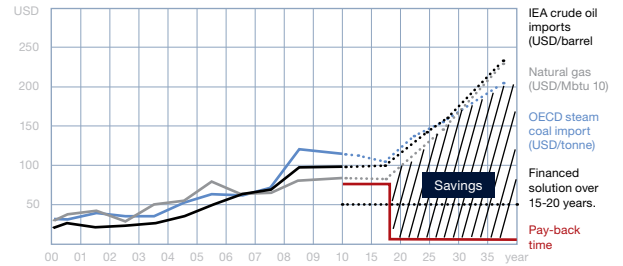
Solar thermal energy will greatly reduce the dependency from other sources of energy production. Thus helping create the basis for a stable economy, and securing a safe and sound investment with a great cost/benefit bottom line. Once the investment is paid back, the production of energy is virtually free. No direct substitute fuel is required – only a minimal supply of electricity of less than 1 % of the total energy production is needed.

The sun saves money from day one, and the savings will increase further from year to year, as the prices of traditional energy resources continue to rise.

Fixed energy prices for more than 25 years

The fluctuations in financial markets and currencies make energy prices unpredictable. Compared to other unstable fuels, solar thermal energy has a fixed price. By investing in a solar thermal plant you can calculate the energy price. The sun is free and solar thermal energy ensures a stable price for more than 25 years.

Pay-back time of a Sunmark turn-key installation is in Northern Europe 6–9 years and in Asia 3–4 years. After the pay-back time only one percent of the energy production is needed for the operation of the installation.

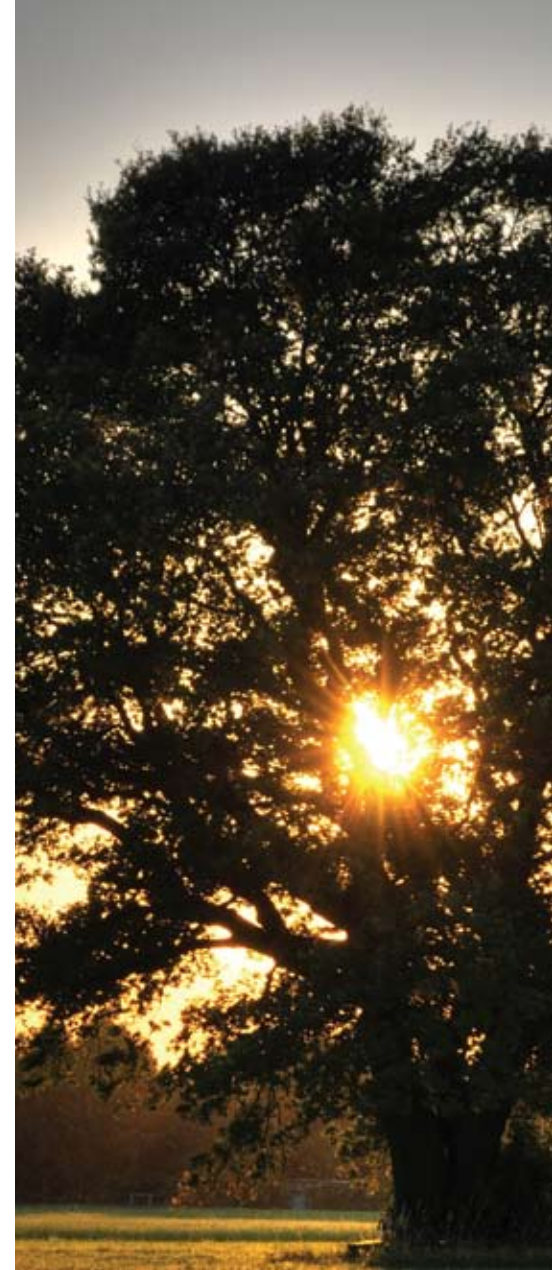



Source: International Energy Agency

Today, setting up a solar energy facility is a sound investment and from day one makes good business sense by lowering the energy prices and fixing energy costs. The pay-back time of a solar installation will depend on the following factors: the size and efficiency of the facility, the temperature set, the radiation of the sun, interest rates and of course the market price of alternative fuels. Currently, a conservative pay-back time is 3-4 years in Asia and 6-9 years in Northern Europe.

Large scale solar energy facilities are becoming even more competitive
Expert analysis has proven: Large and medium scale solar energy installations are 4-6 times

more efficient, compared to solar thermal installations on individual homes. The average cost of setting up a large scale solar thermal plant has dropped over the last few years. Increased production capacity, improved technology and intensified competition have also helped further reduce prices. At the same time, the costs of other energy sources keep on rising. As a natural consequence, solar energy becomes even more competitive.





The world's largest solar thermal energy plant, the facility at Marstal in Denmark, each year reduces the CO₂ emissions by 1,200 tons for each 10,000 m² of sun collector area.

Facts about solar thermal collectors
1 m². collector annually produces 600kWh. (DK) & 1,092 kWh. (Asia). Each kWh produced by solar energy costs less than approx. 0.02-0.05 USD (DK) in the plant's lifetime – based on simple pay-back calculations.

Leader in energy profitability – securing a high and reliable energy out-put

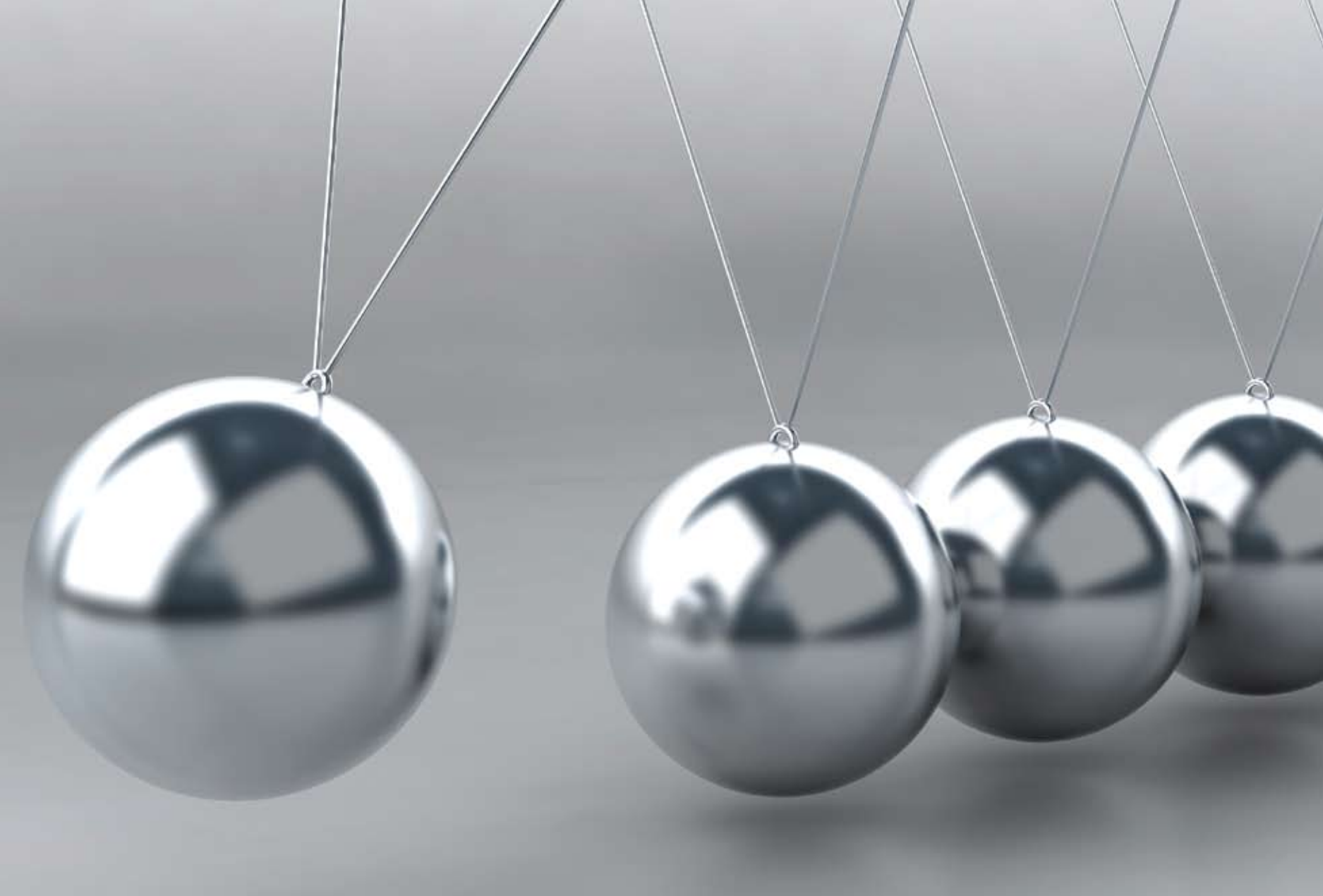
Large scale solar thermal installations produce competitive energy without the aid of state subsidies securing a fixed low energy price.

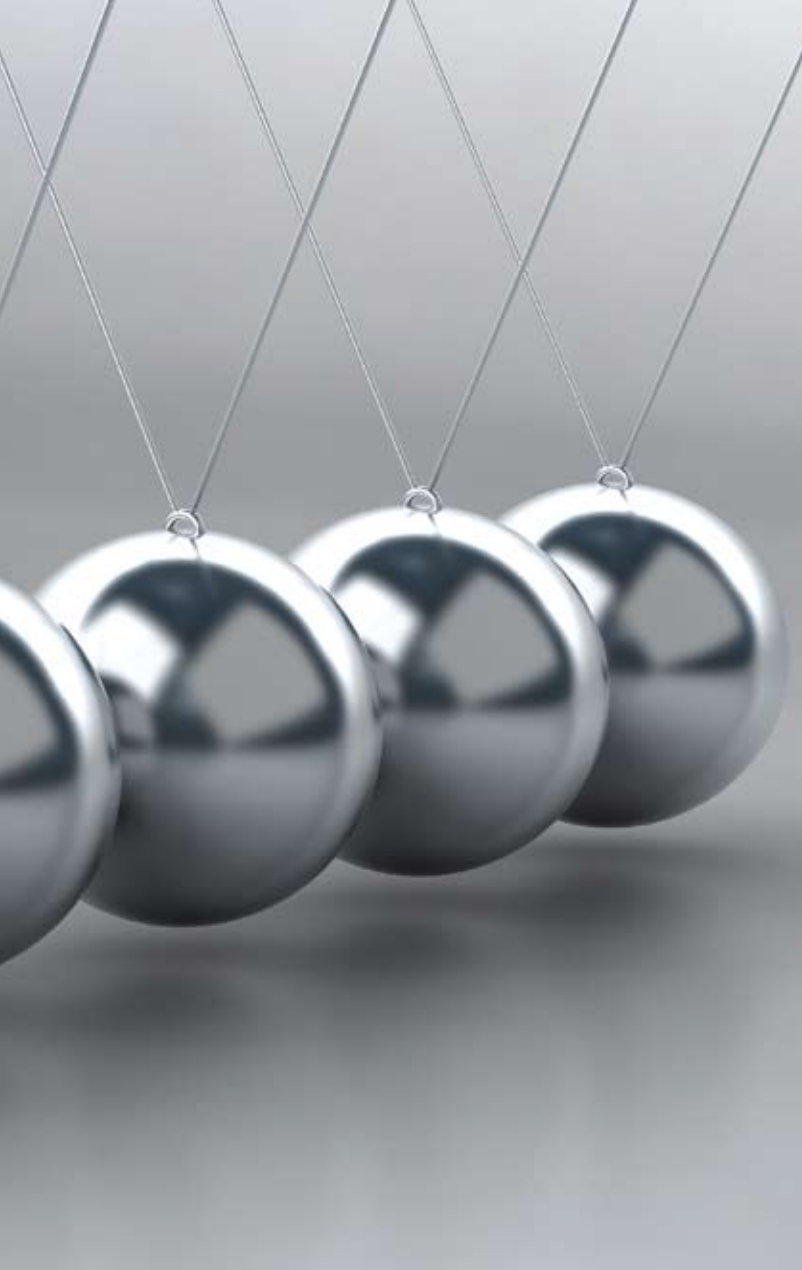
Denmark is the world leader in exploring high efficiency, flat plate solar collectors for large scale installations. This is partly due to the public subsidy of solar energy. However back in 2001, the Danish government stopped subsidizing solar energy solutions. This effect pushed forward a dedicated effort to optimize collectors for the highest possible performance, in order to improve return on investment, making solar thermal energy competitive without subsidies.

The effort was a success, as proven by many installations in Denmark, lead by the world's largest solar thermal installation in Marstal.

The optimization of the technology combined with increasing energy prices from conventional energy sources has resulted in a rapidly increasing demand for solar thermal energy.

As a result the Danish Government has prepared an energy plan, 'Varmeplan Danmark', where additional 8 million m² by 2030 will contribute to the self supply of the Danish energy consumption without the aid of subsidies.





Next step

Sunmark turn-key solutions

Sunmark offers large scale turn-key energy solutions, within the areas of heating, hot water and cooling. We customize each solution to the specific requirements of our customers and provide extensive after sales service.

Solar thermal energy taken to the next level

Most horizontal areas have the potential to become solar energy producing areas.

At Sunmark, we look at a solar thermal energy installation as a total solution, not only the supplying of sun collectors,

exchange stations, piping or control systems. The optimum value is created when a solution is customized to specific needs and scenarios. Each component has to be dimensioned and designed according to the requirements and specifications of the operating of the facility, thus optimizing the energy output. In short, we deliver turn-key energy solutions to meet our customer's needs throughout the lifetime of the installation.

Quality is our bond

To ensure Sunmark quality solutions, we produce, control and cover the parts of an installation that make a difference in reaching the highest efficiency and reliability in energy production.

- 'Sunmark Control' and flow system ensures efficient and optimized energy output.
- Collector and performance are certified and rated according to the highest standards, e.g. Solar Keymark.
- Collector production in Vietnam is certified according to ISO 9001.
- Heat exchange stations are designed and produced by Sunmark in Denmark
- Suppliers are leaders within their field, both technologically and quality wise.
- Product development groups optimize and develop existing and new products.
- Core competencies in all main areas are guaranteed and we only co-operate with leading partners and experts.
- Sunmark Service Solution by authorized partners.

Sunmark Service Solution

The 'Sunmark Service Solution' offers regular check-up's and service calls through Sunmark authorized service partners. We also offer the option to monitor the performance of each installation via the internet as well as a hot-line

The service concept from Sunmark extends the warranty on solar collectors for a minimum of 10 years.

service. Our service partners ensure that the installations are being maintained according to the Sunmark standard. They analyze and control the fluid, check the collectors for damages from external factors, control the heat exchange station, pumps, control system and other vital parts of the system for a long life high performance in energy production.

From passive space to active energy production

Steps of a turn-key installation

- | | |
|-------------------------------------|-------------|
| 1. Analysis | 2-4 weeks |
| 2. Feasibility study | 2-4 weeks |
| 3. Design & dimensioning | 2 weeks |
| 4. Construction of installation | 10-24 weeks |
| 5. Commissioning | 2-4 weeks |
| 6. Full scale operation, adjustment | 1-2 weeks |
| 7. Service of installation | ongoing |



With 22 years of experience and know-how, Sunmark offers a complete project management package, all the way from the drawing board, when facilities are being developed, through to after-sales servicing and maintenance.



Pipe work



Concrete blocks



Fittings



Solar panels



Tank capacity



Exchange station

Selection of cases

District heating in Marstal, Denmark

The world largest solar thermal installation located in Marstal is now expanding the existing installation of 18.000 m² solar collectors with another 15.000 m². Sunmark is responsible for the turn-key solution including the delivery of solar collectors, the heat exchange station and the connection with the biomass boiler, heat pump and ORC.

The thermal solar plant will be finished in 2012 and the total installation will supply 55 % of the total energy in Marstal. The remaining heat will come from locally growing willow. A 4MW wood chips boiler is also part of the project, which ensures that Marstal's citizens will be 100 % supplied by local and sustainable energy sources. A seasonal heat storage system ensures optimal output of the solar heat far into the autumn.

| | |
|-------------------------------------|-----------------------|
| Collector area: | 33,000 m ² |
| Annual production: | 14,542 MWh |
| Share in annual heat demand: | 55 % |
| Energy storage: | 87,100 m ³ |
| Equivalent oil savings: | 1,745 tons/year |
| Supplied households: | 1,600 |



Sun Island Almere, Netherlands

The solar thermal installation in the town Almere, Netherlands is a good example of how aesthetic simplicity and advanced technology can work in harmony with nature. It is designed in a way that compliments the natural environment and is undoubtedly one of the world's most beautiful solar thermal plants. The project 'Sun Island Almere' created by NV Nuon Energy, a subsidiary of Vattenfall, one of the largest energy companies in Europe is based on Sunmark technology.

| | |
|-------------------------------------|-----------------------|
| Collector area: | 7,134 m ² |
| Annual production: | 2,708 MWh |
| Share in annual heat demand: | 10 % |
| Energy storage: | 12,100 m ³ |
| Equivalent oil savings: | 500 tons/year |
| Households connected: | 2,700 |



Selection of cases

Combined Heat and Power (CHP) Toerring, Denmark

The 7.284 m² large solar installation consists of 525 collectors and delivers warm water to the Danish town called Toerring. An important factor for CHP is the sale of electricity. Since the price of electricity typically is lower during the summer, it rarely pays to turn on the gas engines for the power generation. As the need for hot water still has to be covered, a solar plant is an ideal solution, because it contributes mostly during the summer. Due to this both the generator and boiler can be spared. The solar thermal plant produces heat which is equitable with 10 % of the annual heat production. In the summer months the installation will cover between 70-80 % of heating and hot water supply.

| | |
|-------------------------------------|----------------------|
| Collector area: | 7,284 m ² |
| Annual production: | 3,400 MWh |
| Alternative fuel: | Natural gas |
| Share in annual heat demand: | 12 % |



Thai Union Manufacturing Co. Ltd. Bangkok, Thailand

Thai Union Manufacturing Co. Ltd. is the leading producer and exporter of frozen and canned seafood in Thailand. In November 2008, the company signed a contract with Sunmark, supplying the solar hot water system with a total active area of 462 m².

The hot water from the solar thermal installation is used for fish processing. The installation started operating in February 2009 and consists of 33 solar collectors with a size of 14 m² each, equivalent to 25 m³/day at 90°C.

| | |
|-------------------------------------|--------------------|
| Collector area: | 462 m ² |
| Annual production: | 628 MWh |
| Alternative fuel: | Heavy fuel oil |
| Share in annual heat demand: | 18 % |



Sheraton Hotel Nha Trang, Vietnam

Sheraton Hotel is a five-star hotel with an emphasis on environmentally friendly solutions. It is located in Nha Trang City, Vietnam. The Sheraton Hotel signed a Sunmark contract for a solar hot water system with the total active area of 112 m² consisting of 8 pcs. 14 m² solar collectors. The solar thermal system has been installed on the 33rd floor.

| | |
|-------------------------------------|--------------------|
| Collector area: | 112 m ² |
| Annual production: | 138 MWh |
| Alternative fuel: | Oil |
| Share in annual heat demand: | 70 % |



Hospital Silkeborg, Denmark

Institutions such as hospitals, schools, municipalities and sport centers can reduce the high costs of energy by using solar thermal heating systems. Often the annual usage of hot water is so high that a solar heating plant makes profitable sense. At the hospital in Silkeborg, the collectors are mounted on a flat section of the roof without disturbing the appearance of the building.

| | |
|-------------------------------------|-------------------|
| Collector area: | 280m ² |
| Annual production: | 131 MWh |
| Alternative fuel: | Oil |
| Share in annual heat demand: | N/A |







Next step

Proven and optimized technology

Sunmark is an international company which catches the sun locally – with constant focus on product development, performance and superior quality, making us a leading supplier of turn-key solutions.

Past experience creates future solutions

Sunmark is built on a strong foundation of more than 22 years of experience and development. That gives us an expertise that is 'second to none' in the field of turn-key solar energy solutions.

Sunmark aims to be a technological leading and competitive global supplier.

We provide system design and calculations according to EU-standards, and these standards are the basis of the Solar Keymark certification for our collectors. And to validate our own calculations, designs and installations, we co-operate with leading suppliers, partners, consultants and experts. The control systems and our exchange stations are developed in Denmark while our production facility of solar collectors is based in Vietnam. The collector production with an annual capacity of 800,000 m² are certified

according to ISO 9001 quality standards. We select the leading suppliers within their field to be our component suppliers, always ensuring the highest quality and reliability in the installations.

High performance flat plate collectors
Sunmark is continuously developing, testing and optimizing new generations of collectors in order to ensure the highest performance and therefore the best investment for our customers. We co-operate with leading advisers and experts and create collectors that are of the highest efficiency and reliability.

Our collectors meet the Sunmark quality standard and we ensure the same high efficiency in production and guarantee positive customer experience throughout the lifetime of the solar plant.

Less is simply more reliable

Teflon has for many years been a controversial issue. Generally, customers have been willing to pay a much higher price for a collector with Teflon because of the theoretical prospect of a permanent increase

in collector efficiency. However, experience shows that in reality Teflon does not meet the high expectations which justify the higher price.

This is due to the properties of Teflon which expands when heated up and contracts when cooled down. When mounting a Teflon film onto a collector there are considerable mechanical challenges that have not yet been resolved in a reliable manner compared to the collector's desired lifetime of 20-30 years.

To avoid problems with Teflon and ensure high performance simply add more collectors.

So contrary to belief, there is a greater risk that over time the Teflon foil will stretch and tear and rest on the absorber, resulting in a greater reduction in collector performance. Based on these Teflon-related uncertainties, Sunmark cannot vouch for such a product, let alone justify a higher price.

Visual aesthetics in an industrialized and optimized product

Sunmark puts great effort into design and aesthetics when developing new generations of collectors and heat exchange terminals. We are constantly improving quality, efficiency, reliability and sustainability and take pride in the visual appearance of our products. We draw upon the traditions and the originality of Scandinavian design. In our solutions, we aim to

let simplicity and advanced technology meet in harmony, always with functionality in focus. Our heat exchange terminals are designed to meet the specifications of each individual installation to ensure an efficient and reliable operation.

We are constantly at the forefront of new developments so we can optimize the possibilities and the output of our solar collectors. We embrace innovation, diversity and new technological developments, always with a clear focus on our core competencies. Superior quality and high efficiency are always our top priorities in our solar energy solutions.

Silent and clean energy production

A large solar energy facility can be either a proud landmark or discreet and unseen from the outside. They have virtually no height, make no noise, and can easily be integrated into existing surroundings. When our collectors eventually wear out, 99 % of the material used for the collectors is recyclable.

Facts and benefits about solar thermal energy

- Solar collectors absorb the energy from the sun 3-4 times more efficiently than solar cells.
- The price of solar collectors is about 3 times less than the price of solar cells.
- Solar collectors are an attractive investment, even without subsidies.
- Sunmark collectors are 99 % recyclable.
- Optimized and proven technology.
- No movable parts.
- Little or no maintenance.
- Energy for hot water, heating and cooling.
- Storage of energy.
- A solar collector also generates energy in bad weather, however with a lower performance.
- Highly reliable energy production without Teflon.







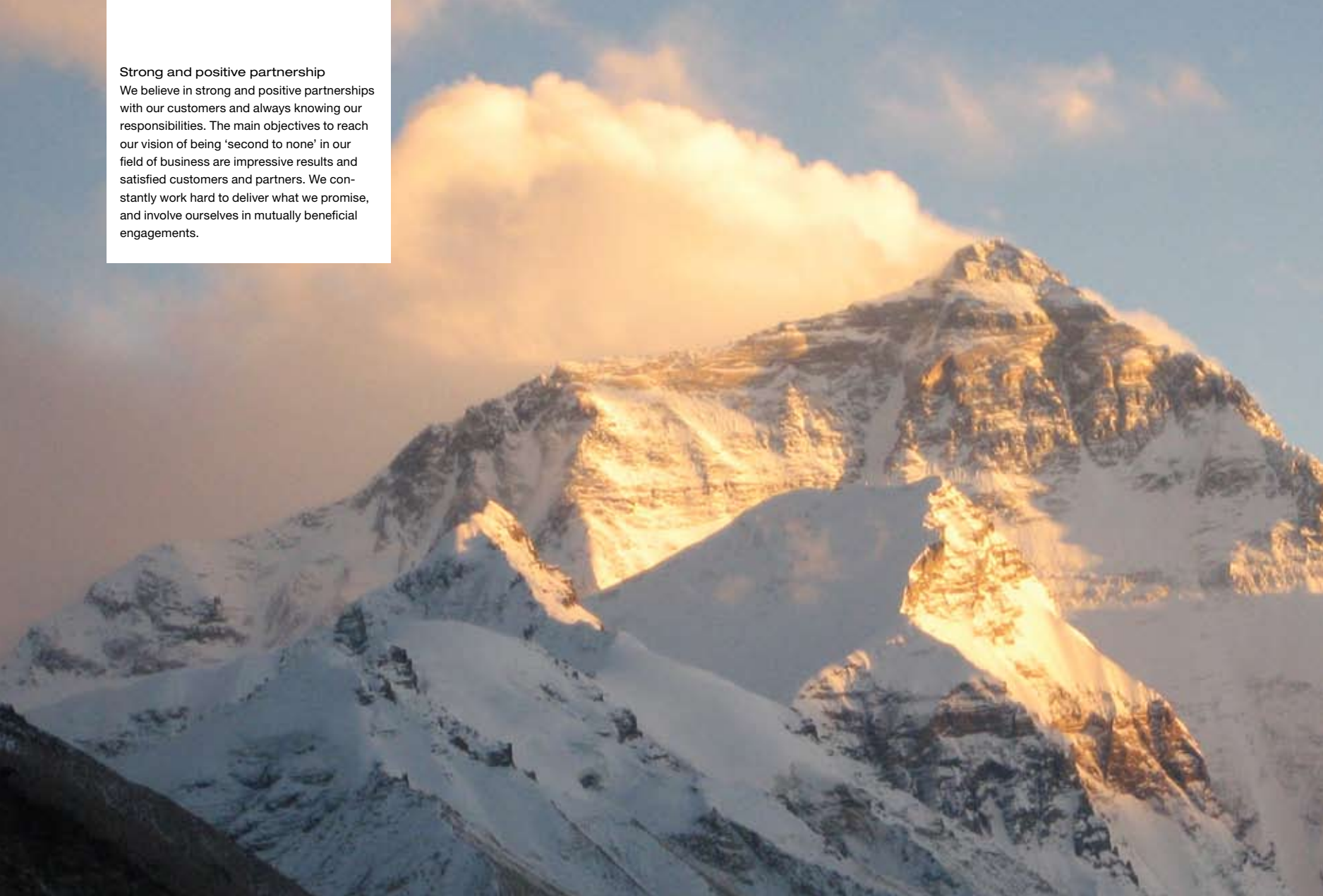
Sunmark

‘Sustainable solar solutions’

Our mission ‘sustainable solar solutions’ is defined as ‘everything about solar energy solutions has to be of real and valuable relevance in all aspects of products and solutions’. For Sunmark ‘sustainability’ points back to superior quality, reliability in operation, efficiency in production, sound return on investment and always being environmentally sound.

Strong and positive partnership

We believe in strong and positive partnerships with our customers and always knowing our responsibilities. The main objectives to reach our vision of being 'second to none' in our field of business are impressive results and satisfied customers and partners. We constantly work hard to deliver what we promise, and involve ourselves in mutually beneficial engagements.





Sunmark

‘Second to none’

Our vision ‘second to none’ is formulated by a strong commitment and desire of making and maintaining Sunmark as the leader within its field. ‘Second to none’ is used as an instant reference point as well as a way of preserving a position. To gain and maintain the position, we have to be resourceful and innovative by doing our best and constantly perceiving ourselves as the ‘no. 2’ in our business, disregarding the real position. We believe in the fact that everything can be done better and has to be done better, since we are living in an ever changing world where today’s latest invention will be tomorrow’s standard.

NEXT STEP is an energy solution that is competitive to existing energy sources and to other alternative options. Large scale solar thermal energy is such a solution and is an important future source of energy. Our ambition is to bring the economical and environmental benefits of the sun to communities and companies – with large scale solutions on a global level. We are specialized in offering individual turn-key energy solutions within the areas of heating, hot water and cooling, and customize each solution to the specific requirements of our customers from across the world. In this field, we aim to be ‘second to none’.

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SUSTAINABLE SOLAR SOLUTIONS