Paving the Way for the Mediterranean Solar Plan

Activity 1.1.1: Benchmarking of existing practice against EU norms

- Country Report Lebanon -

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I. Description of the Lebanese electric power sector

Lebanon is importing more than 95% of the energy consumed. Total primary energy supply of about 5 Mtoe is dominated by fossil fuels; crude oil products contributing about 90 percent. Lebanon also imports small amounts of electricity. Energy imports put a high economic burden on Lebanon. The costs of oil imports are in the range of US$ 3.5 bn. annually.

Electricité du Liban (EDL) is the state-owned Lebanese power utility. Only some concessions for energy production were given to smaller companies. There is no privatisation or liberalisation in Lebanon, although the World Bank recommended respective steps.

Electricity consumption was 12.5 TWh in 2010 with imports contributing about 9 percent. Generation capacity was not increased in the past decade. Only some rehabilitation projects were conducted to increase the availability of older units.

On governmental level, the Ministry of Energy and Water (MEW) is the sole responsible ministry for energy matters. In cooperation with different international organisations the “Lebanese Center for Energy Conservation (LCEC)” was established as a body to foster energy efficiency.
However, currently there is no energy efficiency legislation in force. Lebanon already introduced solar water heaters and compact fluorescent light bulbs (CFLs) on the consumer level.

In 2010, the Ministry of Energy and Water developed a policy paper for the electricity sector that would be seen as a national framework for the electric energy sector in Lebanon for the short and medium term. As for the long term energy sector, Lebanon does not have a general strategy on its future energy system. Such a strategy would be valuable to make the link between sustainable energy supply and general economic development.

1. Fuel Sources

Lebanon does not have any indigenous energy resources and is currently importing these. Recent studies have, though, shown very promising seismic conditions for hydrocarbon deposits off-shore Lebanon. A Draft Petrol Policy for Fuel and Gas Exploration in the Lebanese Waters has been forwarded for the consideration of the Council of Ministers.

Lebanon depends heavily on oil for electricity production. Lebanon Oil Installations is a state-owned company in charge of construction, management, operation and maintenance of petroleum product installations. The company works as a commercial entity and controls storage facilities, research laboratories and two non-working refineries. Lebanon Oil Installations is the owner of the Lebanese part of the GASYLE gas pipeline and the adjacent land. The pipeline links Tripoli refineries to Homs in Syria. A natural gas station has been constructed at the Tripoli Installations of the company. This is supposed to receive the gas from Syria and supply the Beddawi power plant and other clients where possible.

Thus, the gas market structure in Lebanon is fully vertically integrated and government owned, with the Ministry of Energy and Water (MoEW) acting as a single buyer (sole gas importer) and seller (sole shipper and supplier), network owner and operator (through Lebanon Oil Installations), and consumer (through state-owned Electricite du Liban - EDL).

Moreover, Lebanon imports gas oil (diesel), fuel oil and natural gas for its electric power generation. These are imported by the state-owned Lebanon Oil Installations through Zahrani and Tripoli refineries. The two refineries also own and operate storage facilities and terminals, even though the refineries themselves are not working. Military conflicts caused both refineries to cease operation and they are used currently as import terminals and storing facilities for refined petroleum products. Some private companies also operate storage facilities, especially for fuel oil, gas oil and gasoline.

The MoEW controls the imports of oil products. The technical specifications and quality of these imported products are tested by the Directorate General of Oil at laboratories owned by Lebanon Oil Installations. Moreover, the MoEW sets the rules
for the implementation and organisation of petroleum product storage facilities, tank trucking and gasoline stations.

The Lebanese part of the GASYLE pipeline is 32 km, connecting Beddawi power plant to the Syrian border. It has a diameter of 24” and is designed for an inlet pressure of 75 bars. Under an agreement with Egypt, Lebanon will receive 0.6 mcu natural gas per day, just sufficient to cover the needs for Beddawi. The pipeline capacity can accommodate larger volume of natural gas imports. The supply to the other CCGT power plant at Zahrani could be done through:

- Negotiating for another 0.6 mcu natural gas from Egypt and constructing a pipeline to Zahrani, a project involving nearly 135 km, with branches to Salaata, Zouk and Jieh. This all assumes that Egypt will have sufficient gas, though, both to cover own expanding needs and to cover export through newly constructed terminals for LNG and CNG.
- Erecting a permanent LNG terminal or a floating re-gasification unit (FSRU) at Zahrani.

Coal is not used in Lebanon as a primary source of energy for electricity generation. The use of coal is very marginal and is imported by and used mainly for cement plants.

Concerning the use of renewable energy sources, there is a minor use of Hydro Power (Table 1). There seems to be very limited potential for increasing the hydro power capacity, mainly due to the conflicting interests with the needs for irrigation. There is no utilisation of geothermal energy or biomass. Wind energy as well as solar energy are used off-grid on individual basis in small capacities and represents less than 1% of Lebanon’s energy balance.

An MOU was signed in late 2007 between the MoEW and a private investor for the erection of the first wind farm in Lebanon with a capacity of 60MW. Even though the investor has made all the basic technical and financial studies, the project did not move forward, mainly due to high risks that any IPP would face in the lack of supporting laws and regulations, the absence of a regulatory authority, the political instabilities and the guarantees of payments from the national electricity company or the principal buyer.

1. Generation

Electricity in Lebanon is supplied by Electricité du Liban (EDL), a 100% State-Owned vertically integrated company. Power generation, power transmission and power distribution in Lebanon are, therefore, the responsibility of EDL. There are four small distribution concessions with about 7% of the national low voltage customers. EDL has 7 thermal power plants with generating capacities depicted in table 2. Conflicting numbers have been reported in different documents.
### Table 1: Hydro Power Plants

<table>
<thead>
<tr>
<th>Plant</th>
<th>Age (years)</th>
<th>Owner</th>
<th>Units</th>
<th>Installed capacity (MW)</th>
<th>Available capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdel-Al (Markaba)</td>
<td>45</td>
<td>National Office of Litani</td>
<td>2</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Arkache (Awali)</td>
<td>26-42</td>
<td>National Office of Litani</td>
<td>3</td>
<td>108.0</td>
<td></td>
</tr>
<tr>
<td>Charles Helou</td>
<td>39</td>
<td>National Office of Litani</td>
<td>2</td>
<td>48.0</td>
<td></td>
</tr>
<tr>
<td>Kadisha – Abou Ali</td>
<td>54-73</td>
<td>EDL</td>
<td>3</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>Kadisha – Blaouza</td>
<td>46</td>
<td>EDL</td>
<td>3</td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>Kadisha – Lichaa</td>
<td>49</td>
<td>EDL</td>
<td>3</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>Kadisha – Becharre</td>
<td>79</td>
<td>EDL</td>
<td>2</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Nahr Ibrahim</td>
<td>45-55</td>
<td>EDL</td>
<td>8</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Bared</td>
<td>45-53</td>
<td>EDL</td>
<td>5</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Safa/Richmaya</td>
<td>75</td>
<td>EDL</td>
<td>3</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>273.5</strong></td>
<td><strong>190</strong></td>
</tr>
</tbody>
</table>

### Table 2: Thermal Power Plants

<table>
<thead>
<tr>
<th>Plant</th>
<th>Age (years)</th>
<th>Fuel</th>
<th>Units</th>
<th>Installed capacity (MW)</th>
<th>Available capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zouk</td>
<td>24-27</td>
<td>Fuel Oil</td>
<td>5</td>
<td>628</td>
<td>~435</td>
</tr>
<tr>
<td>Beddawi</td>
<td>12-14</td>
<td>Natural Gas – but uses also diesel oil</td>
<td>3</td>
<td>435</td>
<td>425</td>
</tr>
<tr>
<td>Zahrani</td>
<td>12-14</td>
<td>Gas – but using diesel oil presently</td>
<td>3</td>
<td>435</td>
<td>425</td>
</tr>
<tr>
<td>Jieh</td>
<td>30-40</td>
<td>Fuel Oil</td>
<td>5</td>
<td>331</td>
<td>~200</td>
</tr>
<tr>
<td>Hreicheh</td>
<td>28</td>
<td>Fuel Oil</td>
<td>1</td>
<td>65</td>
<td>~60</td>
</tr>
<tr>
<td>Baalbeck</td>
<td>14</td>
<td>Gas – but using diesel oil presently</td>
<td>2</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Tyr</td>
<td>14</td>
<td>Gas – but using diesel oil presently</td>
<td>2</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>2,034</strong></td>
<td><strong>1685</strong></td>
</tr>
</tbody>
</table>
Currently, the CCGT power plant at Zahrani is using diesel oil for fuel since no natural gas is available, and heavy fuel oil would damage the boilers. The CCGT power plant at Beddawi uses also diesel oil when the natural gas supply from Egypt is interrupted due to financial, commercial or administrative problems. This makes production from these essential plants (50% of available thermal capacity) extremely expensive – in 2006, Zahrani used 483,158 tons of gasoil to produce 2,579,350 MWh. With a price for gasoil of US$ 844/ton, the fuel cost per MWh produced at Zahrani would be US$ 158.10 or US$ 0.16/kWh (240 LL/kWh). This should be compared to the average selling price of about US$ 0.07/kWh. Cost savings will be immediate if the fuel is switched to natural gas, and then a further US$ 1 million is estimated to be saved per year from reduced maintenance cost.

The Lebanese electric power sector suffers thus from lack of capacity and very old generation units that experience frequent outages (nominal capacity around 2,300 MW, but available capacity around 1,685 MW thermal and 190 MW hydro). The demand is estimated to be around 2,500 MW. Rotating power outages are thus adopted. The supply of energy from EDL averaged about 21 hours per day in Beirut, and 15.5 hours for the rest of the country in 2009. There are hundreds of low efficiency district based private generators that supply the districts with electricity, when the electricity from EDL is cut, even though, strictly speaking, they are illegal by the Lebanese laws but are allowed to work to cover the demand. They add to the energy bill and to the burden on the public.

The Association of Lebanese Industrialists has a total estimated power generation installed capacity of about 200 MW. Hotels, schools, universities and hospitals have an estimated 100 MW. Residential buildings and districts have their own private generators with a total estimated capacity of 600 MW. Not all households can afford to subscribe with these generators. It is estimated that self-generation constitutes between 33-38% of electricity consumption as per a study conducted by the World Bank.

The Government of Lebanon wishes to attract IPPs. However, the major obstacle is that there is still no electricity regulator established, and many of the laws and regulations supporting licensing do not exist. The political instabilities as well as the needed guarantees of payments from the national electricity company or the principal buyer form the other main obstacles.

2. Transmission and Distribution

There is an electricity interconnection between Lebanon and Syria, consisting of a double circuit 220 kV overhead tie-line between Deir Nbour and Tartous and a 66 kV overhead tie-line between Aanjar and Dammar. In 2010, 9% (1,239 GWh) of Lebanon’s total electricity consumption was imported from Syria and Egypt through the regional interconnection grid.

The transmission system in Lebanon is formed mainly of 220 kV, 150 kV and 66 kV lines. The national ring of 220 kV transmission lines has been completed, except for
a small portion north of Beirut in Bsalim, and the Ksara 220/400kV substation to be linked to the interconnection with Syria.

Presently, the transmission system consists of:

- 30 km of 400 kV double circuit overhead (linking Ksara in the Bekaa valley to Syria as a part of the regional interconnection. Still under construction)
- 380 km 220 kV double circuit overhead (still has a small part to be completed)
- 61 km 220 kV single circuit underground
- 180 km 150 kV double circuit overhead
- 28 km 150 kV single circuit underground
- 755 km 66 kV single and double circuit overhead
- 69 km 66 kV single circuit underground
- 71 substations

The Lebanese National Control Centre project has been launched and the full operation of the centre is expected in 2012.

The distribution system, formed mainly of 5.5, 11, 15 and 20 kV lines, is in a poor state having received very little attention compared to the generation and transmission systems. 11 kV and 20 kV are present in Beirut, 5.5 kV only at a few distribution posts, whereas the rest of the country is fed by 15 kV. EDL intends to make the 20 kV uniform for the whole country. EDL has about 1.2 million customers, with about 82 thousands customers in four small distribution concessions.

Non-technical losses in the transmission and distribution systems are above 25%, whereas the technical losses are estimated at around 15%. The metering of electricity consumption at the LV customers is highly unreliable. The reduction of uncollectibles, i.e. the proportion of billed electricity which is not paid has been reduced to about 5%, through systematic efforts and outsourcing of collecting.

3. Financial Situation

EDL is incurring large annual losses and constitutes one of the largest burdens on the public budget. In the last three years, EDL incurred an average loss of about US$ 1.5 billion a year.

All the above issues are being addressed through different projects; however the tariffs remain a highly controversial topic. It is argued that raising the tariffs will make the electricity unaffordable for a majority of Lebanese households and thereby generate social problems as well as raising the percentage of uncollectibles. However, if EDL could provide 24 hour uninterrupted power supply, most Lebanese households would save the cost of the districts private generators. At present, the consumers pay generally about 100-120 LL per kWh to EDL – but this is
supplemented by an estimated 800 LL per kWh for their private generators. EDL tariffs have remained unchanged since 1994.

4. Policy Paper

In June 2010, the Lebanese Council of Ministers adopted the national “Policy Paper for the Electricity Sector” presented by the MoEW. The Policy is a national framework for the electric energy sector in Lebanon, and includes ten strategic initiatives that are integrated and correlated to cover the sector’s infrastructure (generation, transmission, and distribution), supply and demand (fuel sourcing, renewable energy, demand side management / energy efficiency, and tariffs), and the legal framework (norms and standards, corporatization of EDL, and the legal status). The initiatives are developed into identified plans of action with required budget, financing schemes, and timeframe. The total budget of the policy initiatives is US$ 4,870 million in the short and medium terms (public sector US$ 1,550 million, private sector US$ 2,320 million and international donors US$ 1,000 million) with an additional budget of US$ 1,650 million on the long term.

In conclusion, Lebanon still faces serious challenges in assuring an affordable, reliable, secure and environmentally acceptable supply of electricity. The country has few natural mineral resources; a dilapidated infrastructure; highly unreliable supplies of electricity at high cost; very large unaccounted losses; and inefficient final use. Regional integration is not well developed. The country benefits from a long coastline relative to its size and population giving it access to international commodity markets, and from an industrious and educated population and some useful potential renewable resources. The policy paper developed to address the problems of the Lebanese electricity sector faces major challenges including political instability, regional conflicts, private sector involvement and trust, and financial mechanisms to be adopted.

II. Support schemes to promote the use of energy from renewable resources in electricity

1. Targets and strategy of renewable energy

The Policy Paper for the Electricity Sector in Lebanon sets a target to “adopt the utilization of renewable energies to reach 12% of electric and thermal supply” by the year 2020. This includes 40 MW additional hydro power to the existing 290 MW (in 2012-2015), as well as new wind power (60-100 MW in 2011-2013) and waste to energy (15-25 MW in 2013-2014). The Policy Paper was presented by the Ministry of Energy and Water and endorsed by the Council of Minister in its meeting on June 21, 2010. The policy assumes that the private sector would finance the renewable energy.
projects. However, the document states that “This policy commits to launching, supporting and reinforcing all public, private and individual initiatives to adopt the utilization of renewable energies”.

Lebanon initially depended upon hydroelectric generation for electricity supply and it is still a significant contribution. Lebanon enjoys rather better access to water than neighbouring countries during a rainy season extending for 80-85 days/year, mainly between October and April. Rainfall varies considerably throughout the country; the western part is wetter and there is a substantial snowfall on the Mount Lebanon massif.

Use of water for power generation is compromised by the requirement for domestic water and irrigation. Irrigation frequently takes priority over hydropower. A quarter of the hydro power resources are being used but they contribute only to a small extent to power generation. Peak hydropower generation occurs in March, which is when the electricity demand is lowest.

The Litani in the Bekaa is the most important river; the biggest hydro plant in Lebanon comprising three plants on the Qaraoun Lake is managed by the Litani River Authority: the dam confines a huge 210 million m3 reservoir and the turbines have a name plate capacity of 190 MW, but operate more usually between 80 – 170 MW according to the water flow.

Two other concessions, Bared and Nahr Ibrahim have an installed capacity of respectively 17 and 33 MW. All the hydropower units are between 40 and 70 years old and are in need of renovation. The Master Plan for EDL, developed by Electricité de France with funding from the Government of France, proposes an additional 120 MW hydropower generation, mainly coming from the extension of existing installations and some new run-of-river projects.

Lebanon has a significant wind potential, especially in the North. This can be deduced from measurements of tree deformation that correspond approximately to wind speeds of 7-8 m/sec. A few small wind turbines have been demonstrated in the South, Mount Lebanon and Bekaa. The largest wind turbine is a 300 kW machine installed on Mount Lebanon. The EDL Master plan foresees that 1% of the electrical power demand might come from wind in the year 2012 increasing slowly thereafter. That will represent a generation capacity of 30 MW in 2012, then 60 MW in 2018 (1.5% of the demand). The assumed capacity factor is 23%, which will limit the contribution of wind energy to 120 GWh in 2018, or only 0.7% of the total generation. In January 2011, CEDRO, a UNDP – MoEW project, finalized a wind atlas for Lebanon. The study was funded by the government of Spain. The atlas showed large potentials for wind energy especially in the North and East of Lebanon with an estimated total potential capacity of 1.5 GW.

With most of the country connected to the national grid, solar photovoltaic (PV) is not economical. There are some interesting projects under CEDRO that aim to provide standby facilities for schools using PV, but these would not be grid-connected.
Lebanon has little forest cover, but it has significant other sources of biomass, such as municipal solid waste and agricultural wastes. The Bekaa valley is the main agricultural region with a wide range of crops especially potatoes, cereals, tomatoes and sugar beet. South Lebanon is a wheat growing region and the coastal zone grows mainly fruit including citrus, bananas and vegetables. Cereals are largely produced in the north of Lebanon especially in Akkar. Some of the residues from these crops are used for animal feed, but the majority is discarded. There may be some potential for energy related products, but other applications, such as composting are more likely to be cost-effective. CEDRO is currently undertaking studies to identify the potentials of biomass and hydro in Lebanon.

2. Regulation

At present the electricity industry operates in a legal vacuum. Electricité du Liban (EDL) is a vertically integrated, state owned monopoly. The legal provisions partially to reform this structure were promulgated in Law 462 of 2002. This Law set out the responsibilities of the actors in the sector.

The Ministry of Energy and Water was to establish policy and plans for the expansion of generating, transmission and distribution capacity. Regulation was to be performed by the Electricity Regulatory Authority, which would have technical, administrative and financial autonomy and would issue licenses for all activities. The functions of EDL would be transferred to one or more joint stock companies, for subsequent privatisation.

This Law is in principle in force, but has never actually been implemented. No regulator has ever been appointed. There is therefore no institution to issue licenses for new generation. This curious condition was the consequence of a shift in the prevailing attitude to reform; from 1999 to 2002 the emphasis was on privatisation; after 2002 it appears to have shifted towards public private partnerships and corporatisation, leaving the Law somewhat behind the change in consensus.

Law 462 in any case has no articles on renewable energy. If Lebanon wishes to develop renewable resources, then the law will need to be amended. Various amendments to the law are proposed to make it more applicable to present Lebanese conditions; in theory this can be done relatively easily by the submission of a note to Parliament for a vote, but it is not clear whether the necessary consensus on the future form of EDL is sufficiently strong to allow this to be done.

There is a strong consensus that the sector cannot continue in its present form, but less on what the future should be. There are three entities in government planning for the electricity sector; the Ministry, the Higher Council for Privatisation and the Council for Development and Reconstruction. If these entities do not agree then progress will be slow and the legal basis for grid connected renewable energy may not be available soon.
Law 462 allows up to 1.5 MW of private generation; any plant greater than 10 MW requires a license from the Regulator and between these limits, plants require a permit. Sale of electricity is in theory always illegal.

A temporary scheme of licensing needs to be introduced to bridge the gap between the present arrangements and whatever will eventually be agreed. One interim scheme would be to appoint the regulator, and authorise the Council of Ministers to license plant while the regulator builds up capacities and procedures. There is a precedent for this in 2007. The basic requirements would then be in place to tender for wind plant. There could still be problems over the pricing formula for electricity from renewable sources. Law 462 authorises the regulator to determine prices and there is no indication as to whether the regulator will lay on the single buyer a requirement to purchase at least cost. This could prejudice wind generation. It may be necessary to amend Law 462 to allow the single buyer to agree a PPA with a generator that is simply subject to regulatory approval.

LCEC has prepared an early draft of a Law for the Promotion of Renewable Energy, but the effort is compromised by the absence of any government strategy which makes it hard to propose legal form.

On the institutionally plan, there is no specialised agency to promote grid connected renewable energy in the Lebanon. LCEC has done much to promote solar water heating, but this is a technology that is subject to the same kind of policies as energy efficiency. It is an investment that requires support through marketing, dissemination of information, control of quality and performance and by financial incentives. There is no agency that systematically promotes grid connected renewables.

The following paragraphs identify the country’s major stakeholders and describe their main responsibilities in the RE field:

- Ministry of Energy and Water: it is Lebanon’s main policy formulator in the water and energy sectors. The Ministry is composed of three directorates: the General Directorate of Hydraulic and Electric Resources, the General Directorate of Exploitation, and the General Directorate of Petroleum;
- Lebanese Electric Corporation (EDL): it is responsible for the generation, transmission, and distribution of electricity in Lebanon. It is a state-owned enterprise, which controls over 90% of the Lebanese electricity sector;
- Lebanese Centre for Energy Conservation (LCEC): it is a national organization affiliated to the Lebanese Ministry of Energy and Water. LCEC addresses end-use energy conservation and renewable energy at the national level. It supports the Government of Lebanon in the development and implementation of national strategies that promote the efficient and rational uses of energy, including renewable energy, at both generation and consumer levels.
- Lebanese Association of Solar Industries (ALI): it is an economic organization grouping industrials and manufacturers from all over Lebanon. ALI advocates for a balanced industrial development for all Lebanese regions. The Association seeks to create and maintain an environment which is favourable to industrial investment, growth and development;
Lebanese Association for Energy Saving & the Environment (ALMEE): the organization advocates for a sustainable and harmonious development of Lebanon, with special emphasis on energy savings and the environment. ALMEE is particularly committed to global environmental issues (Kyoto and Montreal protocols) and has developed mechanisms for the mitigation of greenhouse gas emissions;

3. Financial support

The National Energy Efficiency and Renewable Energy Action (NEEREA) has a main slogan: “Finance your energy efficiency, renewable energy, or green building project through Lebanese banks with 0% interest rate and a repayment period of 5 years”. The scheme would allow the private sector getting near 0% interest loans from commercial banks to cover extra costs of incorporating energy efficiency and renewable energy components in development projects, buildings and industries. The NEEREA is a result of the joint efforts between the MoEW, the LCEC and BDL.

The beneficiary would address a local commercial bank with the complete technical and financial study. The commercial bank would send the documents to the central bank of Lebanon (Banque du Liban, BDL). BDL would ask for the technical comments of the Lebanese Center for Energy Conservation (LCEC) to issue the approval on the loan.

The scheme relies on the commercial banks financing, where BDL provides support through the reduction of the obligatory financial reserves the commercial banks have to keep at BDL. On the other hand, the national target set in the electric sector policy assumes that the private sector would be financing the different renewable energy projects without real measures to ensure availability of necessary budget/funding to achieve the target. The scheme would thus support reaching the national target of 12% electrical and thermal energy from renewable sources, as well as the national target for 5% reduction in energy demand by 2014.

The scheme has been launched only recently through BDL circular number 236 dated 25 November 2010. The training to commercial banks is still in progress (July 2011), and the first three applications were already approved by the end of July 2011 with total loans of US$ 23.5 million.

LCEC has been active in promoting solar thermal water heaters in the Lebanese market, providing advice on technical issues, communication and marketing. In this sense, most of the practical work that has been done on renewable energy is to promote solar water heating. Solar water heating is a proven technology that can make a useful contribution.

The LCEC was assigned by MOEW as the technical supervisor of the 500 solar thermal water heaters which were donated by the Government of the People’s Republic of China to the Government of Lebanon. LCEC supervised the installation of these units in the south of Lebanon including the organization of training on
installation. In addition, LCEC supervised the installation of 90 solar water heaters and 12 solar heating systems donated by the Swedish International Development Cooperation Agency (SIDA) and established a nonprofit organisation and facilities.

LIBNOR has recently adopted the European Solar Water Heaters standards in Lebanon and LCEC has prepared a list of the suppliers and manufacturers and a Guarantee of Performance. The user of the appliance is advised to ask for a Guarantee of Performance from the supplier to ensure the minimum required quality of the solar water heaters. The commercial banks have introduced solar loan that is interest free and supported by the Central Bank of Lebanon.

The standards for SWH are at present voluntary, but a proposition is now with the Council of Ministers to make these standards mandatory. A grant is expected from the Government of Greece to install a solar testing centre at the Industrial Research Institute to provide the technical basis to ensure regulatory compliance with mandatory standards. LCEC is working with the Ministry of Finance on a Fund for households to install SWH.

4. Specific questions for investments

Among the measures taken to encourage the investment, the NEEREA described above ensures low interest loan to cover the extra costs of incorporating energy efficiency measures and/or renewable energy sources insuring part of a project’s energy needs (under current financial conditions, the estimated interest is around 0.6%). The scheme is not meant for pure energy producers. Any project with energy efficiency or renewable energy component can benefit from this scheme. It is administered through commercial banks. Any private and/or foreign investment can apply through banks.

5. Others measures

There is no formal arrangement for determining prices for bulk power purchased from the grid, although the practice of PPAs is implicit in the arrangements for the purchase of power from the existing hydro concessions that date from many years in the past. As noted earlier, Law 462 needs amendment to clarify the provisions for pricing electricity from renewable sources.

However, other measures to support the development of renewable energy such as feed-in fixed tariffs, tradable certificates, feed-in premium and issues relating to tenders do not exist currently in Lebanon and should be developed. In July 2011, net metering was approved by the Board of Directors of EDL
Networks issues

The generation, transmission and distribution systems in Lebanon are owned and operated by the national electricity company (Electricite du Liban, EDL), except for four small distribution concessions. Up to this date, all the generation capacity connected to the transmission network in Lebanon is owned by EDL or its subsidiary. Lebanon suffers from lack of generation capacity, and consequently, all available capacity at any time is totally used.

The grid development and reinforcement projects are administered by EDL. Normal procedures from the development of a master plan to the commissioning would take years depending on the project itself. There are no reinforcements planned on the short and medium term. As for the authorization for grid connection to supply the national grid with electricity from renewable sources, the current procedures and practices do not allow for such connections.

Finally, the electrical network in Lebanon requires reinforcement. Both national power generation and electricity imports from Syria and Egypt are not sufficient to cover the demand, and power outages occur daily.