The Renewable Energy Potential in Lebanon

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Introduction

- The cost and non-reliability of supply has crippled the Lebanese economy for years.
- Energy efficiency and RE seem to be the only solution for dwindling oil supplies worldwide.
- Interests in end-use energy efficiency and conservation are now seen by the Lebanese government as a viable alternative to meet growth in demand.

Introduction

- Lebanon is heavily dependent on imports,
  which results not only in a significant drain of cash but also in a grave environmental impact ranging from air pollution from power plant stacks to water soil pollution from accidental spills of fuel and lubricating oils in the sea and land.
- Lebanon has an estimated peak demand of 2,614MW whereas its supply of electricity averages 1,500 MW.
  As a result of this shortage, Lebanon experiences daily power curtailment.
- In the larger industrial and commercial sectors the capacity shortfall is met by the use of customer owned stand-by generators while the residential and small commercial customers are reliant on un-registered (and unsafe) small IPP's.
- The main challenges of the sector remain in the ability to implement law 462 (privatization of the sector),
  meet the capacity demand, secure Natural Gas for power generation, lessen the reliance on fossil fuels, and institute EE and RE legislations.

The Status of EE in Lebanon

- EE should be the 1st step taken before any further expansion of electricity generation is undertaken:
  - Public awareness.
  - Promotion of EE appliances.
  - Buildings and technologies through subsidies
  - Incentives
- Lebanon has no EE and RE regulations yet.

The Lebanese Center for Energy Conservation

- With the help of GEF and the UNDP, the Lebanese Government was able to establish a multipurpose institutional set-up,
  whose goal is to reduce GHG emissions in Lebanon by simultaneously undertaking barrier removal activities
  and providing energy efficiency services to the public and private sector industries improving, thereby, demand side energy efficiency through supporting activities encompassing information dissemination, awareness programs, and policy analysis and program design.

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Activities and Accomplishments of LCEC

- **LCEC financed and supervised the studies of 100 energy audits within the industrial sector.**
  The audits covered detailing inspection of their energy consumption, recommendations of saving measures, implementation of proposed solutions, as well as saving potentials on energy bills and reduction in CO_2 emissions.
- **The potential for further implementation proved to be extremely promising.**
  Many industries/facilities have shown great interest in investing their money for the implementation of the energy saving measures. LCEC financed the implementation in selected public facilities and considerations for others were still given.

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Activities and Accomplishments of LCEC

- **EE Standards and Labels for household appliances represent a major part of LCEC's work,**
  LCEC managed to codify five standards for household appliances mainly: Solar Water Heaters, Compact Fluorescent Lamps, Refrigerators, AC split units, and the electric and gas water heaters.
- **As per the binding reasons issued by LCEC and supported by the minister of MEW H.E. Mr. Alain Taborian, LIBNOR announced its adoption of the CFL and SWH standards on a mandatory basis clearing the stage for mandatory measures in that regards for the first time in Lebanon.**

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Activities and Accomplishments of LCEC

- **LCEC finalized a Roadmap for DSM Implementation**
  It includes the timeframe for the DSM activities, the implementation structure, and a provisional budget for the specified time horizon.
- **LCEC finalized another mission geared at diagnosing the state of availability and reliability of energy and GHGE data in Lebanon. Energy Database Action Plan.**
- **LCEC launched several media campaigns addressing energy efficiency, and solar water heaters through TV and radio ads and spots and through tactical communications such as newsletters and brochures and banners.**

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Legal Achievements

- LCEC is currently following-up on many important legal issues such as:
  - Undertaking the necessary steps to ensure the approbation of the Treaty of Foundation of the Lebanese Center for Energy Conservation (LCEC).
  - Founding the LCEC Association.
  - Introducing the appropriate technical and legal amendments to the Energy Conservation project-law.

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The Swedish Donation

- In an attempt to green the reconstruction efforts after the July 2006 war, LCEC contacted several donor countries and succeeded in securing two donations dedicated to installing solar thermal applications in war damaged areas. The first donation came from the Swedes in monetary contributions to install solar water facilities in the Bekaa, the South, and in Beirut.

- Funding Agency	: SIDA – Sweden	Administrator: UNDP
- Fund Amount	: 500,000 USD	Technical Agency: LCEC
- Project Areas	: Beirut, Bekaa & South	
- Starting Date	: March 2007	Duration: 1 year
- Beneficiaries	: Public Buildings (public hospitals, orphanages, red cross centers, health centers, civil defense centers)	
- Type of Project	: Individual & collective solar systems	
- Project Capacity	: 93 individual units (100 – 200 l) 12 collective systems (35,000 l hot water)	

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The Greek Donation

- The 2nd donation came from the Greeks in the amount of 1 million USD to support identified programs towards energy efficiency reconstruction.

- Project Name	Greek Program "Towards Energy Eff. Reconstruction"		
- Funding Agency	Hellenic Aid - Greece		
- Fund Amount	941,000 USD		
- Administrator	CRES (Center for Renewable Energy Sources)		
- Local Agency	UNDP/LCECP		
- Project Areas	South & Beirut		
- Starting Date	Aug. 2007	Duration:	1.0 year
- Beneficiaries	families in the south & LCECP		
- Type of Project	Individual solar units, EE lamps & solar testing facilities		
- Project Capacity	- 350 individual units (150 – 200 l) - 90,000 EE lamps - complete solar testing facilities (*)		

(*) The solar testing facilities will be installed at Industrial Research Institute (IRI) under Collaboration Agreement with LCECP

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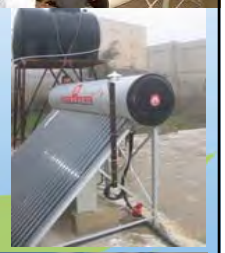
The Chinese Donation

- Earlier donation by the Chinese, granted Lebanon with 500 solar water heaters dedicated for the liberated areas half of which were destroyed by the July war.
- The Chinese fulfilled their promise later on by upgrading the donation with yet another 600 solar units. In that respect, LCEC was involved in data acquisition programs on such units in the attempt of supporting scientific results in the favor of the feasibility of solar water heaters.



- Project Name	Chinese Solar Thermal Applications (Phase 1)		
- Funding Agency	ETC – China		
- Fund Amount	In-Kind Contribution of 500 solar units (Estimated donation value : 500,000 USD)		
- Administrator	MEW / UNDP	Technical Agency	LCECP
- Project Areas	South – Liberated areas		
- Starting Date	Nov. 2005	Duration:	1 year
- Beneficiaries	Selected families in the south		
- Type of Project	Individual solar systems (Evacuated Tube)		
- Project Capacity	500 solar units (200 l)		
- Project Status	Completed early 2006		

(*) Almost 220 solar units were damaged during July 2006 war.
(**) LCECP managed to raise 125,000 USD to install the donated solar units

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The Current Status of RE in Lebanon

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Article 26: Production intended for private use with power less than 1.5 Megawatts

Production equipment intended for private use with power less than 1.5 Megawatts shall not be subject to the Authorization condition provided that the environmental, public health and public safety standards are complied with pursuant to the specific standards adopted by the Authority after reviewing the Ministry of Environment and the concerned administrations and institutions' opinions.

License:	an official document issued by the Authority to joint stock companies, granting by virtue of the present law a concession for a maximum period of fifty years to create, equip, develop, acquire, operate, manage or market Production, Transmission and Distribution equipment for public facilities with a power exceeding 10 MW or the right to use the above-mentioned equipment by virtue of a leasing agreement.
Authorization:	an official document issued by the Authority, granting the right to create, equip, develop, acquire, operate or ensure the maintenance of Production facilities for private use with a capacity varying between 1.5 and 10 MW.

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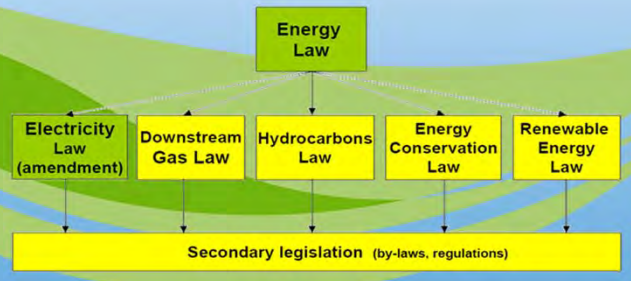
IPP MSC Energy – Project Funded by the European Union

Proposed legal framework



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The most commonly used forms of EE used worldwide are:

- With the exception of hydropower, no RE form is being used to generate electricity on a significant level in Lebanon.


Solar Thermal


Photovoltaics


Biomass


Hydropower


Wind

Hydropower

- The hydropower plants have been around for more than 40 years.
  The amount of power production has been decreasing due to water diversion for irrigation in addition to decreasing rains.
- No developments in this field since 1970.
- There is a need to study the potential for new installations.

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Hydro Prospects

Conditioned to Dam Erection	Additional Power		Hydro Plants	Location
	Private Sector	EDL		
X	6		Bisri	Litani
OK	20		Khardali	
X			Zibli	Safa
X		5	Rashmaya	
X			Damour	
X	20		Hneidi	Ibrahim
OK	40		Janneh	
OK	10		Yammoneh	Assi
OK	50		Hirmel	
X	12		Bou Moussa	Bared
X	16		Elhamra	
X	5		Kassim	
X	18		Kateem	
X		4	Bishnein	Abou Ali
	197	9	Total	

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Photovoltaic's

- Technology is too expensive to enable large scale or general use.
- One pioneering project application (alfa).
- With the exception of some applications by enthusiasts the technology has not been mainstreamed

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PV project Example (Telecommunication)

240Wp , DC solar system in Saida for one ISF remote telecommunication Relay (2004)

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PV Project example (Fakra)

2000W system , 750Wp wind – Solar Hybrid system In Fakra (2003)

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Biomass

- Mature Technology that has not been used to date in Lebanon.
- No excessive wood production exist in Lebanon.
- Areas are not large enough for the economic production of energy crops.
- Some areas can be used for cultivation of Jatropha or Jojoba for oil production.
- Animal waste form farms or municipal solid waste can be used to generate biogas and electricity.
- Burj Hammoud waste dump study shows a feasibility to generate power. No action was done.
- Naameh Land fill could be economically rewarding for biogas collection.
- Considerations for potential returns of tree farm plantations for wood generation both for heat and electricity should be given if the price of oil rises.

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Wind

- Competitive with traditional coal power plants when appropriate winds exist.
- Several attempts made in Lebanon for small scale applications.
- Suffrage from added expense from the need for storage.
- Lack of necessary studies for wind regime at selected sites.
- Large scale applications still await a feed-in law (on Grid to EDL).
- Monopoly of EDL hampers attempts for IPP's to enter market.
- Several studies were undertaken in various parts of the country.
- No national atlas at stake still (Diwan Almuhassabeh @ COM).

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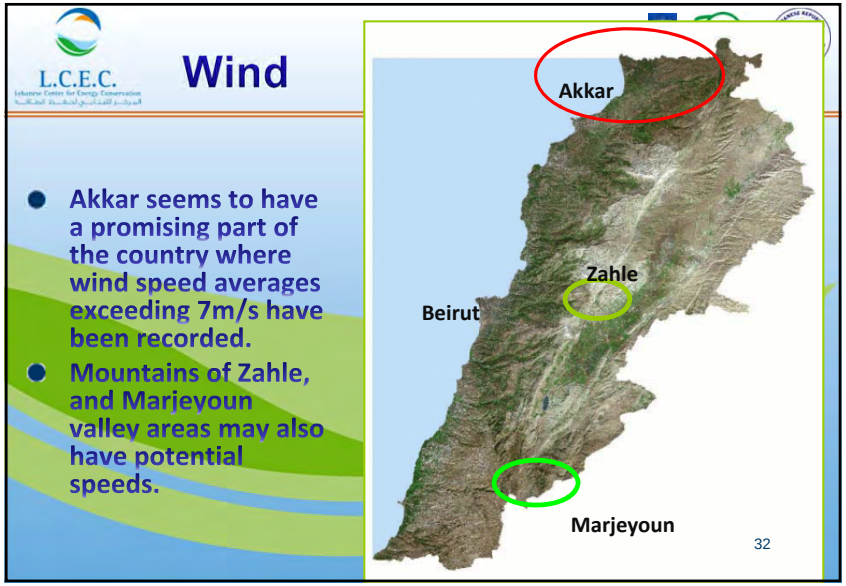
L.C.E.C.
Wind
Akkar seems to have a promising part of the country where wind speed averages exceeding 7m/s have been recorded.
Mountains of Zahle, and Marjeyoun valley areas may also have potential speeds.
Akkar
Zahle
Beirut
Marjeyoun
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Solar - Thermal

- The use of solar energy for space and water heating is the most obvious application of RE in Lebanon.
- The Technology is simple and readily utilizable.
- Several SWH system projects were promoted in Lebanon under the auspices of LCEC.
- Chinese grant (500 collectors).
- CEDRO project with plans to install PV and SWH.
- 0.5 Million dollars grant from the Swedish Government for SWH installations.
- The Greek government donated 350 SWH.
- Solar standards were officially adopted on a voluntary basis. Efforts are being made for adoption on a mandatory basis.
- A Solar testing facility was donated by the Greeks and will soon be operational at IRI.
- A detailed technical study conducted by LCEC and a team of experts has shown that it is to the advantage of EDL to distribute SWH for free as they proved to inflict nationwide energy savings.
- System is proven worthy on many levels.

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Policy Constraints

- Monopoly of EDL on the generation, transmission, and distribution sub-sectors.
- No tax breaks, subsidies, TVA exemptions, or import tax reductions exist for EE and RE material import and installations.
- There are no regulation enforcement on developers to include EE and RE or sustainable construction into their Buildings. Specifically SWH.
- There are currently no plans to reduce GHG emissions or to benefit from CDM and carbon trading for cleaner development.
- Lack of environmentally binding legislations regarding the disposal of animal and farm waste to motivate people to utilize imbedded energy in biomass.

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Effect of current state on the economy and society

- EE and RE state is causing a great damage to the national economy and individuals as well.
- Cost of the need to supply private electricity during power curtailment is increasing with increasing diesel costs.
- Consumers will be faced with the options of increasing electric energy costs or simply shutting down their operations.
- The fact that RE has been ignored for a long time is only adding to the problem.
- Total dependence on diesel and fuel oil to provide electricity and in many cases thermal energy is causing significant degradation in the environment air quality which is ultimately followed by degrading health and increased health costs.
- Lebanon's dependence on fuel oil seems odd.

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What Should we do?

- Replace incandescent light bulbs with CFL (Banning incandescent).
- Raise taxes on incandescent light bulbs and decrease them on CFL.
- Initiate CFL DSM measures by EDL or MEW by giving out cheap CFL in replacements with GLS. The market is far from being saturated.
- Installing SWH for all hot water consumers.
  26m2 compared to 615m2 in Cyprus shows that the market is also far from being saturated.
- Unfortunately, the fact that electricity prices have remained constant despite rising generation costs has motivated some people to move away from diesel heating to electricity.
- Minimize taxes on SWH material and components by exempting installed systems, installers and retailers from TVA.
- Initiate DSM measures in this regard by either EDL or MEW.
- Encourage local bank financing.

m^2 per 1000 person	Country
26	Lebanon
615	Cyprus
305	Greece

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What Should we do?

- Encourage wind farms through proper legislation allowing IPP's to feed into the grid.
- Finalize the wind atlas.
- Construction of more hydropower plants.
- Development of fire wood biomass projects through the introduction of tree farms on wide scale without harming the environment.
- Development of biogas projects through the use of animal farms and waste dumps.
- Introduce the green building concept and work on legislating it.
  (Insulation, double glazing, day lighting and orientation with respect to the sun may be found applicable in certain areas. Civil engineers and architects should be educated about non-traditional building methods).

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Conclusion

- If implemented, these measures will be having an immediate effect.
- Significant reduction in pollution levels will be observed.
- Results in an improved economic growth by reducing the dependence of polluting and expensive independent small power providers will be observed.
- CO2 emissions reduction.

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Thank You

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