Large Scale solar purchasing

A BUSINESS OPPORTUNITY

CADDET renewable energy

IEA OECD

IEA Solar Heating & Cooling Programme

Introduction

Important business opportunities exist for utilities, housing companies and groups of energy users, through co-ordinated large-scale purchasing (procurement) of solar water heating systems.

One important condition for lowering solar water heating system costs is international trading. Market barriers need to be removed and international standards and codes developed, helping to internationalise and rationalise the trade in solar equipment. An immense opportunity exists for professionals in the energy market both to influence and participate with profit in the developing market, through planned solar procurement.

This brochure sets out this opportunity by highlighting the large market potential, providing examples of what has been done in various countries and outlining common solar water heating systems within these countries. It provides decision-makers in the energy industry (natural gas and electricity) and housing providers (including commercial property developers) with an overview of the opportunities that solar water heating can offer to their organisations, both as products for competitive business growth, and as a strategic response to the requirement to reduce greenhouse gas emissions.

Experience has shown that co-ordinated, large-scale international purchasing improves the competitiveness of technology; the same is true for bulk purchasing by single companies. Our aim is to increase the use of solar water heating systems by encouraging co-ordinated large-scale purchasing; this will not only help to improve system performance but also reduce hardware, marketing and distribution costs, as well as helping to meet environmental commitments. This brochure deals primarily with small active solar water heating systems (although large systems may also apply) and will be of interest to utilities, housing companies, local/regional government and other interested groups of energy users. It is anticipated that the widespread adoption of bulk purchasing will help to create a new and sustainable market for solar water heating systems.

This publication has been written by an international collaboration under the International Energy Agency's (IEA) Solar Heating and Cooling Programme (SHC), with support from IEA CADDET Renewable Energy. More information on solar procurement and the opportunities available can be found in a report entitled "Opportunities for Large-scale Purchase of Active Solar Systems", published jointly by IEA SHC/CADDET Renewable Energy (copies available from contacts given on the back cover). In addition, a Task has been proposed, within the IEA SHC Programme, to co-ordinate large-scale solar purchasing within participating countries, with the aim of installing a minimum of 10,000 systems by the year 2003. The objective of this Task, "Active Solar Procurement" is to create a sustainable, enlarged market for active solar heating systems. For further details, please contact one of the people named on the back cover.

Front cover photographs: Top left: Apeldoorn Solar Project, the Netherlands (Source: Ecofys, NL-Utrecht). Top right: Typical domestic solar hot water systems in Denmark. Bottom left: Solar water heater on a UK house (Courtesy: UK Solar Trade Association). Bottom right: Buildings with solar water heaters in Toarp, Sweden (Courtesy: Marie Anden).

The Opportunity

Several challenges face energy utilities as providers of energy, and housing organisations as consumers of energy, as this century draws to a close. Deregulation of the energy industry is under way in many nations, creating new choices for energy products and services for customers. Increasing concern about the effects of greenhouse gas emissions is causing governments and some private organisations to develop CO_2 reduction targets which, in some cases, will be enforced through legislative mandates. Solar water heating provides business opportunities for energy providers and consumers to address some of these challenges.

By being involved in the procurement process, interested organisations will have the opportunity to purchase the right products at the lowest possible costs, developed with their customers in mind. This process will also assure high quality standards for systems and components. Solar water heating can contribute to a positive environmental profile for those businesses providing solar energy to their customers. As solar water heating technology proliferates, there will be many opportunities for all partners to reap the rewards of "going green".

Solar water heating provides clear benefits to all involved parties. Businesses have the opportunity of providing their customers with a means to reduce CO_2 contributions to the atmosphere, while offering significant cost savings for water heating services.

UTILITIES

Energy utilities in a number of countries are taking advantage of solar water heating for their businesses. Currently 1.3 million European households use solar water heaters, producing 8 PJ of energy for water heating; many of these installations have been completed by energy utilities (see ref 1). Solar water heaters, typically installed on building roof-tops, produce around 50% of the hot water load through solar energy, with the balance being made up by electricity, natural gas or oil. While the current emphasis is on water heating, there is also potential for growth in solar home space-heating.

Solar Water Heating Expands Market Share for Gas Utilities

Danish gas utilities have successfully employed the positive aspects of solar water heaters in their marketing strategies, to increase market share of natural gas. One Danish utility, Naturgas Midt-Nord, has attributed a 60% increase in gas sales (878,000 m^3) (see ref 2) to their marketing campaign, which combines solar water heating and natural gas; this provides a cleaner, more environmentally-friendly energy package when displacing oil.

Electricity Utilities Compete for Market Share

Electricity utilities, such as Lakeland Municipal Utility, of Florida, USA and London Hydro, Canada have initiated projects to offer customers combined solar energy/off-

Gouda, the Netherlands 1997 – implementation of active solar by the utility, the municipality and housing associations.

peak electricity packages, as a cost-effective alternative to natural gas or electric water heating.

Solar Water Heating Provides New Customer Choices

Many utilities are finding that their customers are asking for new product and service choices. These customers are motivated by the increased expectations that accompany deregulation and competition, as well as by an increased understanding of environmental issues.

There are many markets where customers have expressed a strong desire for "green" energy products. Some customers demonstrate a willingness to pay more for "green" energy (21%, MORI opinion poll (see ref 3), UK; 11%, Ontario Hydro, Canada (see ref 4)). However, significantly more customers express a desire for "green" energy if the price is not higher (65%, MORI opinion poll, UK; 30%, Ontario Hydro, Canada).

Solar Water Heating Provides Retailing Opportunities

In the UK, some of the recently deregulated energy companies have added solar water heaters to their retail product mix. These utilities use their billing service to offer customers energy-related products such as solar water heaters. Some utilities also offer financing packages to assist sales growth.

Solar Water Heating as a Tool to Achieve CO_2 Reduction Targets and Create Corporate Goodwill

The Dutch utility, Nuon, has already facilitated the installation of around 7,500 solar water heaters through a well-developed project approach. This on-going venture provides utility customers with reliable, cost-effective water heating by combining solar energy with the base fuel. Each installation contributes around 300 kg in annual CO_2 reductions.

Nuon has also benefited by taking a leadership position with respect to emission reduction targets, and has succeeded in turning this issue into a winning business strategy, promoting public goodwill for the utility. As a direct result of this programme, the utility has received extensive positive publicity both locally and internationally.

HOUSING COMPANIES

The involvement of housing companies has been instrumental in the success of solar water heating projects.

Solar Water Heating as a Cost-effective Tool to Meet Energy Efficiency Targets

Energy efficiency targets for new and renovated housing constructions have been established by many countries; solar water heaters are viewed as a cost-effective solution to meeting these efficiency targets.

In the United Kingdom, the 'Home Energy Conservation Act' requires local authorities to draw up plans to meet energy efficiency improvements of 30% in new and existing housing. Solar water heaters are included as a means of contributing to this target.

In Canada, new homes must be constructed to energy efficiency standards to receive the 'R-2000' certification, which is recognised as one of the standards for quality homes in Canada. Builders and housing associations are working with Natural Resources Canada to promote the use of solar water heaters in new housing markets, to help meet the 'R-2000' standards in a cost-effective way.

In the Netherlands, the 'Energy Performance Standard' establishes benchmarks for energy efficiency improvements in new homes. While solar water heaters are already used to increase home energy efficiency, they will play a more significant role as the energy efficiency standards are tightened in 1998 and 2000 to reduce energy use.

Solar Water Heating Provides Commercial Housing Operators with Competitive Heating

The Swedish housing company EKSTA Bostads AB uses solar water heating to provide 15% of the heating needs for 84,000 m^2 of their housing developments; 70% of the heating needs are covered by wood fuels. Their annual heating cost is much less than the corresponding national average for municipal housing, of which a large part uses traditional fuel sources (3 ECU/annum.m^2

heated area for EKSTA's cost compared with 10 ECU/annum.m^2 for the national average) (see ref 5). In the United Kingdom, the Gwalia Housing Society and Tai Cymru (Housing for Wales) have recently incorporated solar hot water systems into two developments. Gwalia Housing is using solar water heating to reduce the environmental impacts of housing, while providing affordable warmth and hot water.

Solar Water Heating Helps to Sell New Homes

As energy efficiency standards for new homes are increased, solar water heaters are expected to play an important role in the sale of new, energy-efficient homes. In the Netherlands, housing associations and housing developers are actively involved with solar water heating.

Solar hot water systems in the Apeldoorn solar project, the Netherlands (Source: Ecofys, NL-Utrecht).

The Solar Heating Market

POTENTIAL

A very significant market growth of about 20-25% per year, and a ten-fold increase in the solar industry by the year 2010, is anticipated according to a recent study "Sun in Action" made by the European Solar Industry Federation (see ref 6). This projected increase is based on a market investigation in the EU countries, as well as other important markets, and is a combination of the real market growth in some countries together with expectations or objectives in other countries. At first sight the anticipated increase seems over optimistic but it should be remembered that the average European market since 1989 has grown by 18%, and the industry is only just beginning to prepare itself for substantial growth. The expected market growth is based on the technical potential for residential applications alone, which is about 0.5-1 m^2 of solar collector per inhabitant in many countries.

"Solar countries" such as Israel, Greece and Cyprus already have high "solar penetration", whereas the best IEA countries Australia and Austria have a penetration of between 0.1 and 0.15 m^2 per inhabitant. The average solar penetration in IEA countries is roughly 0.02-0.03 m^2 per inhabitant; this would suggest that a strong growth of solar heating installations can be expected in the future. A driving force for market development will be the desire to reduce greenhouse gas emissions.

The actual market and the anticipated market growth for different geographical areas is shown in the figure to the right.

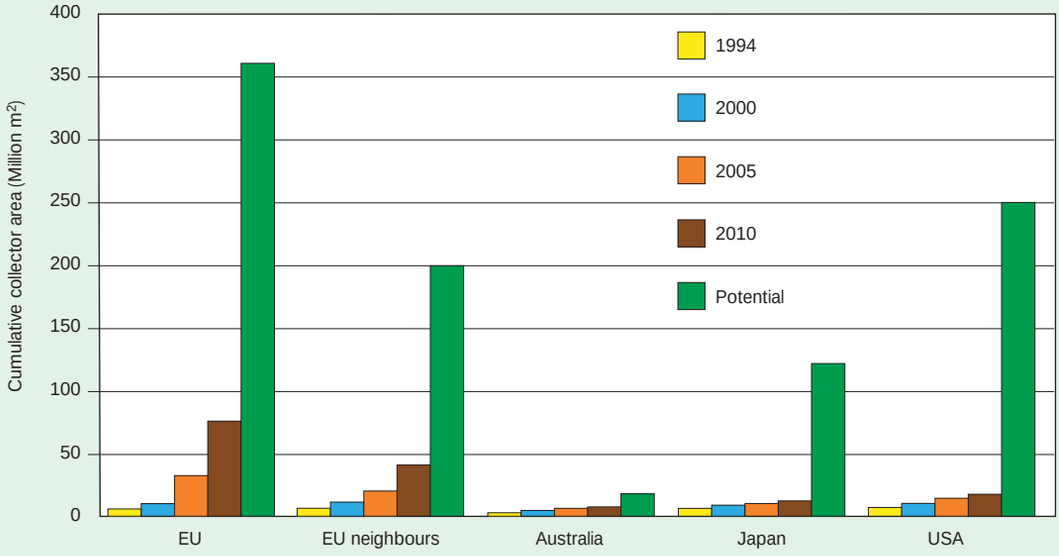
A number of studies carried out by the IEA, the European Commission and in several countries reach a common conclusion: The market for solar water heaters is huge and – taken as a whole – is steadily growing, although the market growth will differ widely from country to country.

The most important solar applications are for residential use: heating of hot water and living space. Today, systems for hot water production in single-family houses are dominant, although in the future, solar heating systems will be used in all types of housing. In countries with centralised heating systems, such as district heating, large-scale solar energy systems will feed heat to the distribution network. Such systems have been successfully demonstrated in Scandinavia and Germany. Swimming-pool solar systems, common in some countries, also present a large market. The Table highlights the potential market in different countries.

Typical domestic solar hot water systems in Denmark.

THE ECONOMICS

The costs of solar water heating systems are often considered to be the major barrier to the development of the solar heating market. However it has been found that this barrier can be reduced through bulk purchasing. In addition, two recent market studies (see refs 7,8) have shown that there are other barriers which have to be recognised and which can be turned into market opportunities. Collector costs today are partially determined by the manufacturing which is often on a small-scale and is at least partly manual. In a mature market, small manufacturers will only exist in market niches; the main market is expected to be dominated by rationalised industrial manufacturing, and the resulting energy costs are expected to be comparable with those of fossil fuels and well below the cost of electricity in most of the IEA countries (with the exception perhaps of countries with a high percentage of hydro power).



Expected solar collector market growth and solar heating potential (based on 1 m^2 of collector area per inhabitant).

However it must be accepted that solar installations imply high investments and low operating costs, and therefore that their economy must be evaluated on the basis of life-cycle costs rather than investment costs. Today's solar heating costs in some countries are already comparable with fossil fuels, whereas in other countries they are up to twice as expensive, depending on the market structure, climate and taxes on fossil fuels.

One important condition for lowering solar costs is international trading (see ref 9). Market barriers need to be removed and international standards and codes developed, helping to internationalise and rationalise the trade in solar equipment.

Table: Number of housing and solar water heaters in selected countries. (reference year is 1995)

Country	Canada	Denmark	Germany	Netherlands	Sweden
Households (million)	11	2.3	35	6.2	3.8
Single-family houses (million)	7	1.4	10	4.3	1.9
Flats (million)	4	0.9	25*	1.9	2.2
Total dwellings privately owned (%)	65	60	40	48	41
New dwellings built annually (x1,000)	200	12	510	85	13
Developed by:					
Property developers (%)	60	5	9	70	30
Housing corporations (%)	5	25	40	25	30
Private individuals (%)	25	57	50	5	30
Others (%)	10	13	1	–	10
Solar Water Heaters owned by:					
Private house owners (x1,000)	10	22	200	14	10
Housing corporations (x1,000)	very few	0.5	**	1	–

* includes two and more family houses

** there are no small systems owned by housing corporations but some corporations own large systems of 70 m^2 or more

Types of Active Solar Water Heaters

A study of solar water heating systems in Northern Europe, North America, Japan and Australia shows that it is possible to identify common types of solar water heaters, although local conditions and traditions influence the market and introduce local variants.

Typical single family solar heater for domestic hot water

- hot water tank situated near the boiler;
- collector area 3-6 m^2;
- storage tank volume 100-300 litres, to match daily hot water consumption;
- pressurised collector loop, freeze-protected with glycol in the water.

Variants of this system are:

- auxiliary heating using a flow-through water-heater or an existing tank (preheating system), instead of a spiral in the top of the tank;
- a mantle around the tank (low-flow systems) used as the heat exchanger in the collector loop;
- drain-back systems, which drain the collectors for freeze-protection;
- natural gas/oil-fired boiler integrated in the same cabinet as the solar tank;
- extra heat exchanger in the collector loop for space heating;
- components of the collector loop integrated with the tank and placed in a single cabinet;
- systems with integrated collector and storage (ICS).

New trends for single-family systems are likely to be the increased use of drain-back and low-flow systems, as well as increasing numbers of solar systems integrated with boilers.

North American single family system

- solar water heater with preheat tank;
- external heat exchanger loop/flexible tubing;
- use of inexpensive standard North American tanks;
- auxiliary heating often takes place in a second tank.

Large solar water heating systems

- applicable to apartment buildings or industrial premises needing hot process water;
- typical collector areas between 30-200 m^2;
- systems are site specific, but generally constructed following principles outlined above;
- solar collector often constructed on-site and often roof-integrated.

Large solar collectors for district heating

- collectors supply energy to the return pipes from the district heating system;
- typically large collector panels (eg 12 m^2) with high efficiency;
- panels often mounted in rows on the ground;
- may be combined with seasonal storage for typical collector areas of more than 1,000 m^2;
- without seasonal storage, typical collector areas are between 100 m^2 and 1,000 m^2.

Figure: Typical European single family domestic solar hot water system.

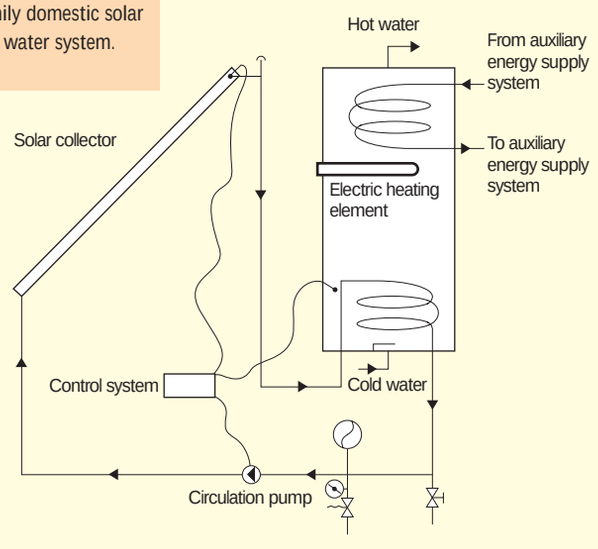
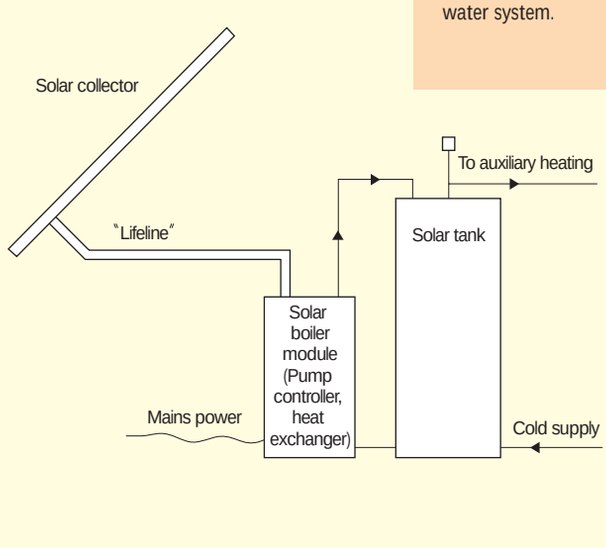


Figure: Typical North American single family domestic solar hot water system.



How to become involved in Large Scale solar purchasing

An immense opportunity exists for professionals in the energy market both to influence and participate with profit in the developing market, through planned solar procurement. If you are interested in learning more about bulk purchasing of active solar water heating systems, contact one of the people mentioned on the back cover to request the report "Opportunities for Large-scale Purchase of Active Solar Systems", published jointly by IEA Solar Heating and Cooling (SHC)/CADDET Renewable Energy. You will also receive information on how to become involved in the proposed SHC Task on international procurement, which is expected to start in 1998 and continue for five years.

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