



Business models for Solar cooling



STAKEHOLDER CONSULTATION WORKSHOP
“POLICY DEVELOPMENT TO SUPPORT SOLAR COOLING IN
THAILAND AS DEMONSTRATION PROJECT in Southeast Asia



Sustainable
Solutions
for the
Environment



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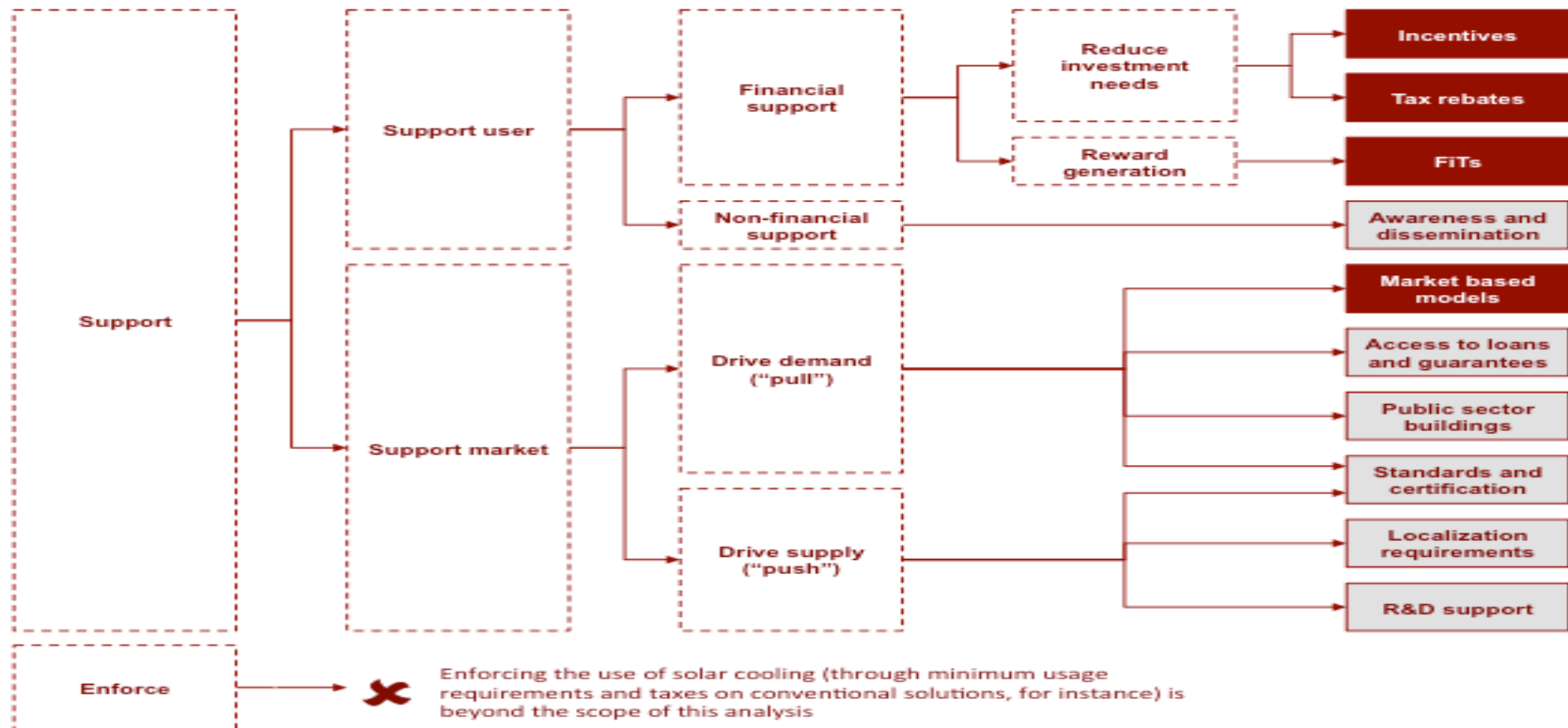
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- The term business models is used to reinforce the notion that the selected mechanisms, in the last 15 years, were the basis for most of the renewable energy and energy efficiency frameworks that were deployed worldwide.
- They can be divided into two categories: those that target the end-users, and those that support the market (market based models). A total of 4 models were considered.



- **Direct incentives** (also known as capital subsidies or grants) are usually given upfront (i.e. a subsidy is given on the amount of the investment to be made) although there are also cases where direct incentives are distributed over a period of time. Direct incentives have been common for solar thermal systems and technologies as compact fluorescent lights or condenser batteries for peak loads, where metering can be difficult but where savings are clearly identified and secured.
- **Tax rebates** reduce the effective income tax rates of citizens or companies that have invested in renewable energy or energy efficiency systems. In addition, companies may also be allowed to accelerate the depreciation of the purchased systems. Tax rebates have been more common in the United States, but there are also some well-known applications in Europe.
- **Feed-in-tariffs (FiTs)** have been used extensively in Europe since 2000 to support the development of renewable energy power generation. The best examples are solar and wind, which have been pushed to record levels in a short time frame and with feed-in-tariffs eventually reaching parity with the conventional power generation costs (commonly referred to as grid parity) in some countries. FiTs can be effective in building a competitive market for new technologies, provided that they are supported by long-term government commitments, robust country budgets and debt ratings, and a clear and transparent scheme.
- **Market based models** - include a broad number of mechanisms that provide indirect market support instead of direct support to end-users. For renewable energy and energy efficiency, one of the best-known mechanisms in this category is the savings model, where an intermediary (the Energy Services Company, or ESCO) installs and operates the system on behalf of the end-user, and sells him energy at a negotiated price (usually equal or lower than the applicable market prices, and guaranteed for a certain period).

Supporting policy mechanisms

- **Awareness and dissemination initiatives** - ensure that key stakeholders understand the potential benefits of solar cooling, its technical details and the available financial incentives, thus helping to mitigate some of the implementation barriers. Past experience suggests that a combination of both government (e.g. stakeholder consultations, training programs) and private sector led initiatives (e.g. contacts to potential users via utilities and banks) yield the best results. Furthermore a tailored approach is required for each type of user (e.g. industrial and residential users have very different requirements)
- **Access to loans and guarantees** - the role of the government, through for instance loan guarantees or credit lines with concessional interest rates, can prove primordial in ensuring that a sufficient amount of capital may be injected in the market.
- **Public sector buildings** - an important promotion tool is to leverage the public buildings – many of which with sizeable cooling needs – to foster demand and drive more players into the sector.
- **Standards and certifications** - to cover both equipment (e.g. efficiency standards for solar collectors and chillers) and system installation (e.g. guidelines for solar cooling deployments in new or retrofitted buildings). Solar standards and certification procedures will improve project bankability, streamline local economic development, simplify the supply chain and mitigate administrative and skill-set barriers to implementation
- **Localization** - to help jumpstart the creation of a local value chain in situations where the most common approach would be to source goods and services from other regions or countries. The major challenge of localization requirements is to reach local economic development and competitive pricing.
- **R&D support** - may range from University funding to pilot programs for innovative technologies. Relevant for areas that are at a pre-commercial maturity stage

Type	Criterion	Description
Benchmarks - results obtained by similar business models in the past and relevancy to solar cooling in Thailand	Number of supported systems	The number of solar cooling systems that have been successfully implemented under similar models
	Post-support sustainability	The degree to which these benchmarks were able to ensure sustainable business models after the end of government support
	Applicability to Thailand	The degree to which these benchmarks are comparable, in terms of socio-economic conditions and climate
Business Environment - adequacy of the business models to Thailand's current business practices and legislative frameworks	Synergies with existing policies	Integration potential into Thailand's existing energy and solar policy frameworks
	Synergies with existing business practices	Integration potential into Thailand's existing business practices
	Applicability	Applicability to all relevant solar cooling sectors (residential, retail, services, commercial and industrial)
	Accessibility	Accessibility to a broad range and number of energy market players
	Bankability	Accessibility to system financing
	Scalability	Adaptability or extension after implementation

Type	Criterion	Description
Economic Development and Efficiency – load economic development and its cost versus efficiency	Local economic development	Potential of cost reduction and creation of a competitive local solar cooling value chain
	Cost to the government	The model's expected cost to the government
	Investment versus savings	Distribution of the solar cooling system's initial investment and respective savings between market government, market players and end-users
Barriers to Implementation – assess the dissemination, administrative, financing and skill-set limitations	Economic barriers	The degree to which the success of the supporting mechanism can be hindered by economic (e.g. split incentives, hidden costs, no access to finance), behavioral (e.g. lack of credibility and trust), organizational (e.g. lack of priority, changes in culture) and skill-set limitations
	Behavioral barriers	
	Organizational barriers	
	Skill-set limitations	

- Each criterion was then rated on a 1 to 5 scale. The meaning of each rating was set individually for each criterion, in order to ensure an objective assessment.
- The full list of criteria is presented on the following slides

Scoring criteria

Type	Criterion	1	2	3	4	5
Benchmarks	Number of supported systems	< 10 systems	10 - 30 systems	30 - 50 systems	50 - 100 systems	> 100 systems
	Post-support sustainability	No new systems	Limited new systems, deployed only in particular situations	Illiquid market (less than 5 players)	Liquid market with multiple players	New business model created
	Applicability to Thailand	Never applied successfully to solar cooling	Applied successfully to solar cooling in different climate and socio-economic conditions	Applied successfully to solar cooling in similar socio-economic conditions, but different climate	Applied successfully to solar cooling in similar climate but different socio-economic conditions	Applied successfully to solar cooling in similar socio-economic conditions and climate

Scoring criteria

Type	Criterion	1	2	3	4	5
Business Environment	Synergies with existing policies	Requires a new energy policy framework	Can be integrated into the existing energy policy framework, with changes	Can be integrated into the existing energy policy framework	Can be integrated into the existing solar thermal policy, with changes	Can be integrated into the existing solar thermal policy framework
	Synergies with existing business practices	Requires fundamentally different practices	Requires substantial changes to existing practices	Requires some changes to existing practices	Can be integrated into existing practices	Is in line with existing practices
	Applicability	Is applicable to a limited number of segments	--	Is applicable to most segments	--	Is applicable to all segments (residential, retail, services, commercial and industrial)

Scoring criteria

Type	Criterion	1	2	3	4	5
Business Environment	Accessibility	Mainly accessible by large market players	--	Mainly accessible by large and medium market players	--	Accessible to small, medium and large market players
	Bankability	Does not contribute to system bankability	Minor contribution to system bankability	--	Relevant contribution to system bankability	Ensures system bankability
	Scalability	Cannot be easily adapted or scaled up	Can be easily scaled up but not adapted	--	Can be easily adapted but not scaled up	Can be both easily adapted and scaled up

Scoring criteria

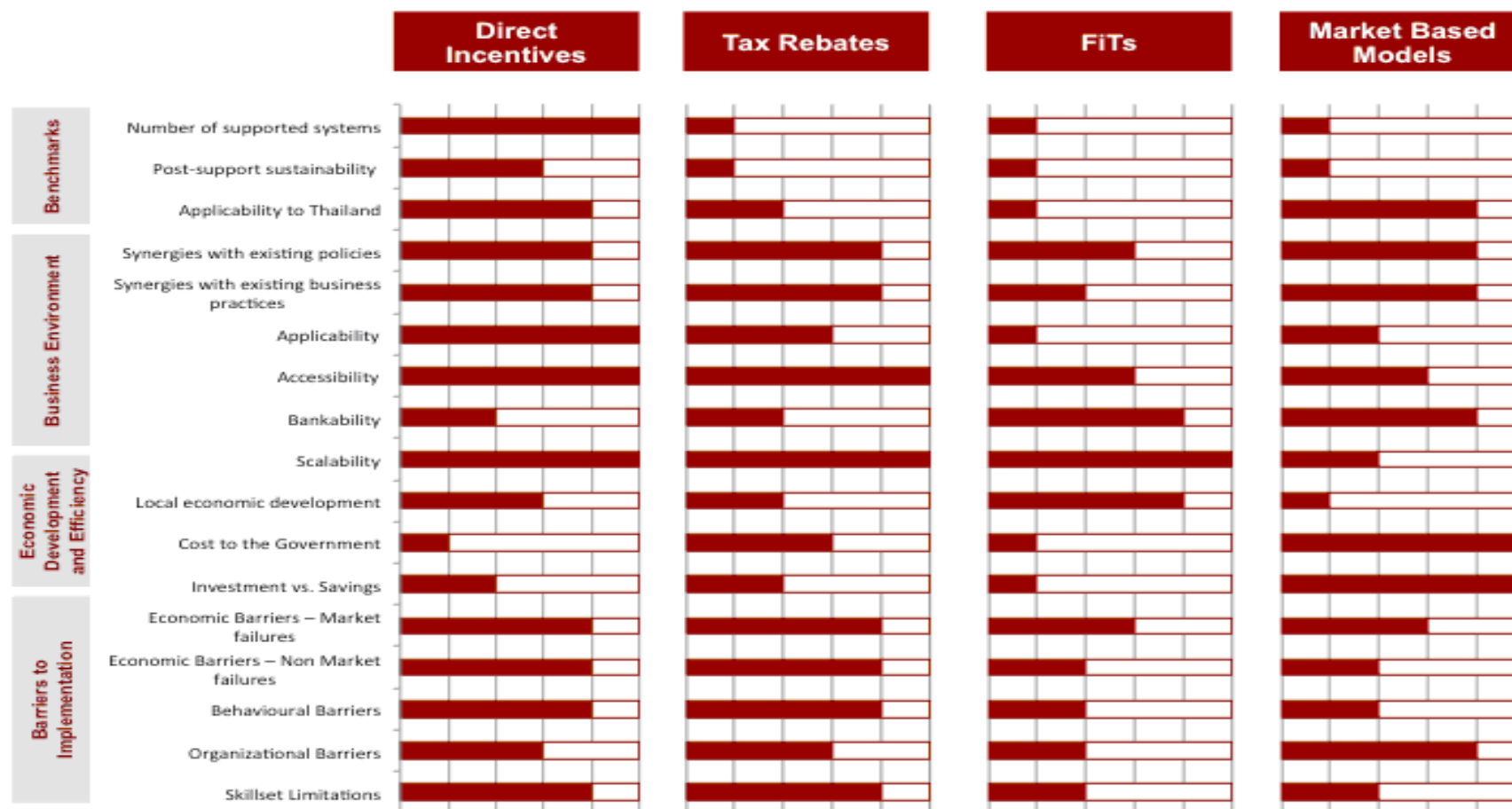
Type	Criterion	1	2	3	4	5
Economic Development and Efficiency	Local economic development	Stagnant costs and no local solar cooling value chain	Modest price decreases, based mostly on imported goods and services	Modest price decreases, based mostly on local goods and services	Significant cost decreases, based mostly on imported goods and services	Significant cost decreases, based mostly on local goods and services
	Cost to the government	Prevalence of measures involving direct costs (e.g. subvention)	Prevalence of measures involving indirect costs (e.g. allocation of public servants)	Prevalence of measures involving lost revenues (e.g. tax reductions)	Prevalence of measures involving recoverable costs (e.g. investments in public buildings)	Prevalence of measures involving only liabilities (e.g. loan guarantees)
	Investment versus savings	Government invests and end-user saves	Government and end-user co-invest, end-user saves	Government is a minor investor, end-user invests and saves	Market players and users co-invest and share savings	Market players invest and user has minor savings

Scoring criteria

Type	Criterion	1	2	3	4	5
Barriers to Implementation		Barriers that prevent implementation and cannot be overcome without significant time and/or resources	Barriers that prevent implementation but can be overcome with significant time and/or resources	Barriers that cannot be overcome without significant time and/or resources but do not prevent implementation	Barriers that do not prevent implementation and can be overcome without significant time and/or resources	No significant barriers

- The barriers to implementation were duly analyzed and comprised: scarce information, Adverse selection, Principal-agent, Split incentives, Hidden costs, Access to finance and capital, Heterogeneity, Form of Information, Credibility and Trust, Values, Inertia, Bounded rationality, Power, Culture, Bureaucratic, Skill set limitations

Scoring results



- In Benchmarks the top scorers are the direct incentives and the market based models while in Business environment direct incentives and taxes rebates
- In Economic development market based models and tax rebates lead while in the barriers for implementation direct incentives and taxes rebates score higher again.

- Two distinct options coupled with a set of supporting mechanisms:
 - Scenario A** combines a short-term focus on direct incentives and/or tax rebates with a longer-term objective of developing a market based model – more references but a slower development
 - Scenario B** proposes the development of a feed-in-tariff model -> limited references but the potential to drive strong deployment rates and cost decreases

Illustrative



Policies and implementation scenarios	Policy		
	Scenario A Government mandate	Scenario B Utility and large users	Scenario C Special programs
Supporting Mechanisms	- Strong 10 years commitment to solar cooling development - Mandatory incorporation of solar cooling in industries with heat needs - Mandatory incorporation of solar cooling in industries with thermal absorption chillers - Mandate minimum fraction of solar cooling - Option may be given to deploy PV power for captive use to reduce power peak consumption if only electricity is used	- Government aided technical Assistance for energy audit and feasibility study. - Government led fund for Equipment leasing and or financing - Solar cooling projects based on PPP models – Utility and infra-structure projects (government owned) sets yearly targets and bids out the implementation	- Creation of special categories of projects with a minimum of solar thermal aperture area and solar cooling contribution. - Distinguish between solar thermal and solar cooling, but value systems that use solar heat for combinations of hot water, industrial process heat, solar cooling and other processes - Mapping of the potential target companies and engage with them in workshops to discuss implementation barriers

Policies and implementation scenarios	Policy		
	Scenario A Government mandate	Scenario B Utility and large users	Scenario C Special programs
Regulatory schemes	- Create a regulatory body for solar cooling systems along with solar thermal and solar PV - Define a roadmap for implementation of solar cooling in industries, commercial and residential buildings with targets and timeframes - Monitor the market for implementation results, costs, practices, problems, unsuccessful and successful cases	- Remuneration for supplying cooling to industrial estates for example IEAT and Hemaraj or commercial building managers like CPN and Big C - Cooling consumption benchmark or allowance to mandate certain sectors to install solar cooling - Solar cooling product labeling and efficiency certificate - Create a regulatory body for solar cooling systems along with solar thermal and solar PV. - Define a roadmap for implementation of solar cooling within utilities and large users with targets and timeframes - Monitor the market for implementation results, costs, practices, problems, unsuccessful and successful cases	- Create a regulatory body for solar cooling systems along with solar thermal and solar PV - Define a roadmap for implementation of solar cooling in several segments targeting specific industries, commercial and residential buildings with targets and timeframes - Monitor the market for implementation results, costs, practices, problems, unsuccessful and successful cases

Policies and implementation scenarios	Policy		
	Scenario A Government mandate	Scenario B Utility and large users	Scenario C Special programs
Financial Schemes	- Incentive for installation after commissioning with granting a certificate of compliance with the mandate for 2 years. If after 2 years the system is not performing as in the certificate, no renovation of the certificate until system is operating. - Implementation period: 5 years for installation and 5 years of monitoring, based on a yearly capacity. For each year the incentive is reduced. Next phase depends on the results. - Monitoring is also required to be able to pass the scheme to a Market Based Model when market conditions are ripe	- Incentive to install the solar cooling system or to provide/purchase solar cooling. - Soft loans e.g. Energy Efficiency Revolving Fund in Thailand for end users and market intermediaries - bank guarantee to mitigate the technology risk for the commercial financing institutions	- Incentive for installation after commissioning with granting a certificate of compliance for 2 years. If after 2 years the system is not performing as in the certificate company must pay a fine in the value of the incentive plus inflation. - Short implementation periods: 1 to 2 years for each program with a capacity target. After evaluation programs can be re-edited with lower or higher incentives. - Monitoring is also required to be able to pass the scheme to a Market Based Model when market conditions are ripe

Policies and implementation scenarios	Policy		
	Scenario A Government mandate	Scenario B Utility and large users	Scenario C Special programs
Awareness and Education	- Promote Solar cooling as a source for cooling and not as an energy efficiency measure - Clearly explain the mandate and the savings in imported energy and avoided new electrical capacity deployment. - Demonstration projects with shared monitoring results, especially for target sectors with specific workshops - Development of technology and installation guidelines including how to perform feasibility studies - Development of training and professional certification courses - Development of a R&D policy to reduce costs in components and installations and in cooperation with excellence R&D centers in the sector worldwide - Development of standards and certifications for solar cooling equipments and also systems	- Promote Solar cooling as a source for cooling and not as an energy efficiency measure - Assessment of potential for solar cooling in Thailand. It can go up to the detail of region - Assessment of sector specific potential energy saving for cooling based on solar cooling like industry and commercial - LCOE Assessment tools as the tools developed by the European funded projects ST-Escos and BioSolEsco: - Workshops for targeting the potential utilities and large users which also should include international case studies. - CSR benefits vis-a-vis the increasing cost of energy, foreign energy dependency and regulatory implications - Demonstration projects with shared monitoring results, especially for target sectors with specific workshops - Development of training and professional certification courses - Development of standards and certifications for solar cooling equipments and also systems	- Promote Solar cooling as a source for cooling and not as an energy efficiency measure - Clearly explain the savings in imported energy and avoided new electrical capacity deployment. - Demonstration projects with shared monitoring results, especially for target sectors with specific workshops - Development of technology and installation guidelines including how to perform feasibility studies - Development of training and professional certification courses - Development of a R&D policy to reduce costs in components and installations and in cooperation with excellence R&D centers in the sector worldwide - Development of standards and certifications for solar cooling equipments and also systems

Panel Discussion and **FEEDBACK** from **Audience**

Solar Cooling General	Business Environment	Economic Development and Efficiency	Barriers to implementation
✓ Solar thermal cooling technologies ✓ Incentives for solar cooling ✓ Solar cooling Adequacy to Thailand	✓ Direct Incentives, Tax Rebates, FiT ✓ Market based models as ESCO ✓ Access to Solar cooling ✓ Bankability of solar cooling ✓ Financing solutions ✓ Scalability of solar cooling	✓ Local economic benefits ✓ Cost to the government and tax payers ✓ Private sector involvement ✓ Perception of savings through solar cooling	✓ Economical barriers ✓ Technical barriers ✓ Behavior barriers ✓ Bureaucracy ✓ Lack of knowledge and skills

	Roadmap Milestones	Thai	EU
Awareness	Demonstration plants	✓	✓
	Monitoring of demonstration plants		✓
	Guidelines for installation		✓
	Feasibility/Sector Market Assessment		✓
	Standard for solar cooling		
	Dedicated solar cooling policy with incentives		✓
	Pilot projects with monitoring		✓
	Open market		✓
	Removal of incentives		
	National players		✓

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Thank You...