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INTERNATIONAL ENERGY AGENCY
Solar Heating & Cooling Programme

In This Issue

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Public Policy & The Solar Market

Expanding the market for solar technology is a continual focus of the IEA Solar Heating and Cooling Programme. Through its work on technology development and research complimented by its design and market activities, the SHC Programme is working to increase solar's market share. Another avenue is the use of public policies. This article explores how different policies can increase solar energy's share in the energy market.

The underlying political motive for public support of renewable energy sources (RES), including solar energy, energy efficiency or any other new energy technology, is to achieve major market impacts to meet important policy objectives, such as reduction of greenhouse gas emissions and improving energy security. Secondary outcomes from RES policies, such as increased employment or new business opportunities, are viewed positively and sometimes may even become the overriding justification for public expenditure in RES.

Why Are Solar Policies Needed?

One of the main reasons solar energy has not penetrated the mass market is its higher cost compared to traditional fuels, and the fact that the market does not capitalize on the smaller external costs of RES and the non-energy benefits. Furthermore, in commodity markets such as energy and buildings, innovations or new technologies seldom form the basis for a competitive advantage – price does.

In general, energy utilities and the construction business often behave like conservative oligopolies when addressing solar energy use. The R&D expenditure of energy utilities, both in Europe and North America, has decreased by 60-80% over the last ten years demonstrating the lack of appreciation for innovations in these industries. It is for this reason that public support and public market interventions are necessary and justified to create a fair opportunity for solar energy to enter the market.

What Types of Policy Approaches Are Used?

Public policies used to support solar energy and its market expansion fall into five main categories: 1) research, technology, demonstration (RTD) support, 2) financial instruments such as subsidies, 3) fiscal instruments such as taxation, 4) legislative measures such as directives or norms, and 5) information. In practice, these five major policy categories are split into tens of different policy variants.

What Are the Best Policies for Market Expansion?

The success of policies cannot

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SHC Solar Award

PRESENTED TO PROF. BECKMAN

This year's SHC SOLAR AWARD was presented to Professor William Beckman, Professor Emeritus at the University of Wisconsin in the United States, at the World Renewable Energy Congress (WREC) Pioneer Awards ceremony in Denver, Colorado, USA.

The award is given to an individual, company, or private/public institution that has shown outstanding leadership or achievements, with links to the IEA Solar Heating and Cooling Programme, in the field of solar energy at the international level within one or more of the following sectors:

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How Government Can Support Solar Water Heating

A range of options used by governments to support solar water heating markets have been tried and tested in countries throughout the world. This article discusses some of these options.

Why Support the Sales of Solar Water Heaters?

Many governments throughout the world actively support the sales of solar water heaters. The reasons that governments provide this support vary, but in most cases they include:

➤ **Industry development.** There are greater economic benefits arising from the sales and installation of solar water heaters than in using conventional energy fueled water heaters. Investment in labor intensive products that save costs in capital intensive industries lead to economic benefits across the community.

➤ **Security of energy service.** With a solar water heater, hot water availability is less likely to be interrupted by disruption to conventional energy supplies.

➤ **Cost savings.** Solar water heaters will result in lower running costs, which in almost all situations give a pay back on the additional capital investments within a few years.

➤ **Reductions in greenhouse pollution.** The installation of a solar water heater has the potential to cut in half the greenhouse pollution associated with water heating in most of the world.

Barriers to Increased Sales

The barriers confronting solar water heaters sales are primarily:

➤ **Up front costs.** A solar water heater is more expensive than the conventional alternative, this leads to a more complex decision making process.

➤ **Not a consideration.** Many people planning to purchase a water heater do not even consider a solar system.

Types of Government Support

The types of government support offered generally address one or both of the barriers noted above. Support to reduce up-front costs includes direct rebates (subsidies), low interest loans and tax incentives. To increase the likelihood that solar is considered as a purchasing option; governments can support distribution of information to purchasers and sales intermediaries or can ensure consideration of solar hot water as an option through regulation.

Rebates/Subsidies

Rebates can vary in complexity and comprehensiveness. Generally, those that are performance based will produce better responses from industry.

Disadvantages of Rebates and Subsidies

The major problem with subsidies and rebates is the cost to the government if the program is funded through general taxes. When funding is taken directly from government budgets then the more successful the program the greater the cost for the taxpayer.

A lack of continuity can be catastrophic to industry and lead to a boom/bust situation. For example in Germany, sales of 900,000 m^2 in 2001 dropped to 560,000 m^2 in 2002 due to a drop in rebates from 125 to 86 /

Table 1. Examples of Subsidy Schemes

Type of Program	Country	Subsidy
System based	United Kingdom ("Clear Skies")	£400 per system
Area based	Germany	110 per sq m If provides >350 kWh/sq m pa
Performance based[1]	Australia (tradeable certificate)	Varies by size and performance Currently approx. $AUD36/MWh saved over 10 years

m^2 for a short period of time. (See Figure 1.) The tradeable certificate scheme in Australia avoids this problem as the funding flows directly from electricity retailers as they purchase Renewable Energy certificates to meet their mandated target under the Mandatory Renewable Energy Target (MRET) scheme.

Low Interest Loans

In New Zealand, the government provides the interest on a loan for approved systems between 2 m^2 and 7 m^2 in collector area. In addition to the subsidies described above, Germany also provides reduced interest rates for loans to purchase solar water heaters.

Tax Incentives

In Europe, a number of counties offer a reduction in the GST or VAT on the purchase price of a solar water heater.

Disadvantages of Loans and Incentives

The major disadvantage of tax incentives and low interest loans is that the amount of subsidy for the purchaser depends on costs and not on performance of the system. In the United States in the 1980s, federal and state tax rebates paid up to 70% of the costs of a new system. And, although inflated prices and special deals created low consumer costs, the systems often performed poorly.

Provision of Information

Descriptive information is available from the websites of most government authorities responsible for promoting renewable energy and many non-governmental agencies.

Some websites provide performance data for different systems and collectors.

Advertising is another component of many government campaigns. Soltherm has documented a number of these activities across Europe.

Governments also are involved in training intermediaries, such as plumbers, which not only leads to improved installation practices, but also greater confidence in purchasing solar water heaters.

Regulations

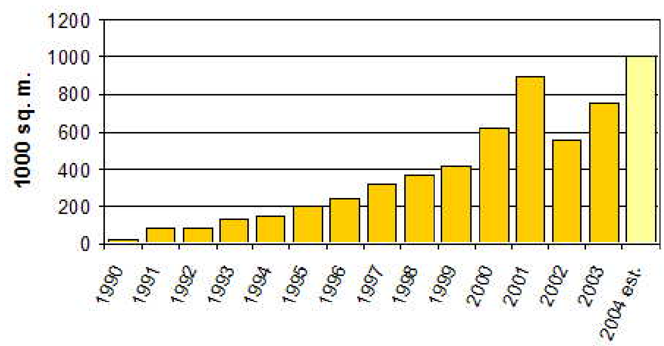
Regulations requiring the installation of solar water heaters also are used. Below are several examples.

Israel

For over 20 years, solar water heaters have been required on all buildings in Israel less than 27 metres high. As a result of this requirement, solar water heaters represent over 80% of the hot water systems in Israel, and supply an estimated 3% of the total primary energy for the country.

Currently, Israel has the greatest level of uptake[2] of solar water heating in the world (600 m^2 of collector for every thousand persons).

Figure 1. Sales of solar water heaters in Germany



Barcelona and other Spanish Municipalities

The Municipality of Barcelona has required solar water heating on new residential buildings since 1999. Since that time, a significant number of other Spanish municipalities have passed “Solar Ordinances” leading to a 10-fold increase in solar heating in Spain.

Victoria, Australia

The State of Victoria has recently proclaimed regulations requiring the installation of sustainability options, either a solar water heater or a rainwater tank in new houses.

In all these cases, the regulations require savings of greater than 60% of the energy used by a conventional water heater.

Conclusion

A range of support schemes for the sales of solar water heaters have been tried and tested in countries throughout the world. The effectiveness of such schemes vary naturally, however,

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[1] Performance based subsidy provides support that varies depending upon the ability of the system to deliver differing amounts of hot water at differing solar savings levels.

[2] Uptake is the solar hot water collector area in operation per 1000 population.

heating water continued from page 3

Table 2. VAT Incentives

Country	VAT General	VAT on Solar Water Heater
United Kingdom	17.5%	5%
France	19.6%	19.6% to 5.5%
Italy	20%	10%
Portugal	17%	12%
Ireland	21%	12.5%

these and other schemes demonstrate that they can create incentives for manufacturers to develop more cost effective products as well as incentives for customers to install systems that will produce the best savings for their individual needs.

In general, programs that provide performance based incentives and stable funding over an extended period of time produce the most sustainable result.

Contributed by Ken Guthrie of the Sustainable Energy Authority Victoria, Australia, e-mail: ken.Guthrie@seav.vic.gov.au

solarheatinginfo

Further information on solar heating can be found on the following web sites:

www.seav.vic.gov.au and www.orer.gov.au information on the performance of solar water heaters sold in Australia, Australian state subsidy program and the tradeable certificate program.

www.bsi-solar.de information on German market.

www.icaen.es information on Barcelona ordinance.

www.greenplumbers.com.au information on an education program for plumbers to support sales of solar water heaters.

www.clear-skies.org information on UK renewable subsidies.

www.soltherm.org information on European support programs and campaigns.

www.solarenergy.ch information on collector and system performance test results.

www.estif.org information on European solar thermal market.

public policy continued from page 1

be viewed in isolation. Several other factors, such as social and cultural factors, energy price, innovation system, in addition to public policies have an influence on the outcome. Therefore, when planning or assessing the polices on market expansion one needs to pay attention in particular to national or local conditions, stage of market entry of solar energy (e.g., stages of technology diffusion), and price factors (e.g., competition basis).

Several countries report major growths in solar energy use. For example, during the last few years world markets for solar thermal systems have grown by around 20% a year. Much of this is due to public policy measures, notably subsidies. An increasing share, notably outside the IEA countries, comes from solar being the best buy option.

European and some Japanese market expansion successes can be directly attributed to major volume policies that significantly compensate the price difference between solar and traditional energy thus allowing the market conditions for solar energy to become very favorable. In such cases, the public sector becomes a major shareholder of solar energy and the success of the policies depend on the political goodwill and continued financial support over a long period of time. Less known polices are so-called "market transformation" policies in which the public sector acts as a catalyst and creates a strong partnership with the market, both with users and producers.

These catalytic policies or micro-economic instruments require more understanding of the market and its needs, strong competence in technology commercialization, strategic visions, better risk taking, more flexibility, etc. than traditional macro-economic volume instruments. When judging the success of policies one should not just look on the impacts achieved, but also to recognize the public costs. And, we should not forget the cases in which solar energy is already competitive and the focus is on business strategies to expand the market.

Could International Collaboration Have an Impact?

Some countries seem to be more successful than others in introducing solar energy to the market, but relating this to just a policy success would be too simple. In practice, understanding the reasons and conditions for success and their relation to policies remains elusive.

Sharing and analyzing experiences with solar markets and policies from different countries could lead to the more effective use and design of policy instruments in the form of best policy guidelines tailored to specific conditions being national or local. An international collaborative effort also may provide the basis for more common international solar policies that would provide the necessary critical mass to accelerate market deployment of solar energy and create links to major international agreements and global trends.

Contributed by Prof. Peter Lund at the Helsinki University of Technology.

pv/thermal solar systems

What is a PV/Thermal Solar System?

This solar technology combines photovoltaic technologies and solar thermal technologies into one system to produce both electricity and heat. The typical systems are solar collectors with photovoltaic systems integrated in the collector-surface or photovoltaic panels used as a solar air collector. By combining the production of electricity and heat, the overall efficiency can potentially be higher for a specific collector-area than the efficiency of traditional "side-by-side" photovoltaic and solar thermal systems.

The objective of this new Task is to catalyze the development of high quality and commercially competitive PV/Thermal Solar Systems. To achieve this, the Task will focus on increasing the general understanding of these systems, developing components, contributing to define internationally accepted standards on performance, testing, monitoring, and providing key selling points for the systems.

The five focus areas of the Task are:

- **Market and Commercialisation of PV/T.** To investigate and identify the critical design parameters and commercial performance criteria, which determine the targets and conditions for successful new components and systems developed and evaluated in the Task.
- **Energy Analysis and Modelling.** To provide the necessary understanding of the energy transfer processes in PV/Thermal Solar Systems in order to define, model, predict and improve the energy performance of the systems. Systems to be considered are flat plate and concentrating technologies as well as air and liquid for heat transfer.
- **Product and System Development, Tests and Evaluation.** To experimentally develop, test and evaluate PV/Thermal Solar System components and concepts based on the findings in Subtask B and the experiences from products and components already on the market.
- **Demonstration Projects.** To gain the knowledge from existing full scale and promote new demonstration projects of PV/Thermal Solar Systems in order to do document energy performance, expectations to reliability, durability and economical feasibility.
- **Dissemination.** To provide efficient and targeted information of the task results to all stakeholders of the Task, and to make this information available to the target audiences through various media and formats according to the preferences of the target audience.

For more information contact the Task 35 Operating Agent, Henrik Sørensen, e-mail: h.soerensen@esbensen.dk

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- Technical developments
- Successful market activities
- Information

Prof. Beckman is the second recipient of the Award. He is recognized for the co-development of TRNSYS, a world renowned building energy analysis and research tool. TRNSYS has been used in IEA SHC work for over 25 years. His book, "Solar Engineering of Thermal Processes," continues to serve as a reference for experts participating in IEA SHC projects. In addition to developing tools and reference materials, Prof. Beckman has taught many SHC experts as director of the Solar Energy Laboratory at the University of Wisconsin. And, he has authored over 131 journal articles.

In addition to his contributions to the IEA SHC Programme, Prof. Beckman served as President of the International Solar Energy Society and was selected as a Senior Fulbright Scholar at CSIRO in Australia. He also was a Visiting Staff member of CSTB in France.

Mr. Crawley presents SHC Solar Award to Prof. Beckman at World Renewable Energy Congress in September 2004.

solar marketplace

The Solar Heating and Cooling (SHC) Programme is not only making strides in R&D, but also impacting the building sector. This section of the newsletter highlights solar technologies that have been developed or conceptualized in a SHC Task and are now being commercially manufactured, marketed or used.

Sustainable Solar Housing Gaining Market Share

The IEA's SHC Programme and Energy Conservation in Buildings and Community Systems (ECBCS) Programme are working together to substantially increase the market for sustainable solar housing by 2010 in participating countries by providing home builders and institutional real estate investors with convincing demonstration projects and needed design information drawing on international experience.

An energy performance standard was selected of 15 kWh/m^{2}a with the exception of single family houses in Nordic climates, which were given a target of 20 kWh/m^{2}a. In very cold, sunless winter climates the target had to be relaxed for detached houses because of their very high surface to volume ratio. Task participants also set a standard of 60 kWh/m^2 for primary energy use for the sum of space heating, domestic water heating and electricity for technical systems. (Primary energy is the amount of energy back at the source, for example, the kWh of chemical energy from burning a fuel to generate electricity plus kWh of line transmission losses from the plant to the house to meet its end-energy needs). At the beginning of SHC Task 28/ECBCSAnnex 38 in 1999, these performance targets seemed ambitious, but have proven to be achievable in the market place. A few examples include:

- Germany: By the end of 2003 more than 4,000 Passivhouses were built (performing more than four times better than houses built to the current building code)
- Austria: The Government financed a program to document the first 1,000 houses meeting this standard on an internet site.
- USA: The Department of Energy is running a Zero Energy Homes Research Initiative. Homebuilders across the United States are constructing very low energy houses - down to "Zero Energy Homes" (ZEH). On an annual basis, the primary energy value of electricity produced by photovoltaic panels integrated in the construction exceed the primary energy demand for space heating, domestic water heating and technical systems on an annual basis.

To share national successes in building high performance housing, a workshop, "Sustainable Low Energy Housing in Europe: Success Stories from International Experts," was held April 29th, 2004 in Lillehammer, Norway. Under the sponsorship of the Norwegian State Housing Bank, experts from seven countries presented successful projects including their marketing strategies. At the workshop, the following topics were examined:

- Driving forces behind sustainable housing
- National trends in low energy housing
- Cost trends
- Experiences in cooperation with market players

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The Swiss Wegere row houses.
Building costs: +11%; 200 /m^2 living area
Operating costs: - 71%; 8.8 /m^2 living area

marketplace continued from page 6

- Valuable selling points for such houses in your country

Switzerland, one of the presenting countries, described three apartment building projects and a row house development. The capital costs were 8-14% higher, primarily due to the greater insulation levels, super windows, mechanical ventilation with heat recovery, and increased quality control during construction. As such housing becomes increasingly common, these additional costs will diminish.

The lesson repeatedly learned in many countries is that such projects are best marketed for their superior comfort, quality of construction and very low impact on the environment.

For more information contact the SHC Task 28/ECBCS Annex 38 Operating Agent, Robert Hastings, e-mail: robert.hastings@freesurf.ch

SHC Programme Collaborates with Solar Industries and Trade Associations

Responding to a lack of awareness of solar heating and cooling's potential to respond to global concerns, such as climate change, energy security and grid reliability, members of the IEA SHC Programme and representatives of European and North American solar industries and trade associations met during the 7th SOLAR 2004, an international symposium held annually in Gleisdorf, Austria. The goal of the meeting was to identify ways these groups could support each other's work.

With the participation of 23 people from the IEA SHC Programme, industry and five trade associations from Europe, Canada and the United States, the discussions on a new vision for solar heating and cooling, the need for continued R&D, and a methodology for converting installed area to MW were open and constructive.

At the conclusion of this workshop, the participants:

- Agreed on a methodology to convert area of installed solar thermal collectors into MW. Using this method, the global installed capacity of solar thermal systems is over 70,000 MW.
- Agreed on a justification for continued R&D for solar heating and cooling systems and designs.
- Agreed on a new vision for the role of solar heating and cooling systems and designs in meeting important national and international goals.
- Agreed on a draft Memorandum of Understanding to be submitted to the governing bodies of the IEA SHC Progamme and the trade associations for signature.

Papers from the meeting will be available on the SHC web site (iea-shc.org) in November 2004.

The Swiss Sunny Woods apartment building.
Building costs: + 5%; 1703 /m² gross floor area (exterior walls included and PV roof excluded)

Thanks To...

Peter Lund of Helsinki University of Technology who served as the Finnish Executive Committee member for 17 years. His dedication and contributions to the Programme were significant and he will be greatly missed by the Committee.

Welcome To...

Jarkko Piirto of TEKES, who is the new Executive Committee representative for Finland.

IEA programme SHC

The International Energy Agency was formed in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD) to implement a program of international energy cooperation among its member countries, including collaborative research, development and demonstration projects in new energy technologies. The 20 members of the IEA Solar Heating and Cooling Agreement have initiated a total of 34 R&D projects (known as Tasks) to advance solar technologies for buildings. The overall program is managed by an Executive Committee while the individual Tasks are led by Operating Agents.

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