
8 POLICY AND FRAMEWORK

8.1 INTERNATIONAL EXPERIENCES

The policy in the European countries is forced by the common European goals in saving primary energy and thus on the development of renewable energies. One of the goals of the European Commission, expressed in the ‘White Paper’ 10 years ago, is to reach 100 million m² of installed solar thermal collectors by 2010.

The European goals have directly influenced the past and current European Framework programmes for funding of research and demonstration projects in the field of renewable energy application.

Other driving sources for national policies are to meet the obligations of the Kyoto-protocol or of the results from the recent European Council meeting, to increase the share of renewable energies in primary energy consumption in the European countries to 20% until 2020¹.

To achieve the objectives, it is essential, to develop mechanisms for a broad market dissemination of solar thermal systems. Mainly, this is done by implementing funding schemes or implementing building codes with the obligation, using renewable energy sources, or a combination of both.

The transmission of the targets into the policy of the member countries is done with different instruments and with different intensity, thus leading to different growth rates of e.g. solar thermal installations. The success of the measures, expressed in installed capacity and on the national shares on the installed capacities, is visualized in the Figures 8.1 to 8.3, all extracted from the ESTIF² home.

ESTIF has also promoted a Solar Thermal Action Plan for Europe, outlining different targets and measures for the growth of solar thermal applications in Europe until 2020³.

Examples of strategies in European countries⁴

I Greece

Still, Greece shows one of the strongest market developments of solar thermal systems. Nearly all installed systems are simple thermo-syphon systems (average size: 2.4 m² collector area and 150 l storage size). In between, approx. 25% of the

¹ Press release of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of March 09,2007, www.bmu.de/english/aktuell/4152.php

² ESTIF: European Solar Thermal Industry Federation, www.estif.org

³ Solar Thermal Action Plan for Europe, www.estif.org/281.0.html

⁴ Details of funding policies in European countries are taken e.g. from the study ‘Internationale Erfahrungen mit der Förderung von Solarkollektoren zur Warmwasserbereitung auf Haushaltsebene’, prepared on behalf of German Society for technical co-operation (GTZ), June 2006. Download from www.gtz.de/de/praxis/12538.htm

households dispose of a solar hot water system, thus covering 80% to 90% of the hot water demand by solar energy.

One of the most important measures, which led to the impressive market growth, were tax reduction programmes for an indirect subsidy for private households in case of the implementation of a solar hot water system. The effective funding of the system due to this measure was estimated in the range of 30% to 40% of the system investment cost. These tax incentives started in 1978 and lasted – with an interruption of a few years – until the end of 2002. The transaction of the programme was simple, although the disadvantage was that the households had first to pre-finance the systems by 100%, before the reimbursement was effective.

The programme was accompanied by an intensive information campaign, organised by the Greek solar industry, including also the dissemination of TV spots. For a more effective marketing, also a co-operation with a large utility was started.

In between, national quality standards have been established and most of the products seem to correspond to the standards, although they have more the character of recommendations. Due to an originally lack of qualified installation personnel, large solar thermal companies have established own installation and maintenance services.

Although after the ends of the tax incentive programme no further public funding is currently available, the growth seems to have stabilized (annual growth in 2004: still 34%). In this context, the Greek market may be described in between as self-supporting.

II Germany

One of the German goals in environmental policy is the increase of the share of renewable energies on the total primary energy demand to 4.2% by 2010 (50% by 2050).

Dominating solar thermal technology in Germany are closed forced loop solar thermal systems with 4 to 6 m² collector area and a buffer storage of 300 l, but more complex designed systems allowing space heating support have a rising market share. Although the utilization of solar thermal installations started after 1973, regular funding schemes have been established first in 1995.

The main important instrument currently is a market stimulation programme, which awards direct investment grants for small private solar thermal systems. The funding directives have been modified for several times, causing casually a strong fluctuation in the number of requested funds.

Since 2007, the new conditions (with decreased funding rates) for funding of systems with a collector area < 40 m² are as follows:

- the apply for funds has to be done after the installation of the system; the ready-to-operate status has to be proved (apply for funds at least 6 month after the installation);

- for systems with domestic hot water preparation, the investment grant is 40 €/m² gross collector area;
- for systems with additional heating support, for process heat or for solar thermal cooling application, the investment grant is 70 €/m² gross collector area;
- new solar thermal collectors, being tested and approved in 2007, have to be labeled with the Solar Keymark, to be accepted for funding. Other collectors have to be certified according to EN12975 Standard.

For systems with collector areas > 40 m², or for innovative systems applying new components or concepts, increased subsidies are possible and generally awarded in terms of a perceptual grant to the solar system investment cost (e.g., 30%). Furthermore, investment grants may be given for large pilot and demonstration plants within the funding programme SolarThermie2000plus for systems with collector areas above 100 m² and for specified applications (solar heating support, process heat, district heat support, solar cooling). The financial support is given here in a range between 30% and 50% of the solar system investment cost.

Beside the requirements on the quality of the collector (according to EN 12975 or Solar Keymark), no further requirements on the planning and installation exist. Nevertheless, the system quality is high in between due to in general well trained installers.

Beside some 'normal' information activities (information at the web sites of the funding agencies, ministries, etc.), the information on the funding possibilities is mainly spread by the installation and planning companies. The successes of the participation on the funding programmes are moreover due to a comparatively high public awareness on the use of environmentally friendly technologies. Additionally, existing strong non-governmental organisations play an important role in the dissemination of funding possibilities.

The system standard in Germany is high for different reasons: danger of freezing, anti-legionella regulations required high system efficiency and large systems due to comparatively low radiation amounts, etc. This leads in the sum to comparatively high system cost of still approx. 700 €/m² collector area, although the costs are slowly decreasing. For this reason, the market in Germany is not as self-supporting as the Greek market is still sensitive to funding programmes.

III France

Renewable energy (with the exception of hydro power) was for long years an unattended energy source in France. A reason for this fact is the still very strong nuclear power industry in France. The situation changed some years ago with the installation of national funding schemes, which includes also mechanisms for funding of solar thermal systems.

The most important funding mechanism is the 'Plan Soleil', which started in 2000 and runs until at least 2008. The plan comprises funding for private solar thermal domestic hot water preparation and for large solar thermal installations at apartment

buildings, hospitals, hotels, etc. The intention is to increase the annual growth rate to 200,000 m² by 2010, leading to a cumulated collector area of 1,000,000 m² by 2010. The funding programme is co-coordinated by ADEME, the French Environment and Energy Management Agency.

The funding scheme of Plan Soleil was modified in the last years. In the first years of the Plan, a flat rate of total 900 € was given for solar domestic hot water systems. Since 2003, the funding was connected to the size of the systems: a flat rate of 690 € for systems up to 3 m² collector size, 920 € for systems between 3 m² and 5 m², and 1150 € for systems between 5 m² and 7 m² collector area. Since 2005, the subsidy was modified from direct grants to indirect subsidies in terms of tax reduction.

The funding scheme is mainly oriented on the funding of systems for private households, but Plan Soleil also includes funding measures for public and commercial applications (with reduced subsidies).

Information campaigns to disseminate the programme were mainly organized by ADEME in terms of advertisement activities in papers and TV, but also national manufacturers share in the campaigns.

In comparison to the programmes in other European countries, a remarkable focus in France was directed to quality assurance measures. The funded systems are allowed to be installed by installers only, who participated a special solar thermal qualification programme 'Qualisol', a central component of the ADEME dissemination strategy. It is reported that by the end of 2005, more than 9000 installers were already qualified.

Additionally, only collectors certified by the national test institute CSTB (Scientific and Technical Centre for Building), are accepted for funding. The certification is done on base of the European Standards and on additional national requirements.

Although the share of the French solar thermal market on the total European market is currently small, the growth rate is very high (more than 100% annually) and the market development is promising since the introduction of the funding schemes.

The average system size of a solar domestic hot water system is approx. 4.5 m² collector area with a storage size of 250 l, normally installed as closed forced systems.

The experience with the qualification measures seems to be very positive as well and broad frustration due to low-quality installations could be avoided. Consequently, the French approach may be exemplary for countries with low general planning and installation experience in solar thermal systems.

IV Spain

Until the year 2000, solar thermal systems were nearly not installed in Spain. National goals, formulated in 2000, to have at least 12% of the total consumed energy by 2010 provided by renewable energies, has brought considerable movement in the development of all kinds of renewable energy sources. Concerning

solar thermal energy, the national target is to achieve in 2010 a cumulated solar thermal collector area of 4,900,000 m².

Of large importance in the development of the solar thermal market were municipal policy laws and obligations for the construction of new buildings, to install solar thermal systems for domestic hot water preparation with a defined coverage rate of the hot water. Those installation obligations were created first in Barcelona (in force since 2000) as a first obligation of this type in Europe.

In Barcelona, the target is to have with this measure 90,000 m² of solar thermal collector area installed by 2010. The energy demand for domestic hot water preparation in new buildings has to be covered to at least 60% by solar thermal (for buildings with a daily hot water consumption above 2000 l, thus apartment buildings, etc.). Additional obligations exist for commercial buildings and other applications (e.g., heat demand for swimming pools has to be covered to 100% by solar thermal). As a consequence, approx. 40% of new buildings are equipped with a solar hot water system.

The applied collectors have to be certified, installers have to prove their installer qualification.

Due to the obligation, the installed collector area in Barcelona increased from 1.1 m² per 1000 capita in 2000 to 16.4 m² per 1000 capita in 2004.

The Barcelona model was copied by other cities, like Madrid and Sevilla. Since the end of 2006, the new Technical Building Code CTE includes similar obligations on the installation of solar thermal systems at new buildings, now valid on a national level for whole Spain. The solar thermal obligations in the new CTE require coverage of domestic hot water demand by solar thermal hot water production in the range between 30%-70%, depending on the hot water demand and on the position of the building⁵.

It is interesting that the regional and national obligations for solar thermal in Spain are not connected to any funding scheme.

In between, the neighbour country Portugal has brought a new building code with similar solar thermal obligations into force as well.

The set-up of solar thermal obligations in countries with only little existing infrastructure in manufactures, knowledge distribution to the users, solar system knowledge of planners and installers, and only small solar thermal organizations, active in the promotion of solar thermal application, may conflict with the quality of the installed systems. Many of the building owners never had the intention before, to install a solar thermal system, but now they are obliged, without being convinced on the benefits of a solar thermal system. Consequently, the impulse to install lowest-cost systems only is high. If an obligation programme does not include well balanced quality assurance measures, improvements in the system quality are small

⁵ More details on the CTE in Spain may be found at www.estif.org/262.0.html

and not necessarily connected to the increased number of systems. Thus, a certain risk of broad frustration with solar thermal systems exists. The near future will show the experience with the Spanish model. However, a long-term positive effect of solar thermal obligations is observed in Israel, where a solar obligation is in force since 1980, accompanied with strong quality assurance measures. In between, this policy has brought Israel to the world leader in solar thermal usage. Although the saturation is theoretically nearly reached, the market is still high due to retrofitting and replacement of old systems.

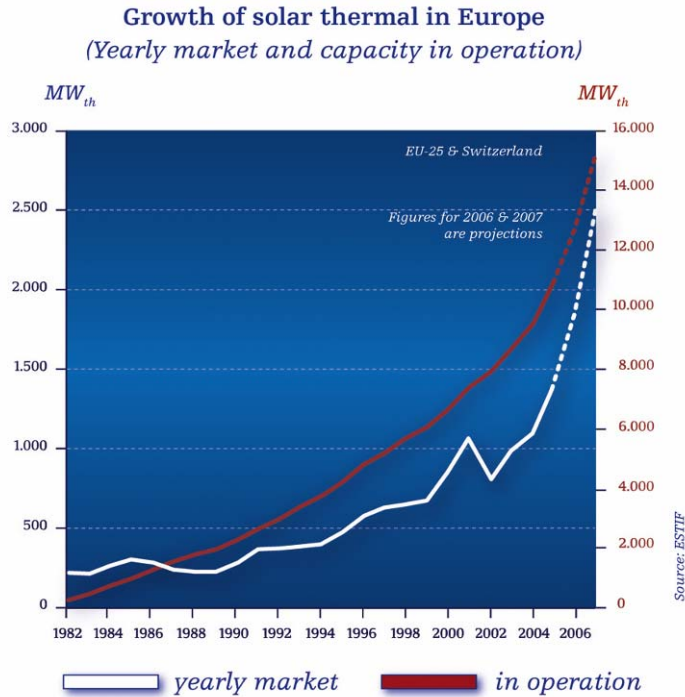


Figure 8.1 Solar thermal market in Europe: Cumulated capacity in operation (red line, right axis) and annual growth (white line, left axis). In 2005, the cumulated capacity in operation was approx. 11000 MW_{th} , with a growth in 2005 of approx. 1500 MW_{th} .

Source: ESTIF.

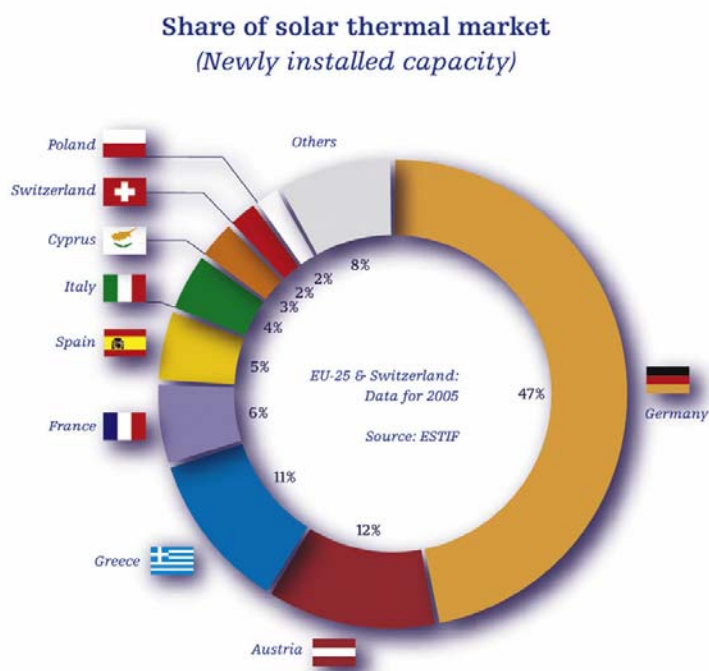


Figure 8.1 Figure 8.2 Share of the annual growth in 2005 (approx. 1500 MW_{th}) by country.

Source: ESTIF.

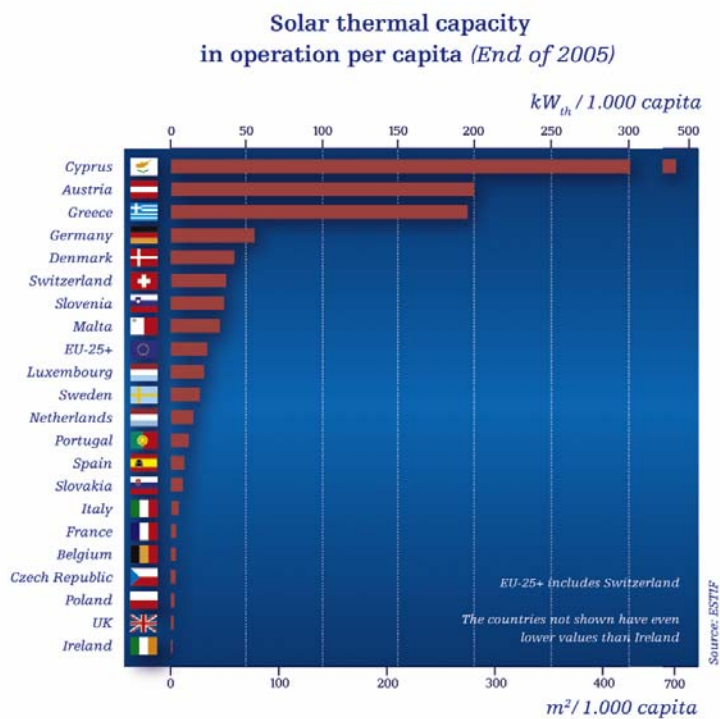


Figure 8.3 Share of the cumulated capacity in operation in 2005 by country and per 1000 capita.

Source: ESTIF.

Table 8.1 Summary of policy measures for SHW implemented in several countries.

Country	Collector area/ head (m ² / 1000 capita)	Grant demonstration	Subsidy	Financial Incentive	Quality Assurance	Regulation	R&D	Awareness Campaign
Israel	580	x			x	x (R)	x	
Greece	264		x (I)		x		x	x
Austria	203		x	x	x		x	
Germany	51		x		x		x	
China	28						x	x
Spain	6			x	x	X (R)	x	
Italy	6	x		x			x	x
France	4		x		x		x	x
Belgium	3		x	x			x	x
England	2		x	x			x	x
Finland	1		x					
Thailand	1						x	

*Note: I = Industrial
R = Residential*

8.2 POLICY MEASURES TO ACCELERATE THE MARKET GROWTH OF SOLAR THERMAL APPLICATIONS

Like many other renewable energy technologies, solar thermal is still not widely adopted that make the cost of technology relatively high as compare to conventional technology. In order to stimulate the market growth, commitments are needed at the national or to the global level. The Kyoto Protocol is one example of the global commitment for greenhouse gas reduction that has triggered renewable energy policy in many countries. Commitments should be set as a practical target goal that can be achieved within a certain time frame. The European Commission's target of 15 million m² installed by 2003 has been reached with its Campaign for Take-Off. The new target is now set at an ambitious goal of 100 million m² installed by 2010.

With the economic potential of solar thermal applications in Thailand as analyzed in chapter 7, a target at 1.5 m² million within 10 years will require 40% of the market growth. This target may be ambitious, however, achievable based on the European

experience that the market volume was doubled by the results of strong political support and continuous effort of the industry.

The policy measures that have been effectively utilized to stimulate solar thermal market in European countries and worldwide are given below:

Policy measures	Description
Financial incentives	<p>Financial incentives can be</p> <ul style="list-style-type: none"> - Subsidy - Rebate program - Tax incentives (i.e. tax credit, tax exemption) - Soft loan <p>These schemes can help bring down the high investment cost that has been the major barrier. Among these incentives, subsidy scheme tends to have most impact on customers' decision. Greece's success installation of solar thermal exemplifies the influence of subsidy in bringing renewable technology to public acceptance. Tax incentives require more paper work and time from customers. In the US, the states of Oregon and California have tax credit and tax rebate programs for solar thermal systems. The programs have helped increase the market volume, however, not as high as the subsidy.</p>
Regulations	<p>Laws or regulation that require or enforce installation of solar thermal systems, from international experiences, are only applied to residential sector. Israel's building code requires that residential building higher than 27 meter have solar thermal for its hot water supply. Some other countries and cities may require solar thermal for new buildings. This mandatory measure can effectively increase the installation, however, may not applicable for Thailand.</p>
Quality assurance	<p>Quality assurance can be tied to financial incentives and other measures to prevent feud in subsidy scheme and help market growth with assurance that systems will function and perform through their life time. Quality assurance can be voluntary and mandatory.</p> <ul style="list-style-type: none"> - Capacity training and qualification of manufacturers, planners and installers; - Service and warranty on component and installation level; - Evaluation of monitored systems, evaluation of funding programmes - Agreement on Standards of solar thermal components; - Establishment of approved national test centers for the certification of solar thermal system components; - Responsibility of a national certification body for the approval of national test centers;
Demonstration	<p>Demonstration programs are mostly used for technologies that are new or not well known in the market. The measure often provide grant to demonstrate use of the technology.</p>
Research and	<p>R&D is available in many countries through national research grant.</p>

Development (R&D)	Most research in solar thermal technology aims at improving quality and efficiency of products.
Awareness campaigns	Awareness campaigns mainly addressed to the end-user. Beside all other measures of awareness campaign, clear contacts should be established (hot lines, web pages, etc.) to provide actual information on funding schemes, conditions, and quality measures.

Below outline some experiences in Thailand and other countries for each policy measure.

8.2.1 National commitments

As a backbone for any national effort to increase the solar thermal market, national compulsory targets on the use of renewable energies should be defined. Department of Alternative Energy Development and Efficiency (DEDE) has responsibility for energy efficiency promotion, energy conservation regulation, energy sources provision, alternative development of integrated energy uses, energy technology dissemination in systematic and continuous proceeding to adequately respond the demand from every sector at optimal costs beneficial to the country development and the people better living standard. For the renewable energy DEDE supports solar energy, wind energy, Biomass energy, water energy, and hydrogen energy. Unfortunately they focused on the solar PV which refers to DEDE solar energy system 8 projects are the solar PV. In many European countries, such compulsory targets have turned out as a driving source to install funding schemes for renewable energy applications, independent of the fact that some of the targets seem to be too ambitious from the traditional energy sectors point of view.

8.2.2 Quality assurance

Before launching broad funding schemes for the market stimulation of solar thermal systems, quality assurance measures have to be elaborated. Different levels are addressed:

- Standards and certification

Here, the ‘players’ are to be identified (national certification body, test institutes) and national test standards for collectors and systems have to be defined. National manufacturers should be involved into this identification process. It is essential for a reliable operation of a test center that a more continuous flow of component testing can be expected. This enables the test center, to recognize and to assess the quality of the products, applied in the installed systems and available on the market. Imported components should fulfill the defined Standards as well. To elaborate test centers and Standards, a broad understanding of the involved partners on the required Standards and on the number and distribution of test centers is required. The role of an approved test center is briefly shown in Figure 8.4.

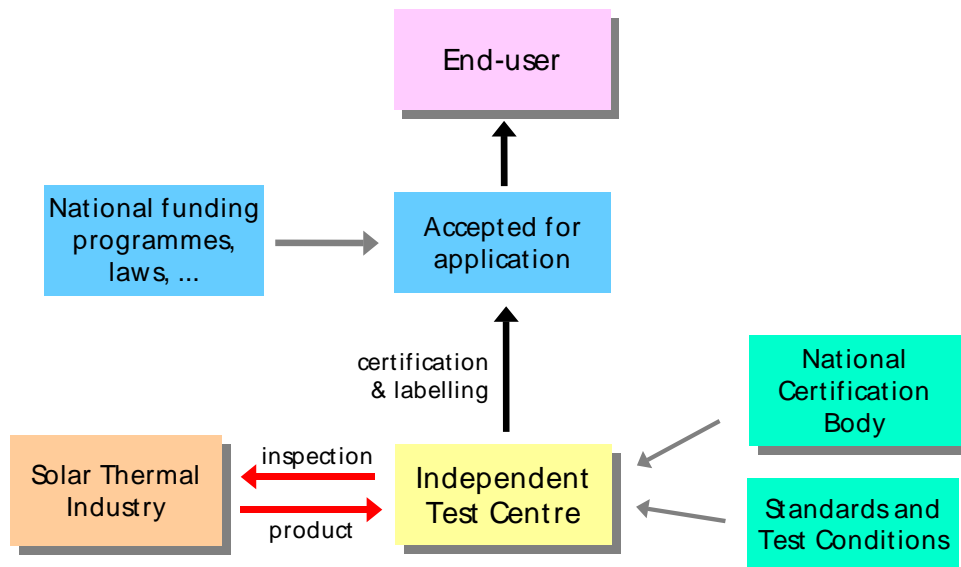


Figure 8.4 The independent Test Centre plays a central role in the quality chain of solar thermal installations.

- Quality conditions of a funding scheme

A funding scheme should be connected with quality measures. Usually, grants are given to systems where certified collectors according to the national valid Standards are applied.

Additionally, as in the French funding schemes, it seems necessary to link grants only to systems, installed by special certified installers. Thus, a further pre-condition for launching a funding programme is the definition and execution of training courses for installers. These trainings may be defined and executed by the standardization and certification group and the involved local manufacturers.

Generic system schemes should be elaborated for the funded systems in order to obtain a minimum level of system quality. This may be also a task of the established test centers or of the connected research facilities in close collaboration with the manufacturers.

A funding programme should additionally include evaluation measures, applied after a defined running period. A certain set of parameters, allowing the assessment of the success of such a programme, may be determined. These measures range from simple energy demand assessments (water and electricity or auxiliary energy bills before the installation and in the first years after the installation) to inspection and service reports, assessment on the users satisfaction with the system, to more advanced energy supply assessments carried out in a number of selected monitored systems (equipped with energy meters, etc.).

- Installers of solar thermal systems should be obliged to give warranty and to offer service contracts. Moreover, a clear operation handbook should be provided to the user / operator.

For large systems, a commissioning phase should be launched after the installation of the system. The contract should contain guaranteed yields for the system, depending on the annual radiation sum only.

8.2.3 Financial incentives

National funding programmes seem to be an adequate measure, to combine both, market growth and a certain quality level of the installation together with accompanying quality assurance measures.

Which funding scheme is preferred, depends strongly on national customs. For small private solar home systems, a funding scheme according to the former French model of a flat rate, i.e., a fixed investment grant per system may be an adequate simple model, which avoids the barrier of a pre-financing of the system for low-income users. For larger systems, funding schemes related to the type or size may be more appropriate, either given as specific direct investment grant or as indirect grants through tax reduction. It is also conceivable, to connect the funding with a certain support of local manufacturers, such as small, well-balanced higher grants for national products.

Moreover, funding schemes should be connected with some kind of evaluation of the funding programme after some years, in order to assess the achieved quality of the installations, the environmental benefits, the market development and the market position of local manufacturers. According to the results of the evaluation, the funding scheme may be extended for another period and / or modified, to direct the outcome of the programme towards the originally defined goals.

Funding scheme periods should not be defined too short. A funding programme running only for two or three years will not really mobilize the manufacturers to do strategic investments on solar thermal. Moreover, the confidence of the user into such a programme is smaller, as it appears with a short running time not as an important policy measure. An appropriate running period of a funding programme may be e.g. approx. five years, with the option of extension after a positive evaluation.

Recommendations on funding schemes:

- Small sized thermo-syphon systems, using system components, certified by the national test facilities. An investment grant is given as a flat rate. Programme duration: 5 years, followed by an evaluation process and with the possibility of programmed extension. At least 5000 systems should be funded within the first five years.
- Medium sized forced solar hot water systems (< 20 m² collector area) for apartment buildings, etc. An investment grant is given as a flat rate for two different sizes of the system. Programme duration: 5 years, followed by an evaluation process and with the possibility of programme extension. At least 500 systems should be funded within the first five years.

- Large size forced solar hot water systems (> 20 m² collector area) for apartment buildings and for commercial applications. Investment grants are related to the size of the system, either as direct grant or indirect through tax reductions. Programme duration: 5 years, followed by an evaluation process and with the possibility of programme extension. At least 100 systems should be funded within the first five years.

8.2.4 Regulations

This instrument has to be considered with care. In the context with the general installation quality of solar thermal plants as observed during the site visits, a compulsory installation of solar thermal systems at new buildings may be too early with respect to the limited knowledge distribution in Thailand. The risk of a large scale distribution of non-optimized systems, or, even more critical, of not properly working systems is high.

Thus, if desired, obligations on solar thermal system installations may be restricted to certain types of new or renewed buildings, such as hospitals or public buildings.

8.2.5 Awareness campaign

It is important, to accompany the programs with awareness campaigns, mainly addressed to the end-user. At least, they have to obtain a certain level of understanding and of the benefits of a solar hot water system. Central information sources are to be established, such as well-maintained web pages, providing actual details on solar system technology and on funding possibilities. A hot line or similar contact possibility should be accessible to users, in case their system installer is no longer on the market available.

Additionally, general information and training units may be established for architects, consultancies, planners and installers, but also for policy makers, focusing on the potential of solar thermal systems, general applications and technology.

8.2.6 Demonstration programmes

A separate demonstration programme is valuable, to assist the market development of solar thermal systems. More focusing on large scale systems, different technical approaches may be demonstrated here, such as large commercial hot water preparation for hotels and hospitals, or solar thermal process heat supply for industrial applications. Other technologies may be demonstrated as well, such as solar cooling, etc. The systems should be implemented into a running commercial application in order to demonstrate their full applicability. Latest system technology should be applied here with focus on optimized system control for high solar energy gains and on high system reliability. A transfer of the system results to industry and target user groups should be mandatory. Again, a central web page for the dissemination of the programme status and of the results is important.

Recommendations on funding schemes:

Within programme duration of five years, 25 high quality systems should be installed to demonstrate the solar thermal use in the different application sectors.

8.2.7 R&D

Parallel R&D activities should be funded on base of qualified proposals. The objective is to encourage Thai research groups and companies to share on the development and improvement of solar thermal concepts, system components and control equipment. Components and strategies developed here may be demonstrated within the demonstration programme.

The above mentioned measures are necessary, to reach a critical mass in the solar thermal market for a self-perpetuating growth, as it is shown in Figure 8.5, again extracted from ESTIF's Solar Thermal Action Plan for Europe.

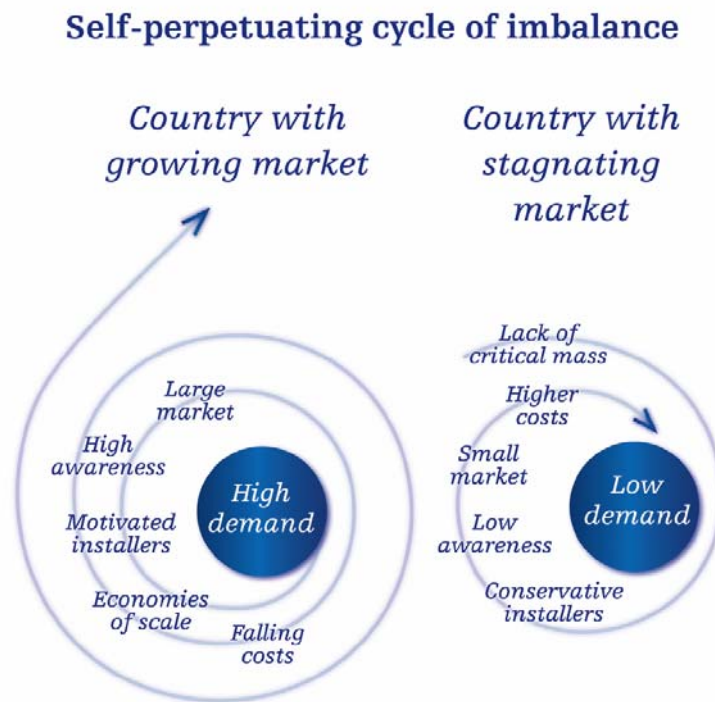


Figure 8.5 Self-perpetuating positive and negative market development.

Source: ESTIF.

8.3 RECOMMENDED POLICY AND FRAMEWORK

Based on international experiences and current situation of solar thermal in Thailand, 4 policy measures are recommended to stimulate the market growth: quality assurance, financial incentives, awareness campaign and demonstration. These measures should be implemented simultaneously particularly the quality assurance measure that should be implemented along with other measures.

Quality assurance addresses to the most important and urgent issue of solar thermal in Thailand. It is the starting point to build a firm foundation for a sustainable market growth. National standards and test center may require a high level of commitment from the government. Measures that can have immediate and direct respond to the needs of the industry are capacity training and qualification of manufacturers, planners and installers. Therefore, capacity building is recommended for Thailand's first step to quality assurance. However, this also requires a monitoring and evaluation scheme to verify the effectiveness of measures. Trainees are needed to be tested before they can become certified planners or installers and the solar systems that are design and installed by the certified installers should be monitored and checked.

Financial incentives such as subsidy and tax credit can stimulate the market growth particularly during the early stage. Thailand has some form of subsidy in the past, however, only to a limited number of systems and in a short period of time. Without national awareness campaign, the subsidy program had only a small impact on solar thermal market in Thailand. This incentives measure is recommended for Thailand only in combination with quality assurance to ensure that only quality systems are installed.

Awareness campaign and demonstration programs are measure that address barriers from the customer side. Based on our interview, many of potential customers are not aware of the technology. Some can not differentiate the two solar technologies; solar Photovoltaic and solar thermal. Awareness campaign is recommended not only to raise the awareness of technological potential; it can address the quality issue by providing customers with un-bias guidelines for a selection of quality suppliers.

Policy measures	Barriers	Addressed problems	Measures / Schemes	Monitoring and evaluation
1. Quality assurance	Technical	- Substandard quality of materials	- Training for manufacturers	- National standards and testing for system components
		- Improper design and sizing	- Training for system designers	- Certified system planner
		- Quality of installation	- Training for installers	- Certified installers
		- Lack of maintenance	- Training for users	- Monitoring of system performance
2. Financial incentives	Non-technical	- High investment cost - Long pay back period	- Subsidy for investment cost. - Tax incentives i.e. credit for income tax, corporate tax - Tax exemption i.e. import duty, VAT	- Monitoring of market growth rate - Monitoring of market growth rate - Monitoring of market growth rate
3. Awareness campaign	Non-technical	- Unaware of cost effective energy saving potential - Misconception of the technology	- Awareness campaign through advertisements and other media.	- Poll and questionnaire
4. Demonstration	Non-technical	- Unaware of technological potential	- Demonstrations of solar hot water systems in different applications	- Poll and questionnaire