

Solar Thermal Utilization in Thailand

Abstract

Thailand is the net energy-imported country, we spent every year more than \$20 Billions on oil. Every times when oil price increased, it has a very strongly impact to the country economy, so the Thai Government has, at all time, been trying to reduce the dependence on the import energy by promoting the use of alternative energy, develop the renewable energy, taxes measure, price adder and subsidy program. However the push from only one side will be difficult to achieve the target private sector will play the important roles for the country to reach the target goal.

Key Words Solar water heater, Thailand Solar Thermal Association, Alternative energy, Renewable energy,

1. Current Situation

Solar water heater has been introduce into Thailand since 1984 by the Government Department of Energy Promotion installing 325 square meters of the flat plate collectors for 6 hospitals, 1 hotel and 1 factory, later transferred the ownership and let them operate the system. Today all the system has either stopped or removed.

After the Government initiation, there is about 10 local companies start to import the solar water heater into the country, in 1994 from the study conducted by the same Department, it was estimated that about 50,000 sq.m of the solar flat plate collector has been installed in the country. It has also been reported that in 1996, total 4150 sq.m were installed, 2740 sq.m in residential area and 1410 sq. in commercial area hotel and Hospital. At that time 70 % of the system were installed in the residential market.

10 years later, the market of solar water heater in Thailand is still very small, many local distributors leave the business, only a few carry on until today.

1.1 European Commission Funding

In 2006, the EU-Thailand Economic Cooperation Small Project Facility (EU-SPF) has provided funding through the group of Joint Graduated School of Energy and Environmental

(JGSEE), the International Institute of Energy Conservation (IIEC) and the Fraunhofer Institute of Solar Energy Systems (ISE) to run a study on how to develop Thailand Solar Hot Water System. The Study took one year, from March 2006-April 2007 to complete.

1.2 Major finding

The methodologies used to conduct the study are including:

- Review the past study
 - Questionnaire interview
 - Meeting and discussion
 - Survey of potential site
 - Visit the existing Solar thermal sites
- From the study they found the following

Issues:

Technical Barriers

- System design and sizing
- Quality and selection of materials
- Water quality
- Installation

Nontechnical Barriers

- High investment cost
- No products standard
- Lack of Government support
- Little public awareness

Due to the above barriers, growth of the solar hot water system installation in the past 15 years are only 10% annually and more than 50% are in the residential area.

1.3 Solar Thermal Association

As a result from the study, the group has made the following recommendation:

Table 1 Recommendation

Policy measures	Addressed Problems	Measures / Schemes
1. Quality assurance	- Substandard quality of materials - Improper design and sizing - Quality of	- Training for manufacturers - Training for system designers - Training for installers

	Installation - Lack of maintenance	- Training for users
2. Financial incentives	- 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
3. Awareness campaign	- Unaware of cost effective energy saving potential	- Awareness campaign through advertisements and other media
4.Demonstration	- Unaware of technological potential	- demonstrations of solar hot water systems in different applications

To make it more effective the group also recommended that the association of Solar Thermal should be formed up to be a single point of contact for the government.

At the end of 2007, altogether 19 local companies act as the founder members, has submitted the application to the Thai Government to form up the Thai- Solar Thermal Association.

Table 2 Founder members of STA

Registration number	Company	Contact Person
0801	A.R.C. Siam Solar Co.,Ltd.	Mr. Michael Nakvachara
0802	ENVIMA (Thailand) Co.,Ltd.	Mr.Magnus Staudte
0803	Forbest Co.,Ltd	Khun Chavala Tangyopuwadol
0804	Forcelink Co., Ltd.	Ms. Tracy Wei Xie
0805	Forefront Foodtech Co.,Ltd.	Khun Somsuda Sriwattananont
0806	Heritage International Development Co.,Ltd.	Khun Samnao Pansang
0807	Infratech Engineering & Service Co.,Ltd.	Khun Somsak Chutanan
0808	J-7 Engineering Co.,Ltd.	Khun Wirachai Jeranuntasin
0809	Leonics Co.,Ltd.	Khun Samrerng Kriengprathana
0810	Pro Solar Group Co.,Ltd.	Khun Ekapong Janooduang
0811	Ravotek Co.,Ltd.	Khun Vikorn Vallikul
0812	Samui Service Engineering Ltd.	Mr.Claude Feller
0813	Solar Solution Co., Ltd.	Mr. Franz Roecker
0814	Sunluck Solar Power Co.,Ltd.	Khun Rattanachote Phadungcharoen
0815	TSUS International Co.,Ltd.	Dr.Suriyon Chomdee
0816	Vispack Co.,Ltd.	Khun Charun Detpratum
0817	Power Solar Co., Ltd.	Khun Kamol Thongsanya
0818	Thai Advance Save Energy Ltd. Part.	Khun Sukawat
0819	Rheem Australia Pty Ltd	Mr James Browne

Main objective of the Association are:

1. Encourage the use of solar thermal
2. Regulate and certify the quality
3. Build up local production capability
4. Represent Solar Thermal Group
5. Provide support to the users

2. Government Program

In parallel with the study carry on by EU funding, the Government has also hired the two university to study the application of solar water system. Naresuan University cover the projects in area of Northern and Eastern part and King Mongkut's University cover the projects in Central and Southern area of the country. List of the projects are shown in Table 4 & 5

Table 4 King Mongkut's University

Province	Customer	Business
Nakhon-panom	Nakhon-panom	"
	Nakhon-panom River View	<i>Hotel</i>
BKK	Nakhonthon	<i>Hospital</i>
	BNH	"
	Chareonkrung Pracharuk	"
	Klang	"
	Royal Princess Srinakharint	<i>Hotel</i>
	Imperial Queenspark	"
	Amari Atriam	"
	Pathumwan Princess	"
	Intercontinental	"
Pranakhon Sri-Ayuthaya	Perrier Vitel (Thailand)	<i>Industrial</i>
	Capsule Jel	"
Saraburi	Nam Sanitary	"
Ratchaburi	Textiles Satin	"
Nakhon-Prathom	Nakhonchaisri Industrial	"
Samut-Sakhon	Mahachai Food Processing	"
Nonthaburi	Spanion (Thailand)	"
Prachinburi	Advantage Footwear	"
Pra-juab Kiri-khan	Air-force Accommodation (Bo-Fai)	<i>Residence</i>
Rayong	Mahakij Rubber	<i>Industrial</i>
Chonburi	Chonburi	<i>Hospital</i>
	Somdejprasankharajyana sungwon	
	Center for Retirement	"
	Dusit Resort Pattaya	<i>Hotel</i>
	Lem-Chabung International	
	Country Club	"
Surat-thani	Pha-Nganchai	"
	Had-kuad Resort	"
Kra-bi	Grand Beach Resort	"

Table 5 Naresuan University

Province	Customer	Business
Chiang-mai	Chiang-mai Gate	<i>Hotel</i>
	Amora Tha-Pae	"
	Chiang-mai Plaza	"
	Holiday Inn Chiang-mai	"
	Chiang-mai Ram	<i>Hospital</i>
Chiang Rai	Kasem-Ratch Kriburin	"
Prae	Prae	"
Pitsanulok	Pitsanuwatch	"
Lampoon	Lampoon	"
Khonkean	Khonkean	"
	Khonkean-Ram	"
	Kosa Khonkean	<i>Hotel</i>
	Khonkean Hotel	"
Loi-ed	Saket Nakhon	"
	Loi-ed City	"
Khalasin	Khalasin	<i>Hospital</i>
	Rimpao	<i>Hotel</i>
Sri-saket	Srisaket	<i>Hospital</i>
	Brahm-piman	<i>Hotel</i>
Buriram	Buriram	<i>Hospital</i>
Udonthani	Udonthani	"
Mukdahan	Mukdahan Grand Hotel	<i>Hotel</i>
Ubolratcha thani	Ubolrak Thonburi	<i>Hospital</i>

In 2007, series of discussion has been made between the Government and the Association and finally the Government has approved the first Solar Thermal Subsidy program which will give the investor 3,000-4,500 per sq.m of the collector installed providing that the efficiency of the collector must not less than 500 kwh/ sq.m-yr. and energy from waste heat from the system must also be used. The program is called 'Hybrid solar water system', funding for the first year is available up to 4,000 sq.m with the smallest system not less than 50 sq.m and largest system not more than 500 sq.m. Total no of 21 projects received approval, list of the 2008 approved projects are shown on Table 6.

Table 6 List of approved projects

No.	The Company Name	Sq.m. Installed	Total Baht Subsidy
1	Nantra Construction (Chiangmai) Co.,Ltd.	84.600	380,700
2	Jasmine Resort Sri-Raja Co.,Ltd.	156.000	702,000
3	Tawee Ngern-thong Co.,Ltd.	72.150	324,675
4	Nanyang Textile Industrial Co.,Ltd.*	500.000	2,250,000
5	Mae Bua-sri Local Group	493.500	2,220,750
6	Thai Ruamsin Industrial Development Co.,Ltd.	462.000	2,079,000
7	Thai-Chinese International School	291.000	1,309,500
8	Royal Orchid Sheraton Travel Hotel	357.120	1,607,040
9	Bhum-prai Co. (Apai-Bhubeth Herbal Center)	493.500	2,220,750
10	Kittimol Co. (Niramol Villa)	155.100	697,950
11	Sunshine Beach Resort Co.,Ltd.	117.000	526,500
12	Ubol Development Co.,Ltd. (Ubol Hotel)	104.160	468,720
13	Anatasila Co. Ltd.	40.920	184,140
14	Whale Hotel Co.,Ltd.	319.920	1,439,640
15	Burapha Petchabune Hotel Co.,Ltd.	130.200	585,900
16	Yutthaporn Development Co.,Ltd. (King Park Avenue Hotel)	135.800	611,100
17	Buddhashinarat Phitsanulok Hospital	58.200	261,900
18	Asia Jumbo Co.,Ltd.	268.550	1,208,475
19	Thai Young Chemical Co.,Ltd.	282.900	1,273,050
20	Maharaj Nakhonraj Chiangmai Hospital	225.600	1,015,200

No.	The Company Name	Sq.m. Installed	Total Baht Subsidy
21	Mae Bua-sri Group Rubber Processing	251.780	1,133,010
Total		5,000	22,500,000

3. Public Awareness

Before official launching of the subsidy program, road show in six target area which are Bangkok, Nakornratchasima, Rayong, Hua-hin, Chiangmai, & Phuket has been arranged, inviting customer from Hotel, hospital and light industry to participate. This event has risen a public awareness on the solar thermal application in their process, by the end of the year Solar Thermal Association also arranged similar road show in Chiengrai, making altogether 7 events in the year 2008.

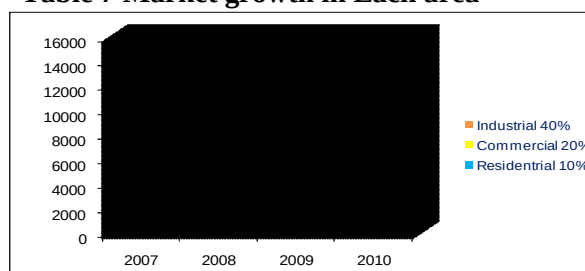
Apart from the road show, the STA directory has been published and distributed to all the provincial energy offices, university and the consultant on solar thermal energy projects.

4. Market size

With the support from the Government and effort from the association the solar thermal market in Thailand is starting to take off. Base on the 11,000 sq.m installed in 2007, which is a flat 10 % growth from 1996, the forecast is now 20 % growth for the next 10 years from 2008 to 2018 or accumulate installation of 400,000 sq.m in 2016. The additional installation of 250,000 sq.m will represent \$125 million for collector value in the next 8 years or \$ 416 million for total system.

One significant change is the shift from residential market to commercial market. In 1996 70% of the market is residential but in 2007 the market is 50 % residential, 40% commercial and 10% industrial. It is also believed that the growth in residential will only be 10% compare to 20% of commercial and 40% of industrial application.

Table 7 Market growth in Each area



5. German Technical Cooperation (GTZ)

GTZ is the organization under German Government providing assistance to the Thai Government to enhance the competitiveness of small and medium enterprises. For Solar Thermal Energy, under Solar Heat in Agro Industry Program, GTZ will work with Department of Alternative Energy in two main areas Training and Technology Transfer. The program currently will be running from 2009-2011, the training will cover the following:

- General Understanding of Solar Thermal application for those who have interest in using solar thermal energy
- Design and installation practices for the suppliers and contractors to do the proper jobs
- Operation and maintenance for owner of the system to keep the system in good condition.

On technology transfer GTZ is aiming to provide knowhow for local manufacturer to improve the quality of the products that will be supplied into the market.

Currently many components of solar thermal system are available locally.

Table 8 Availability of local components

SWH Component	Domestic Manufacturers	Domestic Fabricators	Import
Solar Collector		Yes	Yes
Evacuated Tubes		Yes	Yes
Tempered Glass (Solar Collector)	Yes		
Copper Tubing/Piping	Yes		Yes
GI Piping	Yes		
Plastic Piping	Yes		
Stainless Steel Piping	Yes		Yes
Insulation	Yes		Yes
Small Storage Tank (< 600 Liters)		Yes	Yes
Large Storage Tank (> 600 Liters)		Yes	
Circulation Pump	Yes		Yes
Temperature Sensor, Electrical Apparatus & Other Controllers		Yes	Yes
Valves & Gauges	Yes		Yes

6. Government long term Planning

At the end of 2007 the Government has prepared the Long Terms Alternative Energy Plan which will be used for the period of 15 years from 2007-2022. The plan is to promote all kind of alternative energy available in Thailand. In solar energy area, solar thermal is now become part of the government long term energy plan.

Table 9 Solar Thermal 15 Years Plan

Short Term 2008-2011		Medium Term 2012-2016	Long Term 2017-2022
- Promote the use of hybrid SWH 1. Subsidy 2. Funding for Study		- Promote the Use of Small SWH System	- Building Code for SWH
- Demonstration of hybrid SWH in 100 Government office		- Demonstration Small SWH	
- R&D for Small SWH		- Technology Transfer	
- R&D to reduce cost of SWH component			
- Testing Facility			
Labeling Program			
Low Interest Loan / Taxes Measure			
R&D	Promote local Production	Promote use of SWH	Promote SWH

7. Step to be taken

In 2009 Solar Thermal Association is planning to work on the following area:

Public awareness

Continue to build up public awareness by working with GTZ to organize three road shows in the target area north-eastern, southern and western part of Thailand.

Establish web site of the Solar Thermal Association to keep the public inform about the activities and provide updated technology.

Become a member of the International Solar Thermal Organization, get recognition and let the Solar Thermal Society know the activity in Thailand.

Training

Support the Government to build the training kit by providing necessary components like collector, tank, control,

sensors, valves, pumps, piping, heaters etc.

Work with the Government to invite potential customers to attend general understanding of Solar water heater course.

Arrange with the members to send their staff to the design and installation training course.

Assist the customer who owned the solar water system to receive training on how to properly operate and maintain the system.

Industrial Application

There are many industry in Thailand that use steam and heating in their production process but most of the time they required higher pressure and temperature than the general application of solar water heater system.

Study need to be done to expand the use of solar water heater in to industrial process if applicable the market of solar water heater system can be expanded very fast.

Testing facilities

There is a few testing facility in Thailand to run the performance test of the collector but non of them are fully function which make it too much time consume to get the products test. The Government is planning to build the new testing facility, so that the products can be tested and certified before launching to the market.

Component cost reduction

Collector which is the key component in the solar water heater system is only 30% of the total system cost, others parts like pump, tank, pipe, structure, controls, sensor, transport, cable, switches, insulation and labors are adding up to become 70% of the total system cost.

Study need to be conducted to find out how to reduce all those cost, so that the total investment cost can be lower and make the solar hot water system become more attractive.

Technology transfer

One of the area that has potential to develop is to build a high quality collector

in Thailand. Currently there is about 10 local manufacturers producing the collector on there own technology, the small capacity and the lack of technology make the products look not very attractive and not very efficient. Research and development is required to improve the products quality, which can be done in a couple ways.

First is the government to do the research a provide technology to the private sector. The other is to negotiate with the world class manufacturer to get the technology. The latter will have some royalty cost for the technology but saving our own research cost and time.

The question is which technology to be used? Can the product cost be competitive? Can to owner of the technology help to export the products to other countries in this region?

Regulation on the new building

To help the country reduce the cost of importing oil, the Government will need to come up with the clear policy on the utilization of the alternative energy. Consumption of the conventional energy must be reduce or replace by alternative energy. Construction of the new building must be position in such a way that solar energy can be use for both lighting and hot water producing, direction of wind flow can help reduce air conditioning cost.

This regulation can be immediately apply to the Government Building starting from partially apply and gradually increase to full demand.

This regulation should later apply to all the new building in private sector.

Financial support

Installation of a complete Solar water system in Thailand cost approximately 15,000 baht per sq.m. However the project did not get very much attention from the bank since the total project investment cost is still too small.

The system install in the residential will cost approximately 100,000 baht per unit and providing financial support can help growing demand in these area but bank procedure will make it too complicate to apply.

May be the best option is to have the Government provide guarantee that allow the manufacturer or suppliers to access cheap funding which will in return lower the products cost to the end user.

Taxes measure

There are a few taxes involved in the solar thermal products as follow:

1. Import duty for the raw materials and imported products, vary from 5-30% depending on type of components.
2. Corporate income taxes for the Solar Energy companies, on progressive rate up to 50%
3. Personal income taxes for end user up to 50%

If the Government can reduce the above mentioned taxes, the solar thermal system cost can be reduced and become more attractive for the buyers or investors.

Data base

Share the information with the members and provide the Government with an accurate data on the Solar Water Utilization, so that there will be useful information available for future planning.

Conclusion

Solar Thermal market in Thailand has a very large potential to grow since installed base is still below 0.001 sq.m per capita.

The past few years figure indicated that the market is starting to take off due to the push from both Government and the private sector. However all the plan has to be long term, otherwise the market will drop again.

The growth in Solar thermal system will not only reduce the fuel consumption but will also reduce the carbon dioxide emission which will help the Global warming problem. In 2008 the 32,000 tons of carbon emission will be reduced base on 100,000 sq.m of the solar thermal installed.

In view of country benefit, solar thermal industry has potential to develop and can create a job of 100 man power per year for every 1000 sq.m of collector installed.

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