

SIGNATURE PAGE

Country: Lebanon

Expected Outcome(s)/Indicator (s): National capacities and policy formulations supported and strengthened to reach sustainable development

Expected Output(s)/Indicator(s): Promotion of sustainable energy

Implementing partner: Lebanese Center for Energy Conservation (LCEC)/Ministry of Energy and Water (MEW)

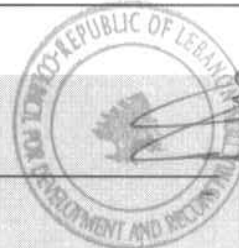
Other Partners:

Programme Period: 2009-2013
Programme Component
Project Title: Global Solar Water Heating Market Transformation and Strengthening Initiative: Lebanon Country Programme
Project ID: PIMS 3611/00062901
Project Duration: 4.5 years
Management Arrangement: NEX

Total budget: USD 3,160,500
Total budget (UNDP managed): USD 1,100,000
Allocated resources:

- Government: USD 2,060,500
- UNDP TRAC: USD 100,000
- GEF: USD 1,000,000

Agreed by CDR: Nabil A. el Jisr, President, CDR



Agreed by (Executing agency): [Signature]

25 MAR 2009

Agreed by (UNDP): [Signature]





UNDP Project Document

Government of Lebanon

United Nations Development Programme

United Nations Environment Programme

The Country Programme of Lebanon under the Global Solar Water Heating Market Transformation and Strengthening Initiative (PIMS 3611)

As a part of the UNDP/UNEP/GEF Global Solar Water Heating Market Transformation and Strengthening Initiative, this country programme of Lebanon aims at accelerating the market development of solar water heating in Lebanon with an objective to facilitate the installation of 190,000 m² of new installed collector area over the duration of the project, an annual sale of 50,000 m² reached by the end of the project and with expected continuing growth to reach the set target of 1,050,000 m² of total installed SWH capacity by 2020. This has been estimated to correspond to over 1,000,000 MWhr of avoided, new fossil fuel power capacity by using solar instead of electricity for water heating, and estimated cumulative GHG reduction potential of over 3 million tons of CO₂ by the end 2020.

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ACRONYMS

APR	Annual Project Report
CDR	Council for Development and Reconstruction
CEO	GEF Chief Executive Officer
CO	UNDP Country Office
CO ₂	Carbon dioxide
CTA	Chief Technical Adviser
EE	Energy Efficiency
EDL	Electricite du Liban
ESCO	Energy Service Company
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GPMU	Project Management Unit of the Global SWH Project
HQ	UNDP Headquarters
IEA	International Energy Agency
IRI	Industrial Research Institute
LCECP	Lebanese Center for Energy Conservation Project
LIBNOR	Lebanese Norms Institute
LASI	Lebanese Association for Solar Industries
LRF	Lebanese Recovery Fund
LSES	Lebanese Solar Energy Society
MDG	UN Millennium Development Goals
MoE	Ministry of Environment
MEW	Ministry of Energy and Water
MoET	Ministry of Economy & Trade
M&E	Monitoring and Evaluation
MYFF	Multi-year Funding Framework
NES	National Energy Strategy
QPR	Quarterly Progress Report
PDF	Project Development Facility
PIR	Project Implementation Review
PM	Project Manager
PMT	Project Management Team
PSC	Project Steering Committee
RCU	UNDP Regional Co-ordination Unit
RE	Renewable Energy
SESCO	Solar Energy Service Company
SWH	Solar Water Heating
SRF	Strategic Results Framework
TPR	Tripartite Review
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services

SECTION 1: ELABORATION OF THE NARRATIVE

Part I: Situation Analysis

Climate

Lebanon (33 50 N, 35 50 E) has a typical Mediterranean climate with more than 300 solar days, with favorable conditions for utilizing solar water heating compared to, e.g., Northern and Central Europe. According to current radiation measures and prevailing figures, radiation is around 1,825 kWh/m², year. This compares to averages of 913 [kWh/m², year] in the Netherlands, 1095 [kWh/m², year] in Denmark, 1387 - 1679 [kWh/m², year] in France and North of Italy and 1679 [kWh/m², year] in Spain, South of Italy and Greece.

Energy Sector

One of the predominant challenges of the century for Lebanon will be to enable more Lebanese to attain a higher standard of living, while avoiding disastrous natural resource depletion, high national energy bill and other environmental damage. A difficult path to the Lebanese economic growth still lies ahead, growth that depends on industry, transport and commerce. The expansion of energy supplies and electric capacity needed to run these industries carries high monetary and environmental costs.

In Lebanon, the combined consumption of energy in industrial plants, commercial and buildings is high and represents around 60% of the national energy bill. The potential for energy savings is important in these sectors and presents essential investment opportunities in Lebanon. Lebanon imports around 97% from its needs from fossil fuel and in year 2004 the national energy bill amounted to around 1.6 billion USD (20% form the annual public expenditure and around 7.8% from the national GDP). In 2005, it increased to 2.1 billion USD (26% from the annual public expenditure and around 10% from the national GDP)

Despite major steps that have been taken by the Government of Lebanon (GoL) since 1990 towards improving the electricity sector, it is still facing major problems such as inability to meet the national demand (high level of rationing of electricity), large financial subsidies to EDL, and high technical and non technical losses. To this extent, the electricity sector is now under GoL's close attention and one of the main proposed reform files in Paris III conference .

GoL is keen to initiate a national energy reform to overcome the above mentioned electricity sector problems in order to meet the expected economic growth that would provide considerable social benefits. The situation is expected to be especially exasperated, if no end-use energy conservation and renewable energy plans are put forth. Furthermore, there are certain governmental efforts planned to ensure the existence of long term national energy planning capabilities addressing the intricate issues of end-use energy demand management and conservation.

Although, end-use energy conservation is emerging as a widely accepted viable alternative to supply side expansion, Lebanon finds itself today without a proper comprehensive framework to address end-use energy conservation issues and strategies in a meaningful and comprehensive manner. However, efforts have been made by the UNDP/GEF project, Lebanese Center for Energy Conservation Project (LCECP), at the Ministry of Energy and Water especially during the past two years that will provide the necessary support to the GoL to demonstrate the importance of energy efficiency and solar thermal applications as an entry point for any national energy reform in

Lebanon. As a result of these efforts, UNDP and MEW signed an agreement in June 2007 that calls for the creation of the Lebanese Center for Energy Conservation (LCEC) which will be responsible for energy efficiency and renewable energy issues at the national level.

In Lebanon, electricity prices have not yet been liberalized and GoL is still heavily subsidizing the electricity sector and huge financial support is still provided to the EDL. This, combined with the higher, liberalized prices of competing fuels, has inevitably led to the increasing electricity consumption in meeting the households' energy needs, thereby contributing to the growing electricity demand-supply imbalance in Lebanon.

In 2005, Lebanon's electricity generation capacity was around 10,580 GWhr, 86% from thermal power plants, 10% from hydro-power plants and 4% from purchased electricity from Syria. EDL is currently facing high technical and non-technical losses that represent more than 35% (11% for technical losses and 28% non-technical i.e illegal connections and unpaid electricity). However, EDL supported by MEW is continuously exerting huge efforts to reduce the technical and non-technical losses, which have been improved over the past decade.

Due to this un-favourable conditions of EDL, GoL faces great challenges in meeting the required demand in the coming years. It is estimated that around 2,300 MW is required in the coming 8 years, which requires huge investments which have not yet been secured and allocated.

The GoL has programmes to privatize the electricity sector with close socio-economic electricity prices reform to reduce its financial exposure with great support for potential opportunities for energy saving and renewable energy. In Lebanon, the prevailing tariff for electricity for LV consumers is as follows:

Domestic Consumers (*)	
Tariff (LBP/kWh) / (\$/kWh)	Consumption (Millions kWh)
35 / 0.023	894
55 / 0.037	1146
80 / 0.053	317
120 / 0.08	213
200 / 0.13	1058
Sub-Total 1	3628
Institutions (Lighting)	
140 / 0.093	292
Industries, Craftsmen	
115 / 0.077	162
LV Subtotal	4082

Ref: Assessment of the National Tariff Policy Application - UNDP Project No. 00013392

(*) The Tariff structure for the domestic consumers is based on the following consumption ranges since 1994;

- 35 L.L./KWH for 1 to 100 KWH consumption per month
- 55 L.L./KWH for 101 to 300 KWH consumption per month
- 80 L.L./KWH for 301 to 400 KWH consumption per month
- 120 L.L./KWH for 401 to 500 KWH consumption per month
- 200 L.L./KWH for the portion of consumption above 500 KWH per month

The above tariff structure is based on GoL subsidizing the fuel oil / gas oil prices being used in electricity generation. On the other hand, the fuel prices are as follows:

- 20 l Gas oil is USD 13.3 i.e one litre of Gas Oil is 0.665 USD
- 12.5 kg of butane gas is USD 12.7 i.e. one kg of butane gas is 1 USD

High domestic hot water needs of the household in Lebanon are supplied by electric water heaters. It should be noted that energy used in hot water production represents around 30% of the household energy bill. UNDP/LCECP financial studies for solar thermal applications for both individual and collective systems demonstrate that an average simple pay-back period of 4 years for individuals' solar water heaters and 6 years for collective water heating systems are achievable based on the current energy and electricity prices. Moreover, regional and international solar thermal experiences further support the UNDP/LCECP's studies and provide the basis for solar thermal applications development in Lebanon.

Institutional Framework

The Ministry of Energy and Water (MEW) is the government body responsible for the energy sector development in Lebanon and consists of 9 General Directorates among which the “Electricite du Liban”, the Directorate of Investment, the Directorate of Hydraulic & Electric Resources, and the Directorate of Oil are considered as the main directorates in the energy sector. As GoL is committed to address the challenges of the energy sector in Lebanon, it has initiated a legal and institutional reform towards re-structuring of the energy sector in Lebanon. Such initiative will lead to the development of a comprehensive energy law that would promote the role of clean energy alternatives.

After the ratification of the United Nations Framework Convention on Climate Change (UNFCCC) by the Government of Lebanon in 1994, Lebanon's First National Communication, National GHG Mitigation Strategy and Assessment of Lebanon's Vulnerability to Climate Change for base Year 1994, was conducted and submitted to the Convention.

UNDP/MEW Energy Efficiency Project, Lebanese Center for Energy Conservation Project (LCECP), funded by GEF/MEW, started its activities in year 2002. LCECP provided and is still providing technical, marketing, financial and legal support to the private and public sectors to promote energy conservation issues in Lebanon. It is worth noting that the Ministry of Energy and Water and UNDP have recently signed an agreement to establish the Lebanese Center for Energy Conservation to act as the national energy conservation and renewable energy institute providing the necessary support to the GoL in setting the trend for the energy efficiency and renewable energy in the Lebanese market; to execute the adopted energy efficiency and renewable energy policies; and coordinate with national and international organizations to secure the necessary technical know-how, financial donations and investments required in promoting energy efficiency measures and renewable energy applications.

UNDP/MT&PW Energy Efficiency Building (EEB) Project in collaboration with the Order of Engineers, Thermal Standards for Building, funded by GEF, started its activities in year 2002. The EEB Project has developed the Lebanese Thermal Standards for Buildings.

Several other international energy development projects have been executed and are under execution to support the Government of Lebanon to build the necessary technical and administrative

capacities to consider energy efficiency and renewable energy aspects within their national policies. (EU-IPP – energy module, MED-ENEC project, etc...)

The above projects would have not been possible without the support of GoL and its direct involvement in the energy sector. GoL is committed towards the international community to implement climate change mitigation efforts.

The key stakeholders in Lebanon, who are following closely the development of the energy efficiency and solar thermal applications and who will have a major role in any energy efficiency and SWH development projects in the country are:

- Ministry of Public Works and Transport / Directorate General of Urban Planning; is the responsible government body following on the execution of the Building Law and granting construction permits in Lebanon. Recently, Directorate General of Urban Planning with collaboration of UNDP in Lebanon has developed the Thermal Standards for Buildings which is proposed to be voluntary until 2010 in order to allow a transitional period of trial and adaptation.
- Ministry of Environment: is the focal point for the Global Environment Facility and hosts and executes a number of international environmental projects. Ministry of Environment will have an important role in promoting the solar thermal applications in Lebanon.
- Electricite du Liban (EDL): it is a public institution and falls under MEW custody and provides electricity to meet the majority of the demand (Generation, Transmission & Distribution). Concessions constitute a good example of public private partnerships and provide distribution services.
- LIBNOR (Lebanese Standards Institute); is a public organization responsible for the development of the national standards in Lebanon and issuance of the Lebanese Conformity Mark “Normes Lebanaise” (NL).
- IRI (Industrial Research Institute), is a semi public institute responsible for quality control, equipment and goods compliance with the adopted norms, testing and certifications for all manufactured and imported goods. IRI has an essential role to regulate the Lebanese market for all imported energy efficiency and solar thermal equipment in close collaboration with LCECP.
- Order of Engineers and Architects; responsible of organizing the architectural and engineering works in Lebanon and building permits. Recently, Order of Engineers and Architects has reached an agreement with mechanical engineers to provide voluntary design drawings for solar water heaters in villas and houses to be included in the building permits application.
- Lebanese Association for Solar Industries (LASI); is a NGO that includes the main local manufacturers of solar thermal units in Lebanon and would play an essential role in promoting solar thermal systems in Lebanon through strengthening the local solar water heaters manufacturers' position in the local market.
- Lebanese Solar Energy Solar (LSES): is a NGO that includes renewable energy experts (consultants, manufacturers, traders, academics, etc...) with the main objective to promote solar thermal systems in Lebanon through collaborating with other stakeholders.
- Lebanese Centre for Energy Conservation Project (LCECP): is a project executed and partially financed by MEW and managed by the UNDP and aims at promoting energy conservations and

energy efficiency concepts in Lebanon. LCECP's main goal is to reduce GHG emissions through managing the energy demand side. LCECP is coordinating with LIBNOR to develop the Lebanese Solar Thermal Standards.

- Association Libanaise pour la Maitrise de l'Energy (ALME) is a NGO with experts in renewable energy (consultants, contractors, traders, academics, etc...) and has the main objective of promoting renewable energy in Lebanon. ALME has been involved in several SWH projects as well as studies and researches.

- Universities in Lebanon would play an important role in promoting SWH through development of Solar Energy Courses as well as research to support engineers to gain theoretical experience in SWH.

The Lebanese Designated National Authority (DNA), established in 2007 and located in the premises of the Ministry of Environment, serves as the national authority for Clean Development Mechanisms under Koyoto protocol that was ratified in 2006.

As Lebanon is still at the early stages of solar thermal market development, there are 8 small manufacturers and another 15 importing and installation companies. Despite of this early stage, a Lebanese Solar Industry Association has already been established (Lebanese Association for Solar Industries, LASI), but until now it has not been able to strengthen its position as a real developer of the local solar market. Further information on manufacturers and suppliers is available at LCECP website: www.lcecp.org.lb. The local manufacturers face great challenges in their business especially in respect to the quality of the manufactured solar panels as well as lack of design and installation capabilities.

National policy framework

In 2002, The Government of Lebanon issued a Degree # 462 that recognizes the issue of renewable energy in Lebanon as well as the involvement of the private sector in the development of the electricity sector in Lebanon. In order to get this law activated, however, a number of challenges needs to be addressed and a number of enabling actions needs to be undertaken. such as the establishment of a national regulatory body, who will develop and regulate the energy sector and provide the overall priorities for its development needs, while the private sector should play an essential role in making the necessary investments.

MEW has drafted a comprehensive energy law for Lebanon (in collaboration with the EU-IPP Energy Module), which is still under review and consideration. A law on energy conservation and renewable energy creating the legal framework for the elaboration and enforcement of a national policy for the promotion of renewable energy sources will be enacted at a later stage. The law on energy conservation and renewable energy should establish adequate framework for promoting energy efficiency and renewable energy technologies in all sectors and fostering the necessary investments, and should define the responsibilities of the authorities for the monitoring and enforcement of the law.

The LCECP responsibilities in promoting energy efficiency in Lebanon are to support the Government of Lebanon in assessing the existing national policies and regulations and to identify barriers to energy efficiency in order to facilitate the market development and penetration of energy efficient equipment. Accordingly, the LCECP will follow the adoption and actual implementation of the proposed policies.

LCECP is currently developing an energy conservation law in close coordination with various stakeholders and which is expected to be adopted by GoL in 2008. This energy conservation law will set the national policy framework for energy efficiency equipment and services.

The UNDP/GEF Energy Efficiency Building (EEB) Project at the Ministry of Transportation and Public Works has supported the development of a national decree to utilize the Lebanese Thermal Standards for Buildings on a voluntary basis till the year 2010 and to become mandatory after that. The implementation of these standards has been facilitated by the creation of certain incentives, from which the constructors can benefit when applying for construction permits.

Lebanese Order of Engineers has reached an agreement with the Mechanical Engineers Members to include SWH options/solutions into villas and single family houses during the design stage. This agreement is paving the way for the future development of the SWH market in Lebanon. .

Since early 2006, LCECP has been supporting the local solar thermal market and is coordinating with various stakeholders to promote solar thermal water heaters despite the great challenges facing their operation in Lebanon. As its own initiative, LCECP has implemented several necessary steps towards an overall national energy efficiency and renewable energy strategy for Lebanon. The planned strategy identifies a number of objectives and activities in pursuing GoL's goals towards adoption of energy efficiency and renewable energy technologies that would reduce the energy sector burdens. One of these activities is to promote solar thermal water heating with an objective to reduce the current imbalance of electricity supply and demand, in particular, during the peak periods. As a part of this, SWH has also been promoted for the reconstruction works that has been underway since the July 2006 war.

Technology Introduction and Supply Chain

The SWH market in Lebanon can be classified as an emerging market, which by the end of 2005 had reached an estimated total installed area of around 106,000 m² and a penetration rate of 26 m² per 1000 inhabitants. It is estimated this has resulted in a saving of over 70,000 MWh of thermal energy and over 45,000 tons of reduced CO₂ in 2005. The total sale in 2005 was estimated at 16,000 m² with a growth rate of 18 % compared to 2004.

As such, Lebanon belongs to the group of countries, in which the positive market development has already started, but for which it will be important that this development can be sustained and, as possible, accelerated. This is envisaged to be reached by attracting new customer groups in addition to the most accessible and easiest ones that are typical for early market development phase as well by ensuring full customer satisfaction on the operation of the systems installed, thereby promoting the image of SWH as a reliable, cost effective part of buildings' HVAC / Plumbing systems. The success stories, experiences and lessons learnt from these emerging developing country markets are expected to accelerate the market transformation also in those countries, in which the SWH market has not yet taken off.

On the basis of a preliminary market survey conducted in 2005 among 22 supply side companies in Lebanon (14 vendors and 8 local manufacturers), the key barriers to accelerating and sustaining the SWH market growth were listed as follows: i) lack of consumer awareness, ii) lack of quality control and trust on product quality, especially as regards local manufacturing; iii) high upfront costs and lack of public incentives (such as tax incentives) to encourage the purchase of SWH systems; and iv) lack of suitable and attractive financing mechanism to cover the higher up-front costs of SWH systems.

Below, some statistical data for the equipment found in the Lebanese market is presented.

Flat plate collectors still represent the main solar equipment used with a market share of 82%, followed by a steady growth of evacuated tube collectors (with 18% market share at the moment) and which will probably continue to increase their market share. Other equipments (such as integrated collectors and EPDM swimming pool collectors) are practically not used in Lebanon. The reason to this is that these products' efficiency is lower than flat plate collectors.

The SWH systems installed into residential houses are typically of so called thermosiphon type. This is a simple, relatively cheap technology predominant in most southern countries, which is not using any circulation pump or electronic regulation, but relies on natural circulation. This can be considered as an appropriate technology also for Lebanese conditions, especially as power cuts of several hours are still quite frequently experienced. A typical unit price of a family size SWH system in Lebanon consisting of a 3-4 m² collector and a 150-200 liter water tank is around USD 1,100 - 1,400 (including installation) with an expected minimum lifetime of 10 years.

Thermosiphon (closed type or open type) is the only complete factory made system sold as a package. Packaged forced circulation and integral collector storage systems are practically not available in Lebanon and these systems are not well developed in Europe and consequently not imported to Lebanon. It is estimated that around 69% of the installed thermosiphon solar water heaters units are closed type thermosiphon and 31% are open type thermosiphon. The Lebanese solar thermal market has the following percentages for the various hot water applications:

- Thermosiphon system: 70% (From which 69% closed type and 31% open type).
- Forced circulation for hot water 26%.
- Forced circulation for pool heating 3%.
- Forced circulation for space heating 1%.

Thermosiphon remains the main application for the flat plate and evacuated tube collectors. However, it should be noted that forced circulation use lot more solar panels square meters than thermosiphon since it can be used for large commercial and industrial applications.

The typical application size for the installed solar thermal water heaters in the Lebanese market is categorized as follows:

- Less than 6m² solar collectors: 72%.
- Between 7m² and 20m²: 20%.
- Between 21 and 100m²: 7%.
- Above 100 m²: 2%

Whereas the typical users of the installed solar thermal water heaters in Lebanon are; a) residential individual (apartments, villas...) 61%; b) residential buildings (collective buidings) 24%; c) large commercial (hotel, hospital...) 10%; d) retails 4%; e) industrial: 1%. These percentages clearly indicate that individual solar systems are still the main application, with some additional market for commercial and collective buildings.

The main sources for the solar thermal water heaters in the Lebanese market, except for the products manufactured in Lebanon; are Turkey, Greece, China and then very few from France and Germany. This indicates a clear preference of the market for relatively low cost products. Few suppliers and manufacturers have technical catalogues with stated technical performances of the solar collectors.

Larger SWH systems for multiapartment buildings, hotels, public buildings etc. can generally be constructed by using the same collectors, but with a larger tank and with a difference that they generally require a circulation pump. The average price in Lebanon can be estimated as USD 450 – per m² (including installation).

The product guarantee currently available in the Lebanese market is typically a one year up to 5 years guarantee for the solar collectors and water storage tank. These guarantees refer to the maximum guarantees proposed by certain manufacturers. No other quality control or certification system is currently in place in Lebanon. In this regards, LCECP has recently secured a Greek donation for the establishment of local solar thermal water heaters' testing facilities that are expected to be ready in year 2008. These facilities will enable GoL to shift the already adopted voluntary European Solar Thermal Standards to mandatory ones.

At the moment, the local manufacturers largely do their own sales, marketing, financing, and installation and provide their own after sales services. No specific national quality standards or certification system are currently in place for either manufacturing or installation. In the interviews conducted, the unavailability of trained installers and the lack of professional distribution networks, high interest rate for financing the business and sales were mentioned as barriers to increase the SWH market in Lebanon besides the following:

- 36% of companies insist on conducting advertising campaign to increase awareness of solar advantages.
- 32% of companies believe that solar installation costs should be reduced .
- 23% of companies stressed the need for good quality service and product.

The raw materials used for manufacturing the solar collector systems such as copper pipes, aluminum sheets and sections, black paint, glazing, silicon as well as the insulation materials can be easily found in the local market. Most of these raw materials are imported from China, Turkey and others by large companies.

With less than 110, 000m² of solar collectors installed in the Lebanese market, but with a positive average yearly growth; the Lebanese Solar market has a long and difficult path, but a steady one to reach a high level of saturation of solar thermal water heaters. The growth should be supported by good quality products and services at affordable price, in order to avoid unsuccessful experiences that took place in late eighties and beginning of the nineties.

Consequently and within the frame of LCECP's mission it is to set up a complete quality cycle for solar thermal water heaters in Lebanon that would include:

- 1) Adopt the European Solar Collector Standards for flat plate and evacuated tube collectors (Done, 2006)
- 2) The standards should have two levels of requirements. The first level to be mandatory to reach the minimum acceptable requirements without increasing prices of products on the local market, and the second level to be recommended to reach International Level Standards.
- 3) Labeling will be based on the above two levels helping consumers to identify quality /price ratio.

- 4) Such requirements and labels should be implemented by a certified institute with enough technical capabilities and personnel.

On the other hand, other necessary actions should be taken by concerned parties to support the Lebanese solar thermal market through:

- a) Increase awareness through intensive advertising campaign
- b) Creation of financial incentives for solar thermal systems.
- c) Implementation of policies and laws to support solar installation.
- d) Increasing the technical know-how at all levels (design, manufacturing, installation and after sales services)

In addition to the growing market, there are several individual and collective solar thermal water heating installations (executed or planned) as demonstration systems funded by different donors, including:

- 500 solar thermal water heaters (individual installations) donated by Chinese Government in 2005. More than 460 units had been installed in year 2006, but unfortunately more than 200 units were damaged due to the July 2006 war.
- 90 individual solar thermal water heaters (100 – 200 l) & 12 collective systems with total capacity of 35,000 l hot water will be installed by the end of 2007 under the Swedish International Development Agency (SIDA) donation.
- 350 individual solar thermal water heaters (100 – 200 l) will be installed in 2008 under the Hellenic Aid donation
- Other demonstrative collective solar water heating systems for residential and commercial applications funded by ADEME – French

SWH financing environment

Although investments in solar thermal water heaters are often cost effective and offer attractive rates of return, many profitable investment opportunities are being lost due to broad national, economic and institutional barriers, which restrict investments in solar thermal water heaters. The problem of financing may be the major factor causing the slow rate of progress in developing countries in achieving modern standards in solar thermal water heaters. The lack of credit and the inability to obtain financing for projects are strong deterrents to investments in many countries around the world.

Financial barriers and constraints have always been recognized as major obstacles for the development of solar thermal water heating projects. These barriers include: Competition for limited investment capital, uncertainty regarding the types of efficient technologies and practices most worth adopting, risk aversion, and lack of motivation on the part of facility owners in energy efficiency investments.

Local banks offer loans, but with relatively high interest rates. Banks are usually conservative about their lending practices. When they offer loans, the repayment period tends to be short compared to the pay-back period required for solar thermal water heating projects, which typically can reach 5 to 7 years. The weak credit histories of prospective customers also make them often poor candidates for loans.

The banking sector in Lebanon is quite liquid and has been strongly growing during the recent years. Loans are primarily disbursed via the commercial banking system. However, some micro-credit entities have been providing loans as well, mostly to SMEs. Credits are based on banks' own funds and on soft loans from International Finance Institutions (IFIs) or donors.

Financial and legal barriers to solar thermal water heating market in Lebanon

Still perceived as a new market in Lebanon, solar thermal water heating projects and equipments are hard to finance due to the following reasons:

- Bankers and financial institutions in Lebanon are more used to finance corporate and personal entities, based on financial and business evaluations, rather than financing projects and specifically energy efficiency projects or solar thermal applications;
- Financing traditional investment projects such as construction and business expansion is more common in Lebanon;
- No in-country financial institutions have experience from financing solar thermal water heating projects or ventures yet;
- The legal and regulatory framework in Lebanon is not yet fully compatible with different solar thermal water heating financing options, particularly performance contracting.; and
- Financial incentives for solar thermal water heaters do not yet exist in Lebanon.

Overview on Lebanese Banking Sector

The banking system in Lebanon is open, the currency is easily convertible and there is no restriction on the transfer of earnings or capital in and out of the country. Moreover, there are additional exemptions applicable to non-resident foreign currency accounts.

Traditionally strong and a leader in the region, the banking sector outperformed the rest of the economy in the 1990s. The major banks also sought to move away from a heavy reliance on interest earned from treasury bills (Government Debt financing at interest rates reaching sometimes 15%), and developed a whole raft of new consumer products know as the concept of retail banking system and even penetrating new markets in the region.

The Lebanese Central Bank is playing an essential role to regulate the banking sector in Lebanon as well as controlling the prevailing interest rates on both the Lebanese Pound and USD dollars.

The Lebanese banking sector is considered the most potential sector and has survived the difficult financial days especially during the reconstruction period after the war. The Lebanese banking sector supported the Lebanese Government in financing the public debt through participation in the Lebanese treasury bills issues. The banking sector has high level of current deposits that would exercise a great pressure on them to develop financial products for public investments.

Main services of the banks and other financial institutions

Investment Advisory Services

For clients, who prefer to make their own investment decisions, this service offers regular contact with professional financial advisors. Combining highly personalized and comprehensive counseling with transaction capability on all major international financial markets, the client is assured that execution is conducted professionally and is provided with regular reports on the status of the portfolio.

Credit Facilities Services

The business includes all kind of credit facilities for low-income to high-wealth individuals. The customers can benefit from a wide range of facilities, aided by financial advisors, to find the most suitable credit that meets their needs. Services include personal and commercial loans.

Corporate Finance Services

The corporate finance Service offers a whole range of services including origination of debt and equity products, syndicated loans, structured finance, project finance, advisory services, international funding, and merchant banking.

Commercial Banking

Commercial lending is always considered as the crux of their activities. The main goal of the banks is to serve its society in the most efficient and effective way to maintain and promote its image as a professional lender. The products offered in this division are: commercial lines of credit to small and medium enterprises, commercial loans, discounted bills, letters of credit, letters of guarantee, term loans. These types of facilities are granted for working capital needs, inventory financing, export-import trade financing, fixed asset acquisition, and project financing.

Retail Banking Concept

As mentioned earlier, as an action to switch reliance on governmental debts, banks decided to find new ways and products to enhance their revenues generation by developing what is called the retail banking system. Viewing that there are some \$40 billion worth of deposits in Lebanese banks. To widen their revenue base, banks are expanding retail services as well as their investment and private banking divisions. Some of these products are personal loans, car loans, home loans, credit cards, ATM cards, savings plans, and insurance products.

Corporate Banking Concept

Raising finance for a business can require as much attention as running the business. Other than making profits at low risk, the concept behind banks corporate lending is the proper arrangement of financing to any business or project that satisfy the client needs, business requirements and cash flow constraints. It is aimed to help businesses with financing for seasonality, growth, cash management, consolidation, international and domestic market expansion, acquisitions, receivables and any other financing that helps the business thrive.

Financing and lending instruments of banks and financial institutions

a. Personal loans

The variety of, and competition for, personal loans has intensified, with multifarious varieties – computer loans, car loans, and education loans. Whatever the name, the principles remain the same. Personal loans rarely go above four years – three is more common – and the majority of banks

charge a flat interest rate on the whole amount for the whole loan period. In addition to the interest payments, some banks impose a one-off 'file set up fee'. On average the interest rates on personal loans range as follows:

USD Regular Interest Rates: 10% - 13%
USD Flat Interest Rate: 6% - 9%
LBP Regular Interest Rates: 11% - 22%
LBP Flat Interest Rates: 7% - 12%

b. Housing authority mortgages and private banks housing plans

There are two public housing agencies in Lebanon – the Housing Bank, established in the 1970s, and the Public Housing Authority, established in 1997.

The Public Housing Authority is designed to help needy families and has agreements with 13 commercial banks. The repayment period is up to 30 years.

During the first half of the period, the mortgage holder repays the capital but no interest. The Public Housing Authority settles the interest. Over the second half, the borrower repays the Housing Authority the interest.

Beneficiaries of public housing loans must pay off at least 75 percent of the loans and interest before reaching the age of 64. They must also be able to personally finance the down payment.

In addition to the housing authority mortgage system, commercial banks have developed private housing plans, by which clients may directly apply for a housing loan from a commercial bank. On average the interest rates on commercial banks housing plans range as follows:

USD Variable Interest Rate: Libor + 3.5% - Libor + 6%
USD Fixed Interest Rate: 6% - 11%

c. Special Loans

Special loans are credit facilities falling under the category of personal loans with a very special purpose for financing. Some banks have developed the concept of special personal loans to reduce requirements of loans granting and at the time ensure the need of the funds to be disbursed to the specific requested category or sub-category. Special personal loans might include e-loans, travel loans, PC loans etc... On average the interest rates on Special Loans range as follows:

USD Regular Interest Rate: 8% - 11%
USD Flat Interest Rate: 5.5% - 9%
LBP Regular Interest Rate: 12% - 13.5%
LBP Flat Interest Rate: 6% - 12%

d. Leasing Financing

Until the introduction of leasing to the local market in 1995, entrepreneurs had few financing options. Commercial banks often extended certain loan facilities for only one-year periods.

Leasing companies finance specific purchases such as equipment or vehicles. Contractually, three parties are involved: the lessee, the supplier, and the leasing company. If the lessee defaults on

payment, then the leasing company repossesses the equipment. The lease can be an operating lease or a finance capital lease.

In capital lease, customers essentially own the equipment. They simply make regular payments to the lessor, usually a leasing company. Capital leases appear on the customer's balance sheet as both an asset and a liability.

Operating lease has the advantage of shifting risk from the customer to the leasing firm. However, this makes it more expensive for the customer. In an operating lease, neither the leased assets nor the lease obligations appear on the balance sheet of the customer. The leasing company retains ownership of the equipment. At the end of the lease, the customer has the option to take title to the equipment, rather than at a price stipulated in the lease.

e. Subsidized Loans

Subsidized loans are loans provided by commercial banks, with which the interests due on the loans are covered or paid by Central Bank not the borrower. Subsidized loans are aimed to assist borrowers in financing options and minimize their financial burden and short term operating cash flow problems.

Actually, two ways are available to call for a subsidized loan. First way, is a direct subsidy request between the commercial bank of the client and the Central Bank. Secondly, a request guaranteed by a Lebanese intermediary institution called KAFALAT s.a.l.

i- Direct Subsidy between Commercial Bank and Central Bank:

The Central Bank supports by 7 % or 5 % the debit interest charged to the loan. This loan is tailored to meet the needs of companies that are involved in the industrial, agricultural, and tourism, as well as high technology, programming, and craftsmanship sectors in Lebanon.

The client must provide the bank with a feasibility study concerning the project at hand, as well as audited balance sheets for three consecutive years. The client must also give the real estate collateral on the condition that its value is not less than 165 % of the loan amount, based on bank estimation.

Moreover, client must present an insurance policy that covers all risks that may be encountered during the project, while holding the bank as the only beneficiary. In general, the loan's repayment period is up to 7 years with a grace period of 2 years.

ii- Subsidized Loan between Commercial Banks and the Central Bank with the Intermediation of KAFALAT sal:

Kafalat is a Lebanese financial company with public focus that helps small and medium sized ventures (SME's) to access commercial bank funding. Kafalat helps SME's by providing loan guarantees based on business plans / feasibility studies that show the viability of the proposed business activity. It processes guarantee applications for loans that are to be given by Lebanese banks to SME's operating throughout Lebanon.

Kafalat guaranteed loans benefit from interest rate subsidies. These subsidies have been set up to mitigate the crowding out effect of the high interest rates in Lebanon that are induced by public sector borrowing. The interest rate subsidies are financed by the Lebanese treasury and administered by the Central Bank of Lebanon.

KAFALAT covers 75 percent of credits of up to LL300 million (\$200,000). The loans can be repaid over five years.

Regarding SWH Panels, few local banks have expressed interest to pursue this market area and they have extended their financial support directly from the manufactures/supplier to consumers. As indicated earlier, the high interest cost of these banks lending have created main barrier in front of further lending for SWH market. The total lending potential for the SWH market in Lebanon has been estimated to be around 80 million USD over the next 6 - 7 years, which the banks should be able to easily cover by using their own resources.

Vendor Financing

Offering sale on credit for SWH panels will depend a lot on the amount of the annual turnover as well as the liquidity position of the vendor under consideration. Given the current figures and the lack of experience of the financial management of the local private companies in general, it seems that neither manufacturers nor distributors will be able to finance the targeted growth in the market without additional and substantial back-up by an experienced financial entity.

On the positive side, some vendors have already allowed a few clients to pay by instalments with good experiences so far, which may pave the way for new financing arrangements by using vendor type of financing.

Solar Energy Service Companies (SESCO)

Solar Energy Companies (or SESCOs) follow an approach similar to Energy Service Companies (ESCOs), where an ESCO will finance the initial investment together with a performance guarantee to secure the promised savings, and the client will pay back to the ESCO from the achieved savings, which will be shared (for the agreed duration) between the client and the ESCO.

The proposed solar energy services companies (SESCO) would basically operate in a similar way on a fully commercial basis, catering the requirements of the potential users and offering least costs energy services in general rather than just promoting SWH. The SESCOs could fill up the missing link between the manufacturer and the users and meet the requirements of diverse users and end-use applications by offering a variety of services such as:

- energy supply against payments related to energy saved;
- installation of solar thermal with or without an O&M contract;
- performance contracting; and
- technical design/consultancy

A local electric utility could also act as a SESCO as a part of its overall demand side management strategy, and with a possibility to collect the payments for SWH devices through the electricity bills from achieved savings. Until now, however, EDL has not been warming to such idea due to its current administrative and financial problems in satisfying the local electricity demand.

Financial and fiscal incentives

A variety of specific financial and fiscal incentives to support the growth of the SWH market in Lebanon can also be considered. In elaborating these financial market stimulation schemes in further detail, the following lessons learnt from the past activities dealing with different public

incentive schemes need to be taken into account so as to design financial and fiscal schemes that can cost-effectively boost the market, but without risking its longer term sustainability.

The stability and, in particular, the predictability of financial incentives is a key condition for sustainable growth of the solar thermal market. For this reason, regulations or incentives based on law have typically stronger effects than short-term incentive programs based on ad-hoc budget lines. The latter have been often applied, at the national or regional level, but their short-term success has often turned into a barrier to growth in the long-term. If the budget of the incentive program is not enough to cover the demand, the funds can be disbursed long before the end of the budget period. In this case, the targeted clients typically expect a reactivation of the incentive program and postpone the purchase of a solar system. This leads to short-term overheating followed by breakdown of the market, when incentives are temporarily stopped. Accordingly, short-term incentive programs may just disrupt the market instead of boosting it on solid basis. The suggestion is that whatever incentives are applied, they should be set and be fully predictable over a long term.

It is essential to develop the support mechanism in such a way that it will encourage the suppliers for further price reduction and system optimization through a competitive environment, while at the same time maintaining adequate product quality.

The proposed SWH project will closely investigate the various possible scenarios, opportunities, and approaches that would facilitates the development of the necessary financial incentives that would develop the local market for solar thermal projects on the national level.

Furthermore, the proposed SWH project will ensure close coordination with the Ministry of Finance, Central Bank, and other financial institutes to consider any successful financial mechanisms already developed and implemented for other sectors that would be feasible to expand to cover the energy efficiency measures and solar thermal projects among other renewable energy applications. Some of the prevailing successful financial mechanisms are the KAFALAT fund, bank AL-Iskan and some other potential financial instruments and mechanisms (Energy Fund, Solar Thermal Fund, etc...)

Moreover, the proposed SWH project will further investigate certain custom and tax reduction on the solar thermal equipment and projects by a cost-benefit analysis of the proposed financial incentives to confirm the macro level benefits.

Taking into account the above, possible forms of financial and fiscal incentives to be adopted by the Government may include:

Interest rate softening:

On interest rate subsidies, there have been some efforts by the GoL to introduce such facilities. So far, there has been a couple such schemes in Lebanon. In principle, interest rate subsidies and the associated low interest loans could be used as a part of the overall SWH marketing package to generate consumers' interest and encourage the purchase of SWH panels among the targeted residential and commercial users, and could be an effective measure to help banks to build loan portfolios in specific target sectors. The advantage would also be that by assuming the entire credit risk, the bank's interest are fully aligned with those of the donor, both in terms of minimizing defaults and continuing lending activity after the donor support has been phased out. On the other hand, this approach is subtle and therefore will only work in larger SWH markets where banks can be confident of building sizeable loan portfolios quickly. In less developed markets, transaction

costs might outweigh the benefits for the bank. Concerns are sometimes also expressed about the market distortion.

Guarantees

In general, the guarantees supported by external donors are most effective at addressing elevated banker perceptions of risk: Once a bank has gained experience in managing a new portfolio of loans, they are in a better position to evaluate true project risks. Partial risk guarantees can ensure debt-service payments to selected lenders or other investors in a project, usually for specific time periods or exposure levels. Partial credit guarantees can also be used to extend loan repayment periods, thus improving the project's cash flow. Both forms of guarantee can motivate banks to lend for projects that they would perceive too risky otherwise. Buying down the risk can mean lower costs of financing for the borrower or decreased security requirements. Other types of guarantees could be linked specifically to the performance of the SWH systems or to underwrite their collateral value (the latter reducing the risk of the targeted financiers as regards their lack of experience of the second hand market, if SWH systems are used as collateral)

Regarding the use of the guarantees in Lebanon to promote the purchase of SWH panels and as discussed before, they could be useful for some specific target groups provided that a right approach is taken to address the identified barriers and that private underwriters will be involved.

Fiscal incentives

Apart from straight forward subsidy schemes, fiscal measures normally have a more structural impact on the market development. These can be found in tax-deduction for private home owners as implemented within Mediterranean countries or corporate tax incentives for companies. The possible import duty exemptions for SWH equipment and/or materials to reduce the price of SWH systems also fall under this category.

Recommendations

By taking into account the above, the following recommendations can be made for designing a successful financial-incentive program for SWH panels:

- Educate the public about SWH panels' technologies and the available incentive program;
- Develop a long term, coordinated package of financial incentives, which have enough budgetary resources to back them up. These incentives can decrease over the time as the market matures, but they have to be predictable (i.e the targeted stakeholders need to be aware, to the extent possible, of any expected changes over a longer period);
- Allow flexibility for program modification and fine-tuning on the basis of the customers' response, but without creating a damaging "stop and go" dynamics and without punishing the early decision makers;
- Design an easy and concise application process;
- Allow also the public sector consumers to use incentives;
- Ensure utility cooperation to the extent possible;
- Track the details of program use and costs, as well as energy savings, and make this information publicly available and easily accessible.

Other Planned or Ongoing Projects

The UNDP/GEF “Lebanese Center for Energy Conservation Project (LCECP)” has been under implementation since 2001 and, among its other activities, has advocated for and implemented measures to promote increasing use of SWH as one measure to reduce electricity consumption. The proposed country component of this Global SWH Initiative will build on this work and bring it one step further to facilitate the required market transformation by the activities discussed in further detail later of this proposal.

During the past two years, UNDP, MEW and LCECP have also been able to secure several donations to support the SWH market. LCECP has been coordinating with international organizations & countries the efforts to develop SWH projects & programmes and is preparing the necessary technical proposals and presenting them to UNDP/LRF, GEF and the countries concerned with an objective:

- to secure sufficient funds for strategy development and execution
- to develop demonstrative projects (pilot projects)
- to ensure sustainable infra-structure framework for solar thermal market
- to transfer the know-how & expertise to the local market
- to increase the public awareness level for solar thermal applications

These projects, for which funding has already been secured, will be implemented in close co-operation with the proposed UNDP/GEF project making together a complementary package to facilitate the market transformation towards increasing use of solar water heating in Lebanon and its adoption as a standard option for buildings’ HVAC installations. For further details, see Section III “Total Budget and Workplan”

Part II: Strategy

The GEF’s experience to date has shown that the barriers being removed generally relate to five market characteristics: policy; finance; business skills; information; and technology. As identified in the second Climate Change Program Study (CCPS2, 2004) as well as in the new draft programming framework for GEF-4, the removal of market barriers relating to these qualities “can form the basis for a market development strategy that is applicable to all of GEF’s Operational Programs as well as being replicable, sustainable, and cost-effective”. The project goal, objectives and expected outcomes have been defined on the basis of this strategic approach.

Project Goal and Objective

The long term goal of the project is to accelerate a sustainable market development of solar water heating in Lebanon with good quality products and services. At current rates of installation under the business as usual scenario, 350,000 m² of new solar thermal panels would be installed in Lebanon by 2020. Under the alternative scenario, new solar thermal installations of 1,050,000m² are expected by 2020. The GHG emission reduction resulting from this alternative scenario can be estimated at over 400,000 tons of CO₂ per year in 2020 or at the cumulative amount of over 3 million tons of CO₂ by 2020 from the project start.

The objective of the project during its lifetime is to accelerate the market development of solar water heating in Lebanon with the aim of facilitating the installation of 190,000 m² new solar water heating capacity during the project and an annual sale of 50,000 m² reached by the end of the project and with continuing growth to reach the stated longer term goal of 1,050,000 m² of total installed capacity by 2020.