Status and Potentials of Renewable Energy Technologies in Lebanon and the Region (Egypt, Jordan, Palestine, Syria)

Desk Study Compiled by:

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ABBREVIATIONS

▪ Agence de l'Environnment et de la Maitrise de l'Energie, France	ADEME
▪ Agence Française de Developpment	AFD
▪ American University of Beirut	AUB
▪ Association Libanaise de Maitrise de l'Energie et de l'Environnment	ALMEE
▪ Association Libanaise des Industriels du Solaire	ALIS
▪ Billion Cubic Meter	BCM
▪ British thermal unit per pound	Btu/lb
▪ Central administration for Statistics	CAS
▪ Economic and Social Commission for Western Asia	ESCWA
▪ Electricité du Liban	EDL
▪ Fonds Française pour l'Environnment Mondial	FFEM
▪ GigaWatt	GW
▪ GigaWatt hour	GWh
▪ Hectare	ha
▪ Industrial Research Institute	IRI
▪ Lebanese Solar Energy Society	LSES
▪ Megawatts hour	MWh
▪ Million Cubic Meters	MCM
▪ Ministry of Energy and Water	MEW
▪ Ministry of Environment – Lebanon	MOE
▪ Municipal Solid Waste	MSW
▪ Non Governmental Organization	NGO
▪ Photovoltaic	PV
▪ Renewable Energy Technology	RET
▪ Solar thermal collectors	STC
▪ Solar water heating	SWH
▪ United Nations Framework Convention on Climate Change	UNFCCC

I. INTRODUCTION

1. WHY RENEWABLE ENERGY?

1.1 The Energy versus Environment Crisis: Climate Change, Global Warming and Air Pollution

Energy production and consumption have serious negative impacts on the environment. The dependence on energy to maintain life and the increased urbanization have led to the increase in consumption of fossil fuels for the production of energy. Burning fossil fuels has resulted in the production of greenhouse gas emissions. These emissions include many pollutants and particulates that are the main cause of air pollution. Additionally, emissions of greenhouse gases lead to an acceleration of the process of global warming and thus to climate change. Global climate change poses risks to human health and ecosystems and has become the leading global environmental problem. Evidently, the global recognition of the gravity of climate change justifies the need to promote alternative energy sources.

1.2 Non-renewable Energy Sources: Fossil Fuels Use

Non-renewable energy sources are energy sources that are extracted from the earth as liquids, gases and solids and that cannot be replenished in a short period of time.

Fossil fuels are non-renewable sources of hydrocarbons; primarily coal, fuel oil and natural gas (Wikipedia, 2007) that are exploited to generate over 85% of global energy demand (Herzog et al., 2004). Fossil fuels are primarily used in the transportation, manufacturing, residential heating, and electric-power generation industries.

The global consumption of these conventional sources has made them prone to depletion. On the other hand, burning of fossil fuels leads to the emissions of noxious gases which are harmful to people and the environment. The shift to renewable sources of energy will ensure the production of energy in a sustainable manner. Energy security has become a serious concern with the growing energy and electricity demand. The simultaneous use of both renewable and conventional sources can extend the availability of fossil fuels for the future generations.

1.3 Economic Aspects in Conventional Energy Sources

The demand on conventional energy sources is increasing globally putting pressure on energy supply and thus leading to higher energy prices. While in some countries, nuclear energy is facing heavy opposition by the communities and some politicians, and while coal is being abandoned, oil and its byproducts seem to be the mostly demanded sources of energy. The price of oil has nearly tripled during the last few years with no visible decreases in sight, as any oil price changes in the period might significantly affect the income and GDP of oil producing countries and large companies. Such changes might seriously affect the economies and hence the stability of these countries. The need for oil and control of its flow are the reasons for the major foreign military interventions that are taking place in West Asia these days.

On the other hand, combustion of conventional energy sources is leading to climate change thus affecting important economic resources such as agriculture, forestry, fisheries and water resources.

1.4 Environmental Benefits of Renewable Energy within Sustainable Development Concept and Conservation of Natural Resources

The emergence of the concept of environmental benefit within sustainable development, "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Brundtland, 1987) incurred a transformation in the approach towards environmental management. While environmental problems were formerly approached as independent issues, sustainable development proposed resolving them while keeping in mind social and economic considerations and disparities between developed and developing countries. The concept has been integrated into climate change and energy priorities raised within the Earth Summit in Rio de Janeiro (1992) and World Summit on Sustainable Development (WSSD 2002), within the right to development, exchange of technologies and information exchange.

The United Nations Framework Convention on Climate Change (UNFCCC) launched during the Rio Earth Summit also states that "energy plays a crucial role in sustainable development - its availability influences all fields of social, economical and political activities; it affects the state of the environment and the climate". Setting and implementing guidelines that regulate emissions and promotes the use of renewable energy sources amongs others can significantly contribute to sustainable development and the enhancement of livelihoods specifically in the rural areas.
Sustainable energy sources are basically non-degradable energy sources that incur minimal if any damage to the ecosystems and environment. These energy sources include solar power, wind power, geothermal power, tidal power, wave power…

Cost of Environmental Externalities: Health Cost and Benefit

The adoption of renewable energies will reduce greenhouse gas (GHG) emissions from burning fossil fuels, thus reduce air pollution and slow the process of climate change. Although the direct link between some health problems and diseases and fuel emissions has not been conclusively established yet, studies indicate that regular exposure to nitrogen oxides, lead and carbon monoxides at certain levels might probably lead to chronic and adverse health effects such as cancer, respiratory problems and irritation. The emissions from burning fossil fuels contain considerable levels of toxins and particulate matter. Acute exposure to such emissions can result in different health implications. Nitrogen dioxide can increase the incidence of lower respiratory tract infection in children and decrease the responsiveness of airways in people who suffer from asthma. According to the World Health Organisation (WHO), the people mostly affected by exposure to nitrogen oxides are children, the elderly, asthmatics and individuals with chronic obstructive pulmonary disease. Particulate matters, especially the fine particles such as PM10, are usually inhaled and are deposited on the pulmonary region. They can irritate the respiratory tract, narrow airways, intensify asthma and bronchitis and increase rates of respiratory infections. Therefore, the use of renewable energies that do not require the combustion of polluting fossil fuels will reduce air pollution and the adverse health effects caused by it.

1.5 Socio-Economic Benefits of Renewable Energy

With climate change and energy as global priorities, the link between development priorities and energy has increased. Increased job opportunities and employment is one of the socio-economic benefits from using renewable energies. Long-term money saving of electricity bills, reduction of cost in generating electricity and reduction of expenditures for generating electricity are also other benefits. Use of renewable energy sources will contribute to a reduction in emissions of some noxious gases thus leading to a healthier environment. Additionally, studies have shown that using renewable energies and poverty reduction are affiliated especially that renewable energy technologies are generally situated in rural or marginal regions with lower levels of investment or employment. Renewable energy can thus help reduce poverty in rural areas and reduce pressures for urban migration (UN, 2005).

II. LEBANON

2. STATUS OF ENERGY SECTOR IN LEBANON

2.1 General Description and Indicators

Due to several factors, Lebanon's official agencies have been unable to produce comprehensive, basic and detailed data about the different sectors of the government. However, main exports, imports and production numbers have been produced regularly by the Ministry of Commerce. In addition, other statistics have been produced by the Central Administration for Statistics. These sources generally provide overall figures only. Extensive field studies have been left to researchers to tackle. A clear example of the basic lack of data is that the most recent census for the country is approximately 70 years old. However, several energy-related estimates have been generated by local and international organizations and the following is a quick overview of the status of energy use in Lebanon (Houri and Korfali, 2005).

Lebanon lacks all major traditional sources of energy. Accordingly, 99% of its primary energy needs are imported. In the electricity sector alone, the main electricity company, EDL (Electricité du Liban), imports around $500 million worth of fuel each year to generate the electricity needed. In addition, and despite large government investments in the power sector, demand still exceeds supply and blackouts are common in peak demand times. Losses on the grid are reported amounting to 56% (in 1997), 15% of which is the technical loss (Chedid et al, 2001) while the rest is attributed to theft. ALMEE (2001) has reported electric losses adding up to 44% mainly due to illegal connections and technical losses. Although this number has been steadily going down in the past couple of years a significant problem still exists. To partially fulfill this growing need, Lebanon resorts to importing electricity from Syria.

Electricity generation and distribution is a monopoly of EDL with some concessions made to smaller companies. In 2001, EDL used 573,071 tons of diesel and 1,355,081 tons of fuel oil (Jizzini, 2002). This is used to produce electricity at an average cost of $0.078/kWh. This value rises and falls depending on fossil fuel derivatives market. With the presence of various problems, political and otherwise, this has resulted in a total debt of $2.4 billion. Government loans of $200-500 million are annually passed in an effort to prevent EDL from going bankrupt. The increased costs and spiraling debt, in addition to insufficient supplies have resulted in frequent outages throughout the year, mainly in the summer, resulting in significant damage to the economy and the tourism industry. Despite its troubles, EDL follows a social pricing that provides electricity at low cost for small consumers. This pricing is shown in Table 1.

Table 1: Tariff used by EDL for residential consumers

Consumption fraction (kWh)	0-100	101-300	301-400	401-500	>500
Cost (cents)	2.33	3.67	5.33	8	13.3

According to a UN (2001a) report, Lebanon's installed electricity capacity in 1999 was as shown in Table 2. However, the full potential is yet to be used due to incomplete grid networking. In addition, hydropower is rarely completely utilized due to dry years or the need to divert water for irrigation.

Table 2: Installed electricity capacity

Type	Steam	Gas	Combined cycle	Hydro	Total
Power (MW)	1063	306	580	276	2225

UN (2001b), World Fact book, and EDL in addition to other agencies report various production and consumption data for various years, which are not always in agreement with each other. The numbers produced by EDL for 2002 (CAS, 2003) indicate that Lebanon has consumed 10.192 TWh of which 9.514 TWh came from thermal sources while 0.678 TWh came from hydropower accounting for 6.7% of the total. Lebanon produced 9.072 TWh and the extra needed electricity was imported from Syria.

The annual growth in electric consumption was 8.5% in 1999, which is second only to Saudi Arabia in the ESCWA region. The annual growth in electricity generation was 19% in 1999 (UN, 2001b). Expected future growth in electric consumption is shown in Table 3 and capacity needed is estimated by Chedid et al (2001). The capacity needed value for the year 2015 is extrapolated from the projected demand reported. This table clearly shows that Lebanon will be at a deficit in energy generation for the foreseeable future.

Table 3: Expected installation and needed capacity forecast

Year	2010	2015
Expected installed Capacity (MW)	3,545	4,148
Expected consumption (TWh)	12.512	14.087
Capacity needed (MW)	3870	(4334)

Several values were obtained for total per capita energy consumption varying from 2.0 MWh/capita in 1998 (Chedid et al., 2001) to 2.6 MWh/capita in 2000 (ESCWA, 2001) to 2.35 MWh/capita in 2000 (Nationmaster, 2003).

2.2 Oil Supply

Lebanon is not an oil producing country, but is located in proximity to oil producing countries.

Until 1988, the Lebanese government retained a monopoly over the petroleum market, but at present some eight private companies are licensed to import, store and distribute refined products. Specifications of products are prepared and issued by the Ministry of Energy and Water (MEW)/ General Directorate of petroleum (Abi Said, 2005).

This fact offered an advantage by making Lebanon a refinery center for part of the crude oil exported from Saudi Arabia and Iraq by pipelines to two coastal refinery stations (Zahrani in the South, and Tripoli in the North). Unfortunately, these refineries stopped working since 1975 due to the civil war in the country and the following foreign occupation and other types of political intervention. Lebanon has since then been forced to import its petroleum products from the international market.

The energy balance for Lebanon shows that gasoline, diesel and electricity represent over 90% of the total energy consumption, which highlights the importance of the thermal electricity production and transport sector. The capacity of storing oil products in Lebanon is currently more than 400 Ktons distributed on 210 storage tanks all over the coast. The government is planning to expand its owned storage tanks facilities at Dora, through reclamation of 800,000 m^2 of land.

Table 4 shows the amounts of fuels imported to Lebanon to fulfill its various energy needs. The lack of local oil resources generates a heavy reliance on oil imports and results in a heavy drain (more than $1 Billion in 2001; Hammoud, 2002) of foreign currency from an already indebted economy. According to a report compiled by Ecodit (2002), $805 million were spent on imported energy in 1999.

Table 4: Oil imports to Lebanon

Oil imports (2002)	Thousand Tons
Oil	1230.1
Diesel	1688.3
Kerosene	132.8
Fuel-oil	1590.5
Butane gas	110.9

2.3 Fuel Oil

Fuel oil has the second highest importance rate in Lebanon with 33% as compared to diesel which has the highest amounts of importation of 35%.

Fuel oil is used by the two major power plants in Jiyyeh and Zouk Mikael in addition to some small generators that serve their factories and industrial facility.

The fuel oil "RFO 6" is among the most polluting petroleum by-products. It is enriched by certain chemicals to enhance its combustion and heat production properties. This increases the pollution resulting from its emissions especially in the absence of filters and other treatment means.

2.4 Diesel Oil

Diesel is used in transport, industry, heating, and mainly in thousands of back-up private generators complementary to the electricity produced by EDL which continuously experiences failures and shortages.

The quality of the diesel imported to Lebanon is very low. Additionally, there is no enforcement of a regular maintenance for the vehicles using diesel. This increases the emissions and pollution caused by those vehicles.

For heating purposes, diesel is burned in primitive units that do not have any sort of emissions treatment. The case is similar for the generators providing the industry and the households with electricity.

EDL has installed in the early 1990's two thermal power plants in Zahrani and Beddawi that are primarily designed for burning natural gas. Due to the unavailability of natural gas, the two power plants are being operated using diesel. This is increasing the maintenance requirements of the two power plants, reducing their efficiency and increasing their emissions and hence their environmental cost.

2.5 Natural Gas

The Lebanese market imports at present liquefied petroleum gas (LPG) mainly for domestic and commercial use, through a single licensed private importer (Abi Said, 2005). Lebanon is in the process of converting its power generating plants from oil to natural gas. To help meet this demand, a natural gas pipeline that links the Baniyas plant in Syria to the Deir Ammar-Beddawi power plant in northern Lebanon was completed in March 2005. This pipeline will allow Syrian natural gas from the Syrian Petroleum Company to flow into Lebanon for the first time providing 53 million cubic feet per day. Syrian officials indicated that this amount could eventually double to 105 million cubic feet per day. Furthermore, a multilateral agreement governing another pipeline "The Arab Pipeline" from Egyptian natural gas sources to Jordan, Syria, Lebanon, Turkey and extending to Europe is taking shape, on the institutional, administrative, financial, executive and operational levels (Abi Said, 2005).

2.6 Renewable Energy

Renewable energy plays a minor role in the energy mix in Lebanon. Its use has been limited to hydropower whose share has been dropping with increased electricity production and consumption to reach 5-12% in recent years (CAS, 2003), depending on rainfall and thermal plants productivity. Other forms of renewable energy are not being used on a grid scale and few applications exist in individual houses (Houri, 2005).

Hydropower

Figure 1 shows the progress of energy consumption over the past three decades indicating the share of hydropower, which has dropped from a maximum of 79% in 1969 (not shown in graph) to 42% in 1974 to 3.5% in 2001. The strong fall in energy consumption in the years 1976, 1989 and 1990 was due to the civil war that extended from 1975 to 1990. The graph clearly shows a decreasing absolute and percentage contribution from renewable energy sources over the years. Exceptional weather and heavy rains in 2002 have raised the hydropower contribution to 6.7%.

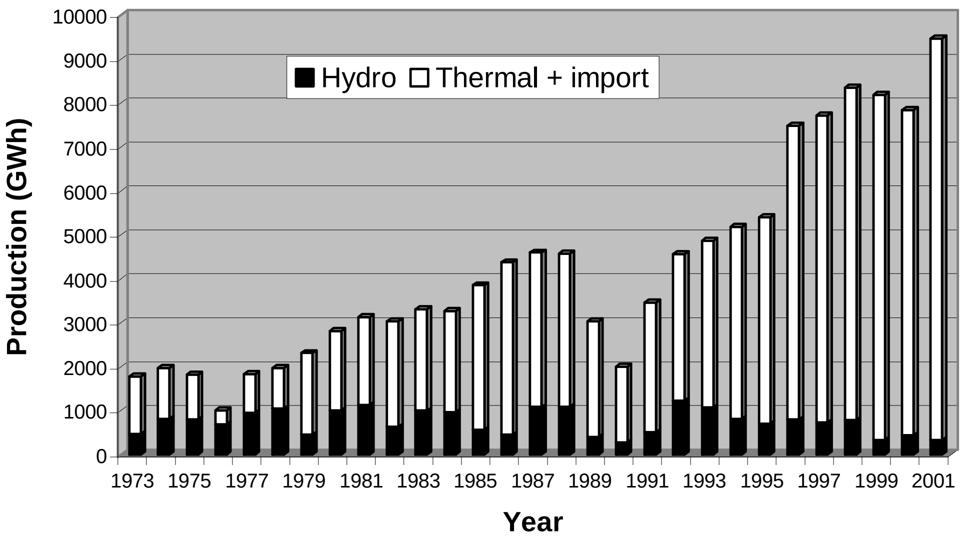

Figure 1: Electricity consumption in Lebanon (Jibran, 2002)

In order to further understand the annual energy consumption patterns, figure 2 illustrates the monthly variations in energy consumption averaged over five years. This graph indicates that peak consumption occurs in the middle of summer and winter; however, it does not account for the frequent outages/blackouts occurring during these peak times. If the actual demand is taken into account, the bars corresponding to the peak times would be even higher.

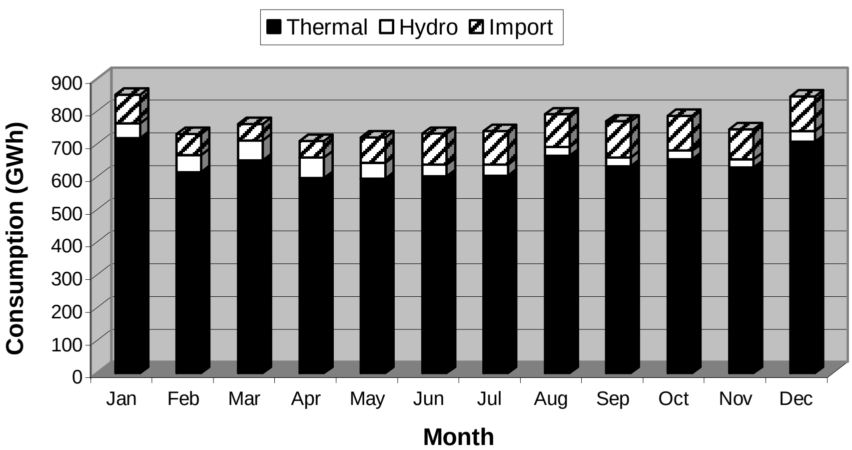

Figure 2: Average monthly consumption (1998-2003)

Solar Thermal

Due to its abundant solar resources and the maturity of the solar thermal industry, Lebanon stands to benefit greatly from the utilization of solar water heating (SWH). While solar energy has rarely been used to generate electricity, energy savings from the use of solar thermal collectors are wide spread. Plans for the implementation of solar thermal collectors (STC) have been thoroughly studied (Kablan, 2003; Chedid, 2002; Sakkal et al., 1993). However, local acceptance has neither been due to published research nor due to government support. It has been simply a case of observed saving and simplicity of use. Figure 3 shows the increasing use of SWH systems. It shows a healthy upward trend (Houri and Korfali, 2003). No figures are currently available to quantify the thermal energy collectively produced through these systems.

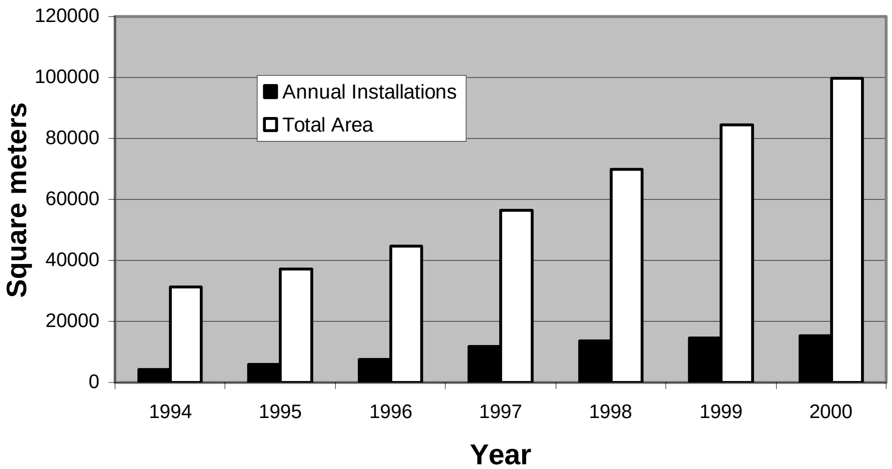

Figure 3: Annual Installations of SWH systems in Lebanon

3. EXISTING RENEWABLE ENERGY OPTIONS AND THEIR SUSTAINABLILITY IN LEBANON

Several renewable energy options exist for Lebanon and in considering the best renewable energy alternative, it is important to consider all potential renewable energy sources, their costs, market availability, suitability for the selected location, significance of the energy produced and return on investment. It is to be kept in mind that no one single option will constitute the overall solution for the current energy crisis but rather a combination of these options.

3.1 Tides and Waves

Lebanon has 225 km of waterfront, which is relatively long compared to its area. However, the Mediterranean Sea is an almost closed sea with minimal variation in tides and relatively small waves for most of the year. These factors, in addition to immaturity of technology, make tides and waves unsuitable for consideration.

3.2 Geothermal Energy

Three tentative sites have been identified that may carry some economic value. The first is in the town of Sammaqiye near the Syrian border. This area belongs to the general District of Akkar, which used to be an active volcanic area a long time ago. This ancient activity is illustrated in the volcanic rock commonly found in the area. In the early 1970's, a well was dug down to around 550 m and 70ºC hot water, rich in sulfur, erupted to a height of 30 m above ground. Another case of hot underground water was observed in the town of Qubayat (also in Akkar). Both of these sites have not been developed yet. While both sites do not provide water hot enough to generate electricity, they could serve to offset some of the water and space heating needs. The Third site is off the shore of Tyre in Southern Lebanon where thermal vents have been discovered covering an area of 800 m at a depth of 60 m below sea level. These sites are documented both on film and remote sensing maps and images.

3.3 Solar Energy

3.3.1 Solar PV

With the majority of towns and villages connected to the electric grid, solar photovoltaic (PV) in its current status is not economical and cannot compete with electricity supplied with the traditional oil-based methods. An exception exists for isolated remote applications such as transmission and relay towers. Some attempts by solar power enthusiasts and some municipalities have been installed but are not considered to be cost efficient especially when compared to the subsidized electricity prices. The above applies to the well established solar PV market. Needless to say, none of the options under development today such as solar towers and solar concentrators are installed or even being considered at any level as a means to produce electricity. Without a well known and established technology, these systems will not be considered for Lebanon.

3.3.2 Solar Thermal Collectors

3.3.2.1 Solar Insolation in Lebanon

Lebanon is located at 33°N and 35°E with altitudes varying from sea level to 3000 meters, average daily solar insolation varies between 2 and 6 kWh/m^2 depending on the source and location (Ghaddar, 1999; ESCWA, 2001; Chehab, 2005). Figure 4 illustrates measured average daily insolation for each month based on data obtained from the American University of Beirut (AUB) weather station in 1998 in Beirut (Ghaddar, 1999). This graph shows the wide variations, more than double the insolation, obtained between summer and winter months.

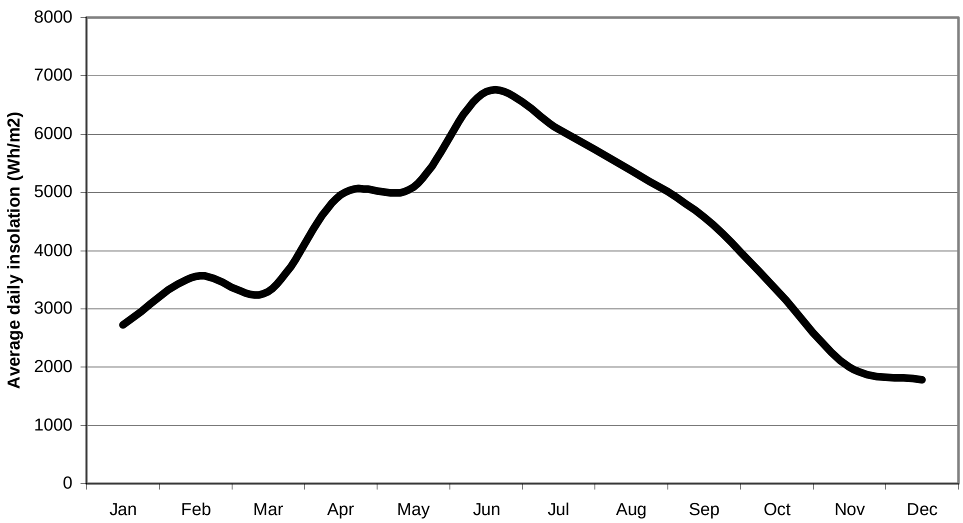

Figure 4: Average daily solar insolation throughout the year

3.3.2.2 *Residential houses and heating needs*

Based on a study by the engineering department in Saint Joseph University, 70% of residential houses use electricity to heat their water. 25% use diesel and only 5% use gas, wood, solar and other sources of energy. A similar study conducted at AUB showed that 60% of household use electric heaters, 31% use diesel and 9% use natural gas, wood and solar energy, the latter making no more than 1% (Chedid, 2002). A much larger urban sample covering more than 500 households indicated that 2.8% of households use solar thermal collectors for water heating either alone or with a backup system while 82% were found to use electricity (Houri and Korfali, 2003). The calculated consumption for an average 3 kW residential electric water heater is 6480 kWh/yr according to EDL and 2555 kWh/yr according to ALMEE in an average year. These widely different numbers are due to the lack of representative studies conducted in residences that would check the electric consumption of a given water heater under field conditions.

The residential and commercial sectors consume 80% of the electricity in Lebanon. For these two sectors, electric space heating consumes 31% of their total energy while domestic water heating (for commercial and residential application) consumes 22% of the total (ALMEE, 2001). The average consumption of 60°C hot water is estimated to be 30 l/person or 150 l/household. According to Chehab (2005), the main consumer of hot water is the residential sector with 108,000 m^3/day, followed by hotels consuming 1140 m^3/day, health establishments consuming 478 m^3/day, and educational institutions with 220 m^3/day.

3.3.2.3 *Types of installation*

Individual SWH installations for domestic use had dominated the market up till 1996. Since then a strong growth in collective systems has been observed with the annual installed collective systems increasing from 132 in 1997 to 164 in 2000, i.e. 24% increase in annual installations. During the same period, the number of individual systems increased from 1268 to 1490, i.e. 17.6% increase. Only 3 systems of more than 50 m^2 were installed in 2000. The progress of advanced SWH, using forced circulation, is illustrated in figure 5. This progress shows a clear increase in these systems providing higher efficiency. This also indicates that investors and larger establishments are manifesting increased interest. Solar market growth is being aided by decreasing costs per unit as illustrated in figure 6. Numbers up to 2000 are sourced from ALMEE (2001). Numbers from 2001 to 2004 are predictions based on an 8% annual reduction in installed cost.

The available systems on the market today are open and closed cycle. The closed cycle systems are more expensive especially that they are mostly imported. However, they are expected to have a longer lifetime since well water is commonly used in Lebanon. This water tends to be rich in calcium carbonate and other salts that may form solid crystals inside the system. A typical installed system (4 m^2, 200L) could cost anywhere from $700-$1500 depending on type and manufacturer. Vacuum systems are new in the market and are significantly more expensive and are being marketed for industrial applications; however, the recent drastic price drop has encouraged some residential applications. Lebanon's residents generally reside in multi-floor apartments and space is at a premium in the cities, even roof space. This means that space may be a limiting factor in SWH system installations. With minor behavioral modifications and sharing of hot water resources among the building residents, vacuum collectors could prove more successful in harnessing the solar radiations to provide hot water for city residents since they provide more hot water per unit area.

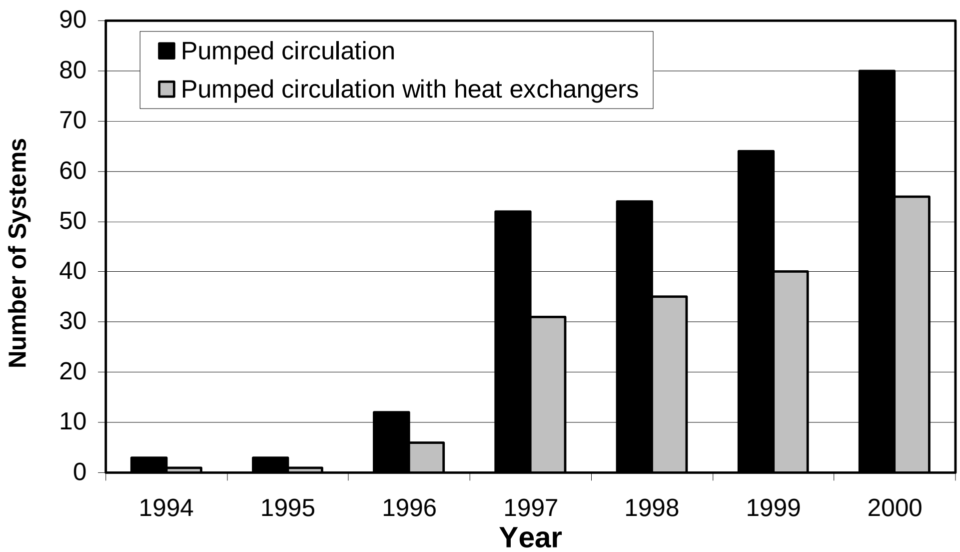

Figure 5: Progress of advanced SWH systems installations.

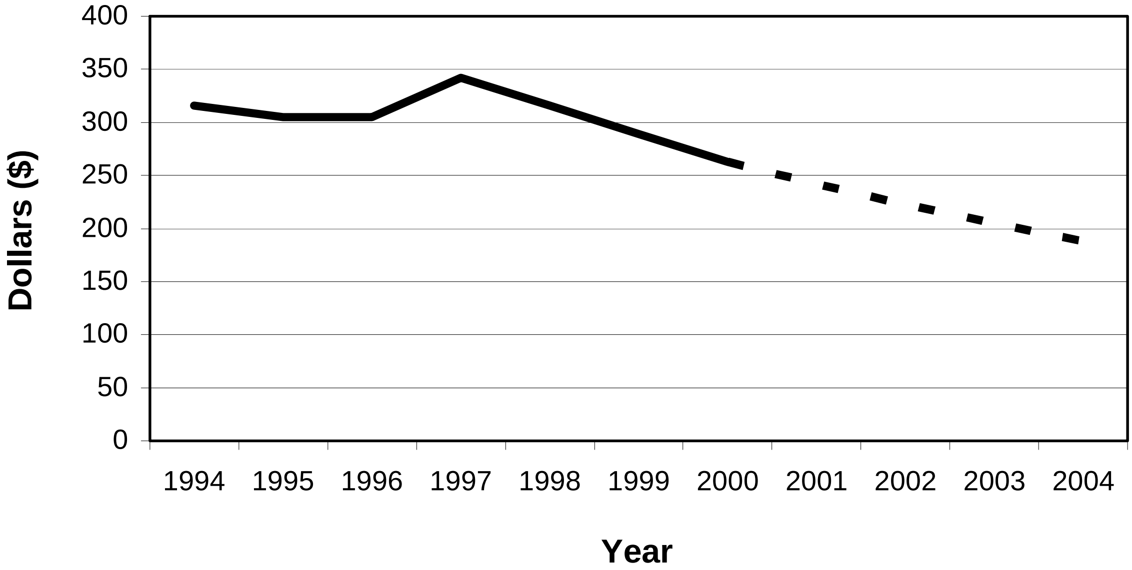

Figure 6: Price per installed square meter.

3.3.2.4 Local manufacturers and importers

Due to the simple technology involved in making solar water heaters (SWH), several local manufacturers have been able to compete with imported systems. Initially most of these systems used the thermosyphon concept with an open loop system but lately, some have been able to go into the closed loop and forced circulation systems. Some of the local solar-collectors manufacturers have organized themselves under the umbrella of Lebanese Association for Solar Industrialists (ALIS) in an effort to improve their collective influence on decision makers in Lebanon. Table 5 shows a list of local producers and importers with an estimate of their annual production/import for the year 2004. These numbers are educated estimates and are not in line with those reported by ALMEE (2003) for the year 2001 especially that the market is not declining. The lack of a clear reporting mechanism on the production, import and installation of SWH systems plays a major factor in the diversity of numbers obtained.

Table 5: Estimates on the sales of local companies

	Company	Local Production (m^2)	Foreign imports (m^2)
1	Solarnet	400	
2	Kypros/Siemens	2000	200
3	Ghaddar Trading	400	
4	LSECO	400	
5	Sky Energies (Novasol, Greece; Giordano, France)		400
6	Falcon	400	
7	Solahart (Australia)		200
8	Solarite	200	
9	Al-Bina (Maltesos, Greece)		100
10	Solapower (Ezink, Turkey)		200
11	Other Local Manufacturers	400	
12	Other importers (mainly China)		200
	Total	4200	1300
	Grand Total	**5500**	

(Source: Sfeir, 2004)

3.3.2.5 Market penetration

SWH installations are making headway on account of their own economical return. Figure 7 shows the increasing use of SWH systems both on annual installation basis and total collector area. It shows a healthy upward trend. Total installed in 2000 is estimated to be around 15,000, and the total area of around 100,000 m^2 installed avoid the emission of 35,000 tons of CO_2 per year. Of the collectors installed in 2000, less than 20% are imported

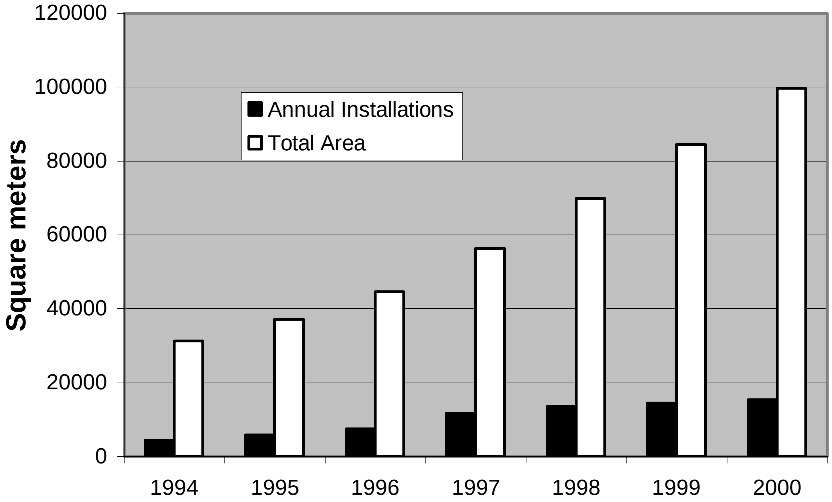

Figure 7: Annual Installations of SWH systems in Lebanon. Source: ALMEE 2003

However, when the percentage annual increase is analyzed (figure 8), it is seen that the economic hardships people are going through due to a faltering economy, result in the annual percentage increase going down. This is despite the fact that the market is nowhere near saturation yet. Profiling SWH systems users showed that the wealthier portion of the society is the one utilizing these energy saving systems (Houri and Korfali, 2003). This was gauged by identifying certain variables like house age, annual electricity consumption, average apartment area and price. All these variables indicated that SWH users live in more expensive modern and bigger houses, and use more electricity than the average consumer. SWH systems are yet to be common among the more impoverished classes who need it most. Nevertheless, the results obtained indicating 2.8% of households consuming SWH are an improvement over previously published results indicating that a maximum of 1% of households are using SWH (Chedid, 2002).

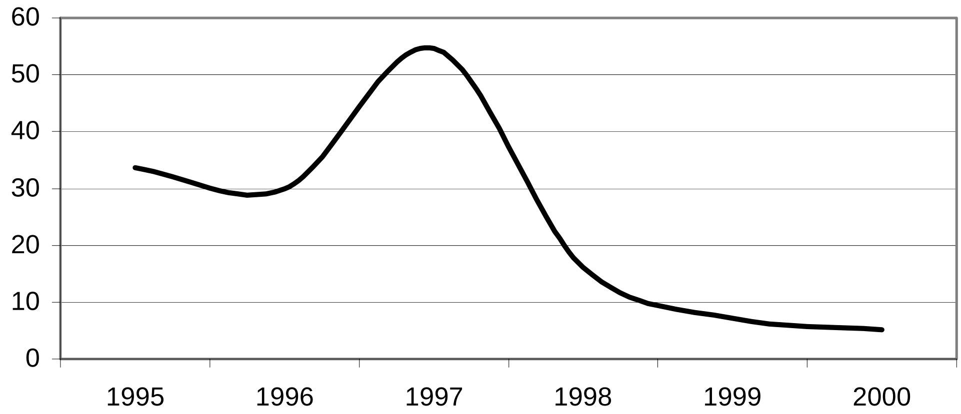

Figure 8: Year on year percentage increase in SWH systems installed

Figure 9 illustrates the sectors installing SWH systems. It clearly shows that based on area, individual houses and houses in buildings are the major contributors in this field. Unfortunately, swimming pool owners are paying minimal attention for this technology and the industry seems oblivious to its existence. Significant work, education, and awareness need to be done to illustrate the importance of SWH as and energy saving alternative.

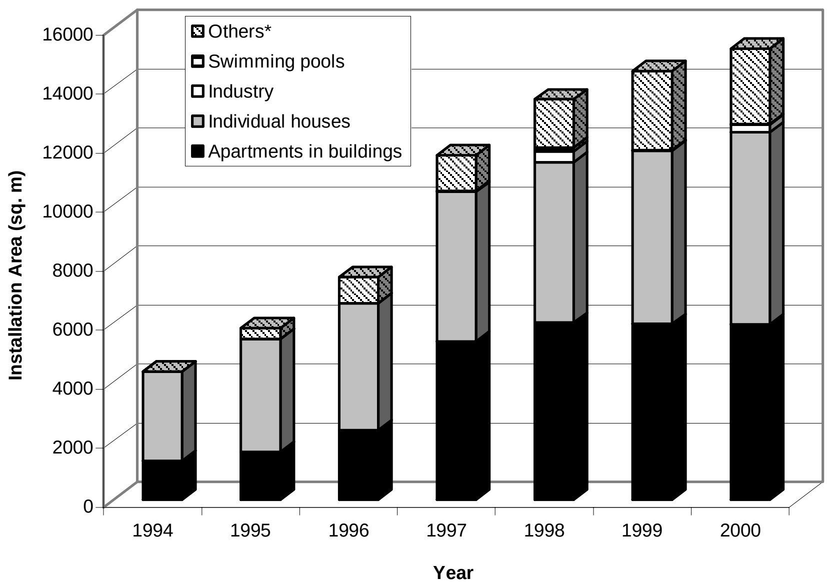

Figure 9: Annual installations by sector in square meters. Source: ALMEE 2003.

*Others: include hospitals, hotels, universities, public buildings etc.

3.3.2.6 Demonstration Projects

Through the collaboration of several agencies (ALMEE, ADEME, MOE, AFD, FFEM), five demonstration projects have been conducted in Lebanon in order to present the importance of energy efficiency and the role of solar water heating in reducing energy bills. These projects and their highlights are summarized in Table 6. These projects have resulted in an overall savings of around 1500 KWh/yr for an average 150 m^2 residence.

Table 6: Energy Efficiency and Solar thermal utilization demonstration projects.

Site	Location	Use	Area (m^2)	Comments
1	Zouk Mosbeh	53 residences	3,900	First collective system (2000 L, 16.8 m^2 collector area)
2	Maghdoucheh	30 residences	4,350	Collective system with diesel backup and individual hot water meters
3	Ouzai	Orphanage	5,000	Collective system with diesel backup
4	Khirbet Rouha	Orphanage	5,000	Collective system with diesel backup
5	Ain Alak	6 residences	1,436	Collective system with diesel backup

3.3.2.7 Future prospects

Solar thermal collectors are wide spread and their market is growing with increasing fuel prices (Houri, 2006). The market is still expected to grow and according to the Lebanese Solar Energy Society (LSES) figure 10 is suggested to show the future market of SWH systems. Any effort by the government or local NGO's to promote these systems will greatly and rapidly enhance their use.

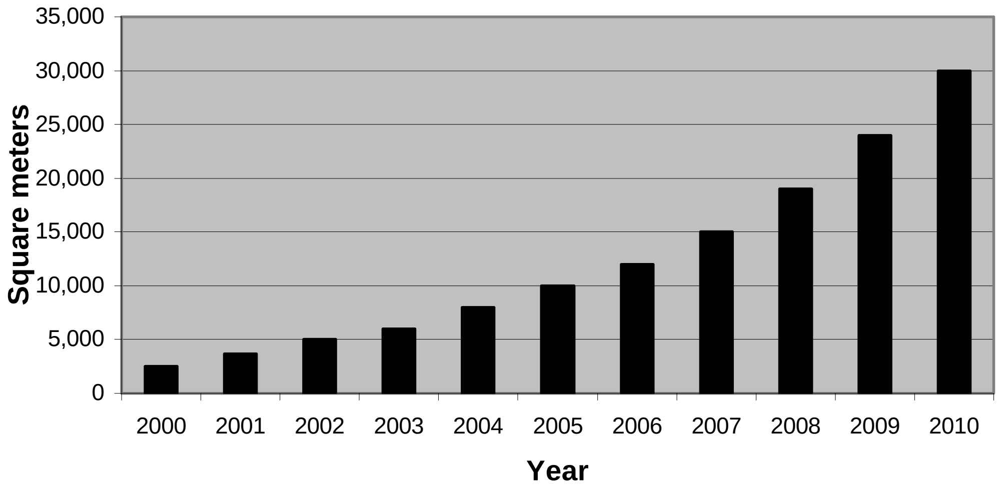

Figure 10: Predictions for SWH systems installations

The extent of the success of SWH systems is a direct function of government regulation. Table 7 compares the situation in Lebanon to similar neighboring countries where SWH systems have been very successful. This is because of regulation forcing housing developers to install these systems on all new houses and providing incentives for residents of older houses to install SWH systems.

Table 7: SWH systems installed in representative countries

	Lebanon (2000)	**Greece (1994)**	**Cyprus (1994)**
Total ($x10^6$ m^2)	0.1	2	560
Per person (m^2)	0.025	0.20	0.85

3.4 Wind Energy

There is significant evidence to support the presence of strong sustained winds in various areas in Lebanon, specifically the north. This evidence is mainly based on the tree deformation index, which suggests speeds of 7-8 m/sec to be present in selected sites. With the absence of a wind map for Lebanon, attempts at measuring the wind have been done on small scale and by individuals or small organizations (Houri, 2001). Few individual attempts have been made at installing small wind turbines (100's of watts) in the south, Mount Lebanon and

Beqaa. Some of these systems were self made while others were installed by wind enthusiasts for private use and without prior detailed studies of winds in the area. The largest wind turbine installed is a 300 kW wind turbine installed in the area of Ammiq which also suffers from the lack of prior wind studies which has resulted in its sitting idle most of the time. Another 7.5 kW wind turbine was installed in the area of Khiam, South Lebanon, but was felled by the most recent bombing in the south. With wind energy growing more competitive every day, wind turbine installation preceded by a good wind-monitoring plan seems to be the future. However with the strongly regulated electricity generation and distribution system existing in Lebanon, and due to the monopoly of one company on electricity (EDL), it is up to the government to promote and install wind farms and connect them to the grid. A regulatory change could open up the market for entrepreneurs fairly rapidly; especially that electricity generation in Lebanon is relatively expensive. The ministry of energy has recently signed a contract to produce the first detailed map of wind energy in Lebanon which is expected to be completed by the summer of 2007.

3.5 Hydropower

3.5.1 Water balance

Lebanon is famous for its waters in an otherwise water deficient region. However, the Lebanese topography and the short rainy season result in the loss of a large percentage of the water without proper utilization. To further understand the rain distribution over the seasons, figure 11 illustrates average monthly rainfall at selected sites. This graph clearly shows that most of the rainfalls between the months of November and April in most areas of Lebanon. The precipitation is mainly in the form of rain although between December and February, most of the precipitation on mountains is in the form of snow. This property serves to provide additional water flow for rivers in spring as the rising temperatures start melting the snow. This pattern is illustrated in figure 12 showing the flow of various coastal rivers where peak flow has a one-month delay over peak rainy period (Houri, 2006).

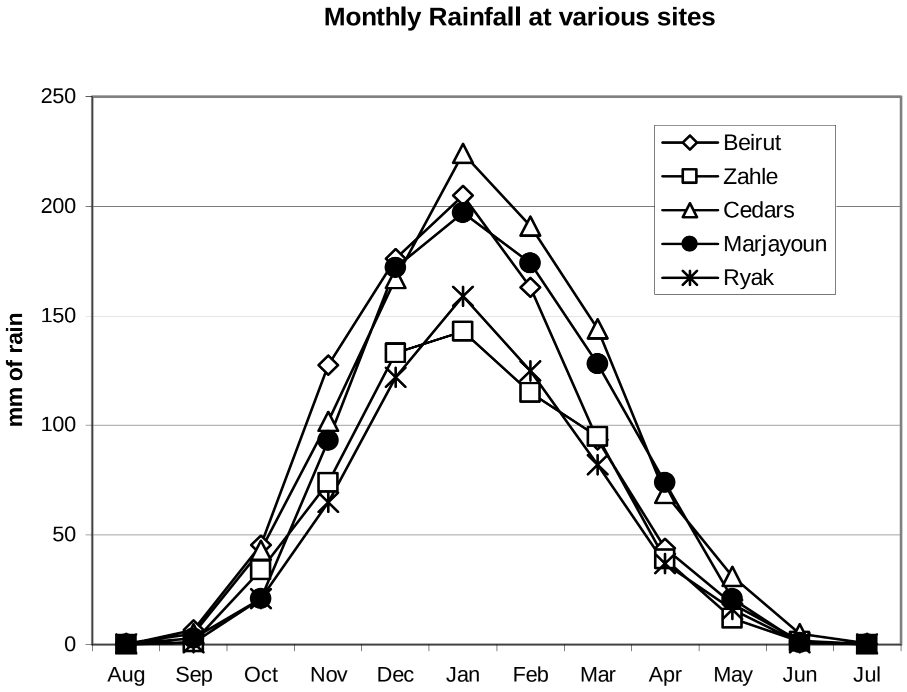

Figure 11: Monthly rainfall at various sites

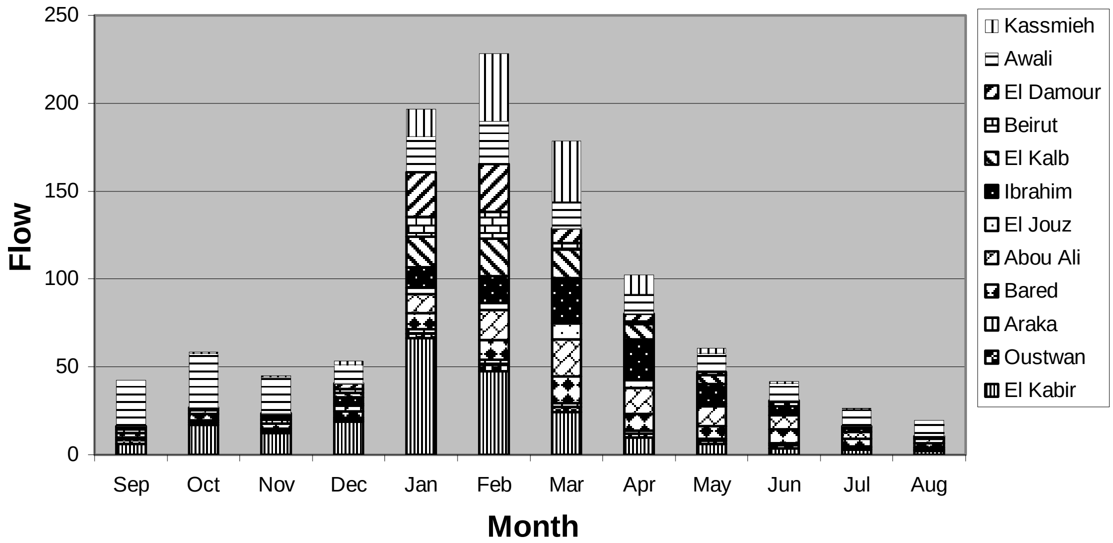

Figure 12: Average monthly flow of coastal rivers

Meteorological data from selected stations indicate that the average rainfall in the 1996-2000 period is 9 to 14% lower than the global average (Ecodit, 2002). This has resulted in a significant decrease in hydropower generation. Compounding this problem is the fact that more water is needed to irrigate drier agricultural lands. With global warming on the rise, this pattern is expected to continue. Lebanon receives 8600 million cubic meters (MCM) of precipitation; however, 50% is lost to evaporation, 8% to neighboring countries and 12% into the underground water, leaving around 2600 MCM available. This value falls down to 1300 MCM of controllable surface water and 400 MCM of controllable underground water (Fawaz, 1992). Figure 13 shows the average annual river flow of various rivers. The Litani river flowing in the Bekaa area is clearly the most important one.

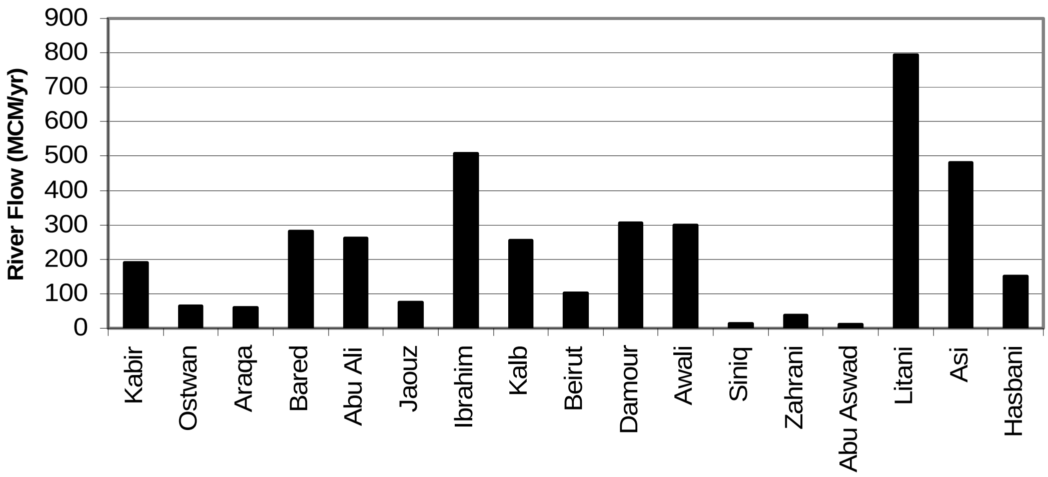

Figure 13: Average annual rivers flow

3.5.2 Available and projected hydropower plants

The significance of utilizing water to generate electricity has been locally recognized for a long time. Accordingly, several hydropower plants have been installed while others were studied and planned. Table 8 details the constructed hydropower plants to date and their productivity over various periods of time. Hydropower generation varied from 273 GWh to 1204 GWh with an average of 722 GWh over the past 20 years (Kamar, 2004). The data shown indicates that hydropower productivity has dropped around 33% below the pre 1975 levels. This can be readily attributed to increased water consumption for expanding domestic, industrial and agricultural applications, in addition to decreasing rains. One can also notice that relatively strong rivers like Litani, Qadisha and Ibrahim have more than one hydropower plant on their path. One can also clearly see that these plants are generally old varying between 36 and 71 years old. General efficiencies for similar, properly maintained, systems are reported to be around 75% (Turbogen, 2004).

Table 8: Installed Hydropower plants and their productivity

River	Hydro power plants				Annual GWh Up to 1975	Annual GWh 1995-1999	Production 2002
	Plant	Installation date	Capacity MW	Storage	Production average	Production average	GWh
Safa	Safa*	1932	13.2	Daily	41	19.1	26
Litani	Awali (Arcache)	1965	3x36.5=109.5	Daily	347	457	424
	Joun (Helou)	1968	2x24=48	Daily	194		
	Markaba (Abdel Al)	1961	2x17=34	Annual	125		
Kadisha	Blaouza	1961	3x2.8 = 8.4	Daily	31	55	74
	Abu Ali	1933	2+2x2.7 = 7.4	Daily	22		
	Mar Lichaa	1952	3x1.04 = 3.1	None	10		
	Bcharre	1929	2x0.8 = 1.6	None	6		
Ibrahim	Ibrahim 1	1962	2x7.5 = 15	Daily	59	83	94
	Ibrahim 2	1956	2.5+2x5 = 12.5	Daily	50		
	Ibrahim 3	1950	1.66x3 = 5.0	None	22		

Bared	Bared 1	1954	3x4.5 = 13.5	Weekly (1,1 MCM)	48	50	60
	Bared 2*	1962	2.5+1.2 = 3.7	None	14		
Jaouz	Chekka Cement	1950	2x2.1+1.1=5.3	None	17	N/A	N/A
Kalb	Hraiche*	1953	2x0.8+0.3=1.9	None	N/A	N/A	N/A
Bardouni	Wadi el Arayech*	1923	2x0.4+0.3=1.1	None	N/A	N/A	N/A
	Total		283.2		991	663	678
	Total Thermal Capacity		2044+				

* Labeled power plants are either partially or fully out of service. Total nominal capacity for currently functioning hydropower plants is around 274 MW while their actual capacity is 212 MW, EDL (1994) + EDL (1996).

Figure 14 shows the variation of monthly contribution of hydropower to the total power in 2003. This season represents a best-case scenario, as rainfall was highest in 50 years. Peak production is in line with river flow shown in figure 12. Most of the power generated between July and November comes from the Litani dam project with its large 220 MCM reservoir that allows for significant water storage throughout the summer.

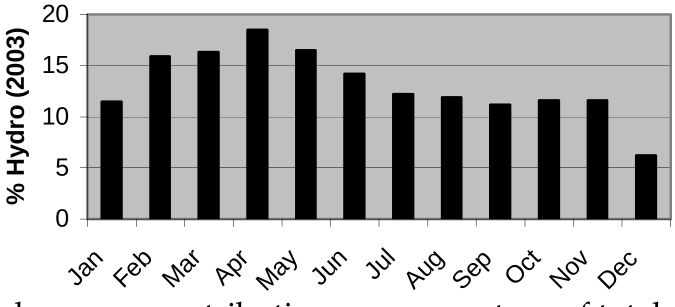

Figure 14: Hydropower contribution as a percentage of total generated electricity (2003)

3.5.3 Future water use for hydropower and agriculture

Future plans for the utilization of water are dependant on several factors including energy needs, domestic water needs and the needs for irrigation. According to the Ministry of Energy and Water (1999), the water deficit is about 1 BCM /year for a mean precipitation year. Irrigated area will increase from 80,000 hectares today to 280,000 hectares in 2009. For that purpose 37 dams and lakes are planned for the coming years with a total capacity of 622 MCM of water storage.

Irrigation and domestic needs may be partially met by a planned "800 m channel" irrigation project designed to serve West Bekaa and South Lebanon, and is expected to irrigate 15,000 ha using up to 120 MCM: 100 MCM for agriculture and 20 MCM for domestic uses benefiting 168,000 people and up to 335,000 in the summer. All of the irrigation projects together will add 322,255 ha of irrigated areas and will result in the loss of more than 400 GWh in hydropower generation in an average year (Hajjar, 1997).

A detailed water policy for Lebanon has been studied and presented by El-Fadel et al (2001), while Jurdi et al (2001) studied the management of the Litani river basin. These studies have emphasized that Lebanon will be suffering from a water deficit by 2010 and that significant (and wise) utilization of surface water for agricultural and domestic water use is warranted. By 2010, water demand for irrigation, domestic and industrial sectors will be 1897 MCM, reaching 2589 MCM by 2020 (El-Fadel et al, 2000).

All of the above factors and uses have to be taken into consideration when plans for new hydropower are studied (Houri, 2005). Hydropower is definitely an economical alternative but not without some environmental concern.

With the exception of the unusually rainy season in 2002-2003 in which the share of hydropower rose to 12.9% of generated power, the share of hydropower is decreasing as Lebanon is getting less rain each year and more of the water is diverted for irrigation. New dams on major rivers may raise the hydropower share (As-Safir, 2003), but of 21 planned dams with an estimated cost of $547 million, only few are designed for electricity generation (205 MW total, Table 9) while others are designed for water flow control and providing fresh drinking water. Currently, around 860 MCM of water are used in hydropower plants with a maximum of 1700 MCM in wet years and a minimum of 350 MCM in dry years. The planned hydropower plants, in the view of many workers in the field, fail to utilize the full potential of hydropower in Lebanon. For example, Ibrahim River alone is said to have the potential for generating 193 MW for six months of the year while currently, it has an installed capacity of only 32.5 MW (Karam, 2004).

Table 9: Future Hydropower plants (Kamar, 2004)

River	Plant	Capacity (MW)	Comments
Litani	Bisri	6	
	Khardali	20	2 + 5 + 13 MW
Safa	Zibli Richmaya Damour	4.5	
Ibrahim	Hneidi	20	
	Jannah	40	30 Mm^3 dam
Assi	Yammouneh*	10	
	Hermel*	50	27+37 Mm^3 dams
Bared	Boumoussa	12	
	Hamra	16	
	Ksaim	5	
	Kottine	17.5	
Abou Ali	Bchenine	4	
Total		**205**	

* Construction is about to start

3.6 Biomass

Limited space in Lebanon (10,400 km^2) and high population density 413 person/km^2, in addition to inappropriate weather conditions have made Biofuel use in Lebanon a very limited process. The scarce amounts of water available are poorly managed and water rationing is common. Being dependent on food imports from abroad, any water available is quickly directed to the use of deserted lands for food production. Therefore the use of land to simply generate biomass is not a wise decision. However, with proper management, one can find several sources of energy within the Biofuel context. Due to its relatively low energy demand: 4,963,000 tons of fuel, and 1650 MW of electricity, effective solutions offsetting a significant portion of the energy bill can be readily developed. Currently Biomass use is restricted to traditional wood harvesting for coal and firewood. This is an inefficient method of forest product use in addition to the destructive effects it is having on forested areas in Lebanon. In addition, some trial projects for the generation of biogas from animal wastes have been constructed but are generally used for heat generation and not for electricity.

Although Lebanon has little forest cover, it has significant other sources of biomass (Houri, 2004), namely municipal solid waste (MSW). If burnt, the 400 tons of MSW produced on a daily basis could provide 30% of the electricity needs, however, due to lack of emission controls and a strong resistance from locals and NGO's this alternative is not being considered. As a matter of fact, in a country like Lebanon with little natural resources, MSW is far more valuable if the raw material is recovered and recycled. Glass, paper, aluminum and some types of plastics are examples of material that can be completely recycled locally. Biogas generation from sewer and farm waste decomposition has the potential of offsetting 2.8% of the electric needs. Some plans are currently under way for large-scale utilization of biogas on a dairy farm.

Three main sources of biofuel will be discussed: waste (mostly organic), biogas from residential and farming waste, and biodiesel.

3.5.1 Energy from Non-Separated Waste

Ayoub (1995) has established the basic characteristics of waste in Lebanon indicating that 62.4% of municipal solid waste is food waste and 11.3% is paper and cardboard. The heating value was found to be 8032 Btu/lb. Currently Lebanon produces around 3940 tons per day of solid waste. The main focus of energy from waste should be on urban areas. These areas provide a high concentration of waste that could make energy harvesting an economical alternative. 5.2 MWh/ton may be produced (Bioenergy, 2002) which implies that if all the solid waste in Lebanon is burnt, it can produce 854 MW (52% of Lebanon's production) and if only the collected trash of Beirut and Tripoli (two largest cities) are burnt, 484 MW (29% of production) may be obtained. Local resistance to this highly polluting technology is expected based on previous local experience. Lack of emission regulation combined with the need of strict control, in addition to high technical demands precludes the use of this technology in Lebanon.

3.5.2 Biogas

With the high food waste content of municipal solid waste, biogas is expected to be produced at a significantly high rate. This has been most recently illustrated in a huge spontaneous fire that occurred in Tripoli's landfill. The Naameh landfill (used for Beirut's MSW) contains 3 million tons of waste with an average annual addition of 600,000 tons and can produce 23,000 m^3/day of biogas. Similarly Tripoli's landfill can generate 3000 m^3/day of biogas. Since Biogas can generate 5.84 kWh/m^3 (Bioenergy, 2002), these two sites can produce 6.3 MW, 0.4% of the national electricity consumption.

From the currenlty closed landfill site at Burj Hammoud, a 9 million dollars investment in biogas collection could produce 6.47 MW for 15 years offsetting 0.4% of Lebanon's electric needs (Ecodit, 2002).

The Ministry of Agriculture reports that Lebanon has 76,000 cows, 378,000 lambs, 436,000 goats and 10 million chickens. Since lambs and goats are generally freely roaming, one can assume that only cow and chicken manure can be economically used for biogas generation to make electricity. 15.2 MW can be generated from cows (PGE, 2002; Discovery Farms, 2001), in addition to 8.6 MW from chicken (Escobar and Heikkila, 1999). The electricity produced will offset 1.4% of Lebanon's electricity. The presence of these cow herds and chicken in concentrated large farms will help in applying this technology. Extra savings would be expected on site from the generated heat.

Biogas may be produced also by the anaerobic decomposition of municipal wastewater. Lebanon produces 249 Million m^3 of municipal wastewater. The planned traditional aerobic treatment of wastewater plants consumes 400 kW per 100,000 residents (Smedt, 2002); for Lebanon, 16 MW would be needed. With the use of anaerobic digestion, only 1.6 MW would be needed. With full utilization of the biogas generated for electricity production, the process can become completely self-sufficient. Utilizing the anaerobic decomposition option will result in close to 16 MW of avoided electricity consumption (1 % of Lebanon's electric needs)

Application of the biogas technology on currently polluting and discarded products can offset 3.2% of Lebanon's electric needs, in addition to major reduction in emissions, pollution, offensive smells, waste, and foreign currency spending. These processes require little space, create jobs and are generally accepted by the neighboring community.

3.5.3 Biodiesel

Lebanon imports 80,000 tons/yr of cooking oil. With a moderate estimate of only 50% potential recovery, 40,000 tons of waste cooking oil will be available to work with, in addition to large amounts of beef and lamb tallow. Assuming that the average consumption of Lebanese is along the world average (Worldwatch, 1998), i.e. 36 kg/person/yr, and knowing that the Lebanese population prefers mostly lamb meat, which produces 44g tallow/kg of meat and edible fat one can conclude that approximately 6,353 tons of tallow are being currently disposed of improperly. With an average yield of 85% biodiesel from oil and fat, Lebanon can easily produce 39,400 tons of Biodiesel. This would offset 0.8 % of total Lebanese fuel oil imports.

4. COST-BENEFIT ANALYSIS: FOSSIL FUELS VERSUS RENEWABLE ENERGY SOURCES

Without going into the abstract benefits of the use of renewable energy and the disadvantages of fossil fuel dependency, this section will deal with the direct cost-benefit analysis relevant to Lebanon.

Environmental Impact: In order to put the residential electricity consumption into an environmental perspective, the potential emissions must be estimated. To generate electricity, EDL uses a mix of fuels for its various plants. Only 6.7% of electricity is being generated from clean hydropower while the rest is generated by highly polluting thermal plants. Table 10 (Bazzi, 2002) summarizes the use of various fossil fuels in thermal plants to generate electricity in Lebanon. Assuming that all power plants are working to capacity (which is not always the case) and accounting for the hydropower share, the average kWh produced consumes 45.84 g of 2% sulfur diesel, 70.57 g of 1% sulfur diesel and 138.76 g of gas oil. According to AEAT (AEAT, 2003), and based on averaged emissions from various power stations, the average residential consumer produces 1.6 tons of CO_2, 7.3 kg of SO_2, 2.7 kg of NO_x and 180 g of PM_{10}. A 15% technical loss is taken as an average in electricity transmission (ESCWA, 2001). The assumed technical grid losses can only be estimated, as Lebanon suffers from a lack of accurate reports and from illegal connections to the grid. According to the UN (2001a), grid losses in the ESCWA region vary between 14 and 22% due to several technical and maintenance problems. Implementation of residential power saving programs can have a significant impact on the local and global environment especially when the lack of appropriate scrubbing technologies at the power plants is taken into consideration.

Table 10: Fuel used for thermal power plants

Fuel used	**Sulfur content**	**Nominal capacity**	**% of production**	**Average fuel consumption (g/kWh)**
Fuel Oil	2%	331	17	289
Fuel Oil	1%	607	31	244
Gas oil	N/A	1010	52	286
Total	--	1948	100	--

4.1 Solar Water Heaters

A quick cost analysis indicates that the average payback period of a SWH installed system under local conditions to replace electric heaters is 4-5 years. A $4m^2$ system can fully provide the hot water needs for a family of five for six months of the year with minor water use adjustments. It can significantly reduce the electric bills in the remaining months. It is this visible savings that is motivating people to purchase SWH systems.

Social and environmental benefits are abounding. SWH systems work quietly, use a renewable energy source, reduce the electricity bill for the consumer, and save the country millions of dollars in avoided new power plant costs. They have a long lifetime (up to 20 years) and are reliable. They provide jobs and income for a highly unemployed population. They also help in reducing the health bill by reducing the pollutants that would have been generated by power plants. Increased awareness about the environment and renewable energy may creep in through the intent of citizens to save money. Since most residents today rely on electric heaters for water, 60-80% of the residential electricity used may be saved by the adoption of SWH systems especially if their use for space heating is adopted.

SWH systems are expected to save 80% of energy consumed for water heating. According to ALMEE (2003), 400,000 solar water heaters over 10 years will save 8% of total electricity and will avoid the need to increase electricity capacity by 100 MW avoiding a total installation cost of $100 Million. These systems would also reduce the energy bill by $30 million over 10 years in addition to significant savings due to reduced pollution. To fulfill the hot water needs in Lebanon, 1.5 Mm2 are needed. With a total installed area of approximately 100,000 m2 by the year 2000, the market is still wide open for further development. It is estimated that the cost of solar heated water is $0.24/L, which is less than electrically heated water ($0.27/l), but more than diesel heated water ($0.20/L).

Case Study

In order to understand the significance of the implementation of SWH in residential houses, the following case study is presented. The system utilizes a thermosyphon system that has proven itself. The system chosen is the Kypros solar water heater (Kyprossolar, 2002), with 2 panels installed (2 m^2 each) with a 200L hot water tank. The local current price of this system is $900 including installation. The system used is very suitable for the Lebanese water as it utilizes a heat exchanging fluid and does not pass the water directly through the panel. This is very convenient for the salt laden groundwater used for the residence. Since the weather in Lebanon is generally warm and maximum heat capacity would be needed in winter, the solar thermal panels will be tilted to have latitude plus 15 degrees or approximately 50° from horizontal. The water tank also contains an auxiliary electric heating element for extended cloudy days.

The Kypros solar heater should produce 3230 kWh/yr. Another calculation method would be through a general assumption made indicating that water heating constitutes 25% of the electricity bill for the average household and that solar water heating can offset 80% of the water heating requirements (Cansolair, 2002). This indicates that the average household can save 20% of its electric need. With an average household consumption of 6907 KWh/yr (Houri and Korfali, 2005), this means that an average house can save 1381 kWh/yr, which translates to $184/yr since the system will offset only the higher priced fraction ($0.133/kWh).

Accordingly the payback period for this system is 4.9 years. While this payback period is in line with reported numbers for other sites, it differs drastically from the manufacturer's claim of six months payback period. In addition, while this system sizing is suitable for a family of five, the energy saved almost offsets completely the higher cost fraction of the electricity bill allowing a typical Lebanese family to benefit completely from subsidized electricity prices for minor consumers.

Renewable Energy Technology (RET) Screen analysis. While the above analysis gives a good rough idea, a more detailed analysis using the RET Screen modeling tool provides for a more professional analysis taking into account actual availability of the system and its productivity throughout the year. In this case, a 2.5 m^2 flat plate glazed collector with 114 L storage capacity placed at a slope of 33.8 º (latitude for Beirut), will result in a green house gas reduction of 1.42 tons of CO_2 per year. The summary of results obtained by the RET Screen analysis is illustrated in figure 15 showing the cumulative cash flow for a domestic SWH. According to this graph, the system will pay for itself within 7 years while producing $2,610 in cash savings during its 20-years lifetime. This is done taking into account most variables like system cost, installation, discount rate and miscellaneous expenses.

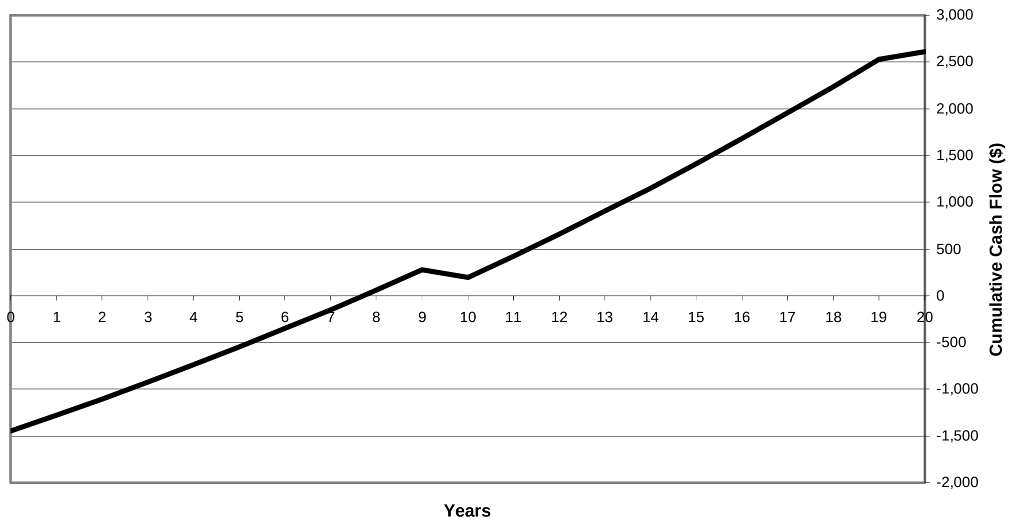

Figure 15: Cumulative cash flow for glazed domestic SWH.

A new emerging technology is the evacuated tube SWH whose prices are dropping rapidly. Figure 16 shows a similar SWH to the above, also for domestic use, but in this case using evacuated tubes. This system will pay for itself within 8-9 years and will save $2060 during its lifetime. It will save 1.78 tons of CO_2 per year.

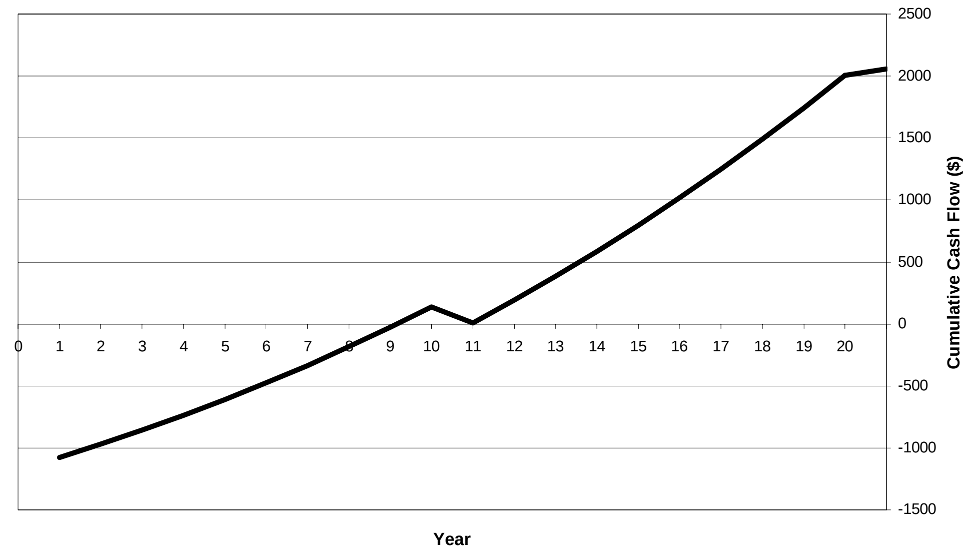

Figure 16: Cumulative cash flow for an evacuated tube domestic SWH

4.2 Hydropower expansion, water pricing and economic return

The analysis of hydropower economic returns is far more complex as several needs have to be taken into consideration. Those needs vary from the basic fresh water needed for the population (for household use and irrigation) in an area where water is a valuable commodity, to the environmental and touristic needs.

If we take the three hydropower plants using water from the Litani River at around 820m and delivering it at around 30m as an example, 1 m^3 of water going through these three plants will produce 1.7 kWh (0.9 + 0.4 + 0.4). With a total production cost of $0.025 / kWh versus $0.1464/kWh for thermal generation, actual savings would be $0.206/$m^3$. This number implies that water prices for irrigation in areas benefiting from the Litani reservoir should not be less than 20 cents per m^3. This result clearly indicates that agricultural use and productivity must be carefully monitored to insure that crop productivity exceeds a $1360/ha limit. When taking into consideration the environmental impact of dependence on hydropower rather than thermal power, this number is bound to go even higher.

4.3 Free market effects on the growth of renewable energies

A recent study has shown an interesting correlation between the rise in oil prices and the growth of solar thermal market demand (Houri, 2006a). The trend of apathy towards solar has suddenly changed in the past few years with the rapid increase in diesel prices. On one hand, consumers using diesel are directly impacted by the increasing prices of diesel and are scrambling for money-saving alternatives, and on the other hand, the electricity company (EDL) is feeling the need to lower its costs by encouraging consumers to save on electric usage. While this latter attempt is weak at best, the first driver has been strong enough to move the market.

4.3.1 Diesel Prices Growth

Up to 1999, oil prices have been at their lowest since the seventy's. However, this trend has changed with the emerging economies especially in China and India requiring more of the dwindling supplied of oil. Oil producing countries have not been able to keep up with the demand and this has forced oil price to skyrocket. In the years 2002, 2003, 2004 and 2005 respectively the average increases in crude oil prices by 7%, 18%, 29% and 20% respectively. Most analysts estimate that this trend will continue and a $100 per barrel is not an unreasonable price to expect in the near future. Since Lebanon does not produce oil or even refine it, local prices are heavily dependant on international price variations. Accordingly, the economy overall has been suffering from these latest oil price hikes.

4.3.2 Solar Water Heating Market Growth in Lebanon

One sector that stands to benefit from the rising fuel prices is the renewable energy sector in general and more specifically the solar water heating sector. The solar thermal market has been growing at an increasing rate with annual installations increasing from 7095 m^2 in 2001 to 16,848 m^2 in 2005. Percentage wise, installations increased by 16%, 22%, 35% and 24% in the years 2002, 2003, 2004 and 2005 respectively. This, compared to an almost constant population growth of 1% (Human Development Report, 2005), is indicative of market forces rather than natural increase. A comparison between the growth in solar hot water (SHW) system and global oil prices is shown in figure 17 and clearly illustrates the closeness of this relationship.

Further analysis of the relationship between these two increases yielded a direct correlation between the two as illustrated in figure 18. This clear correlation should be taken into consideration when planning for renewable energy systems adoption all over the world and especially in countries lacking the regulatory framework for their adoption.

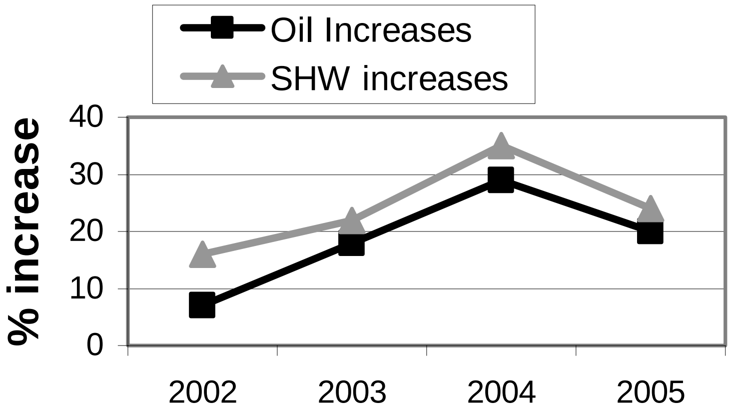

Figure 17: Comparison between oil prices and SWH installation

4.3.3 Expected Results of Freeing Up Diesel Prices

The effects of the most recent rise in oil prices has been blocked from the public by the government's decision to fix diesel prices at around $0.5/liter and to bear the extra cost itself. The liberation of prices will result in an increased cost up to $0.6/L today and up to $0.9/L in the next five years if the predicted prices of $100/barrel are reached. This constitutes an increase of 20% today and 50% over the next five years which according to the correlation established in the previous sections could lead to an increase of 25% in the coming year and around 51% over the next five years in SWH systems installations. Not to over simplify the factors involved in the adoption of SWH system installations, the indicated percentages do not take into account the issues of market saturation, consumer education, and potential rises in electricity costs. However, with the current status, none of these factors are expected to have a significant effect in the short to medium term: the SWH market which is estimated to be around 3 million square meters is far from being saturated as the overall installed area is still around 0.12 million square meters. The consumer education factor may be balanced out by the fact that the more educated, wealthier population has significantly moved forward in the application of SWH systems. No wide scale program is in sight to educate the general public yet.

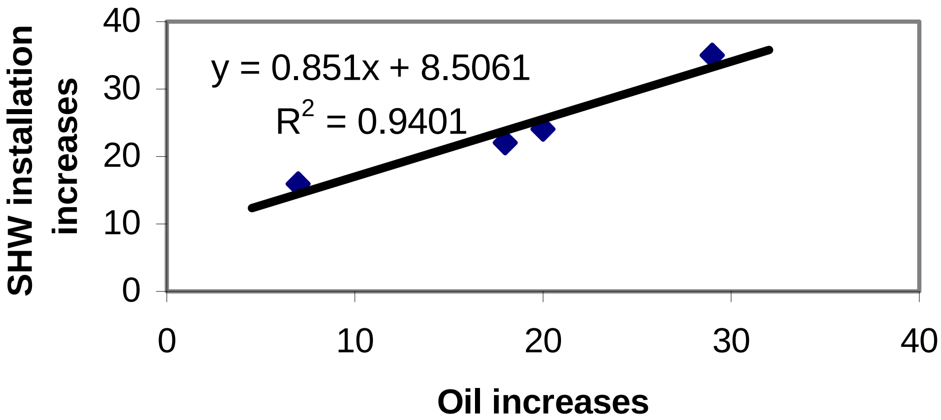

Figure 18: Correlation between oil increases and increases in SWH installation between 2002 and 2005

4.4 Cost efficient technologies

It is clear that Lebanon, within the framework of current legislation and economic status, will not be able to benefit from any renewable energy technology that is unable to cross the 0.07 cents/kWh barrier which is considered to be the cost of electricity generation in Lebanon. Again no exact figures are available to this effect and some studies put this number at around 11 cents/kWh. Wind, solar thermal and some from of biomass have been able to cross this line internationally and they are the ones that can be considered locally. Costs of environmental benefits are still not being considered.

5. ENERGY POLICIES AND LEGISLATION IN LEBANON

5.1 Overview of the Existing Energy Legislation in Lebanon

Legislative texts in Lebanon are issued in the form of decisions, decrees or laws. While decisions can be legally issued by ministers, decrees are issued by the council of ministers, and laws by the Parliament after being proposed by a Minister or Member of Parliament, and consultation with relevant parliamentary committees; it is published in the official gazette only after the approval of the President of the Lebanese Republic.

Law 462/2002 (annex 1), on the management of the energy sector, is the main form of legislation on energy in Lebanon. The law defines the role of the government in the energy sector, documents production, transport and distribution of energy and sets the legal steps required to privatize the management of the energy sector whether partially or completely.

Law 462 states that private electricity producers are only allowed to produce electricity for private use and it cannot be distributed to others. Thus, legally, it is prohibited to produce and to sell electricity. This is something that has to be changed through the law in order to ensure the proper and legal implementation of renewable energy technologies. For instance, household feed-in is not possible without legal backup. If ratified, the feed-in law would allow the production and the sale of electricity by the public to the government, and therefore contributing to the government's electricity distribution network.

Currently, solar water heating is the only type of renewable energy technologies that can be legally used in Lebanon since there is no legislative endorsement for other types such as the concentrated solar thermal power (CSTP) and wind energy (both are used for electricity production). In order to ensure sustainable development, a new national energy strategy based on renewable energy should be adopted.

5.2 Essential Components

Sustainable Energy Policy: Energy Efficiency and Energy Conservation

A new national energy strategy (or policy) should include energy efficiency and energy conservation. For example, the current construction law does not include heat insulation for buildings or making space for solar water heaters on the roofs of the buildings. Such basic construction concepts should be included in the national energy strategy since they contribute to energy conservation in buildings and facilitate the use of solar water heaters by the community.

As for energy efficiency, most of the Lebanese citizens are not familiar with energy saving appliances. Only few institutions/projects in Lebanon are dedicated to promote energy efficiency, let it be in households, in offices, in schools or even at governmental institutions. If practiced, energy efficiency can save a lot of energy and thus make the used conventional energy resources last longer. Adopting a national sustainable energy strategy is the key.

6. BARRIERS TO THE ADOPTION OF RENEWABLE ENERGY TECHNOLOGIES IN LEBANON

6.1 Policy Barriers

The main barrier to the adoption of renewable energy technologies in Lebanon is the lack of political will to do so. Lebanon, like most developing countries, has no long-term strategic planning, especially on issues related to the environment. Sustainable development has only been enforced in some projects due to specific requests from developed donor countries funding these projects. Climate change is still not on the radar of the Lebanese government, and the country totally follows the Arab League's positions on this issue. The Arab League energy policy is heavily influenced by oil producing countries, especially Saudi Arabia, which clearly has been hindering renewable energy development.

In terms of energy security, which is increasingly being understood by Lebanese government as a requirement and necessity for a stable economy, renewable energy is not being seriously considered as an option without any logical justification. The short-term objective of the Ministry of Water and Energy is to insure continuous supply of fuel oil, and its long-term objectives are to hook up to the natural gas pipeline from Syria and to privatize the electricity sector.

Privatization of the energy production sector has proven that it can increase the adoption of renewable energy. Nevertheless if the privatization process is not

done properly, privatization can lead to monopoly and other bad practices. Around the World, examples show that renewable energy has only been able to kick-start when there is a national or local authority supporting it.
The Lebanese government has to understand the benefits of a long-term sustainable development strategy and a sustainable energy strategy. It has been proven that energy security can only be achieved with the adoption of an aggressive renewable energy and energy efficiency strategy.
Lebanon also has to start getting involved in climate politics, and the government has to fully understand this issue and its impact on the country. A recent study released at COP12 in Nairobi has shown that mitigating the climate change impact of one ton of CO_2 will cost us 85 US dollars, while the cost of reducing this one ton, by renewable energy and energy efficiency, is only 25 US dollars.

6.2 Legislative Barriers

The lack of vision and political will by the government to develop renewable energy and promote energy efficiency has led to the lack of any serious legislation that supports it. Renewable energy is scarcely mentioned in existing Lebanese energy laws and there is no established administrative structure in place to develop the sector.
The development of an appropriate renewable energy and energy efficiency policy and legislation is a crucial step for any serious take on renewable energy. In countries like Germany, Spain and Italy, the establishment of a renewable energy feed-in-law has led to exponential increase in renewable energy production. The lack of such legislation in Lebanon creates a great barrier for renewable energy, since there is no clear process and standards for the development of that sector. It also eliminates market security for renewable energy development by the private sector. The private sector needs to feel that renewable energy projects will generate profit, and this requires government support, which is translated in renewable energy policy and legislation.
Government is currently subsidizing the electrical sector. These subsidizes are creating another barrier, since they are making electricity produced by fuel oil appear to be cheap, thus hindering the development of alternative energy,

especially renewable energy. The real cost of fuel oil is being masked by the fact that currently the government is filling the gap between the cost of electricity produced and the revenues collected from public electricity bill.

6.3 Information Barriers

Another important barrier for the development of renewable energy is the lack of accurate data and research on the different aspects of the subject. For renewable energy investment to take off, the feasibility of the different renewable energy technologies needs to be assessed. For example, wind atlas and solar map for Lebanon are essential basic information that is still not available in Lebanon. At the time when this report was written, the government was in the process of developing a wind atlas, but until this study is finalized wind energy companies will not be able to assess the market of wind energy in Lebanon.

Universities, NGOs and research centers in Lebanon need to conduct scientific and technical studies related to renewable energy, energy efficiency, energy security and climate change. All of this information will encourage renewable energy technology, and identify opportunities for renewable energy development.

The lack of awareness on the importance and potential of renewable energy, not only among government officials, but also among scientist, researchers, NGO and the general public is delaying the fast up-take of the technology. Awareness on why we need renewable energy and the threat of climate change is almost non-existent. In Sweden, 99% of the population has exact understanding of the climate change issue, and as a result the government has passed an energy strategy to have 100% renewable energy by 2020. Generating awareness on the necessity of renewable energy on all levels is considered as the main driver for prioritizing renewable energy in energy policies and plans.

Access to information, although secured on the legislative level, is not yet practiced in the public and the private sectors. This has hindered the dissemination of information related to renewable energy, and thus any institute that requires conducting any renewable energy research needs to reinvent the wheel and duplicate existing research.

7. IMPLEMENTATION SCHEMES FOR RENEWABLE ENERGY SOURCES

Promotion of renewable energy use in Lebanon may follow two different pathways: The first depends on providing appropriate condition for individuals and organizations to move into the renewable energy sector, and the second relies heavily on government initiated projects. Keeping in mind the current status of the Lebanese public sector, the first pathway seems to be a more reasonable one. Some schemes cut across all renewable energy sectors and will be listed here while others are sector specific and will be mentioned in the appropriate sections. Most of the following implementation schemes avoid asking the government to "pay".

a. Establishing a feed-in-law that allows energy producers to sell or at least offset part of their electricity load through renewable energy installations.
b. Remove taxes and customs charges on all renewable energy items such as solar thermal collectors, PV panels, wind turbines, etc...
c. Provide financial incentives for renewable energy users on houses in the form of added construction space permits. This proved to be very effective when new laws for the thermal insulation of buildings were considered.
d. Establish quality labels for all renewable energy products.
e. Remove government subsidies on electricity and fuel in all its forms which would encourage the population to adopt energy saving and renewable energy alternatives, while at the same time reducing governmental expenses that could be used to justify reduced taxes on renewable energy products.
f. Encourage Energy efficiency technologies as a first step in reducing the electricity bill altogether.
g. Encourage education in the field of renewable energy on all levels starting from introducing people to what they are all the way up to promoting University research and generating qualified graduates in these fields.
h. Establish a credit systems for renewable energy similar to that adopted for small industries and housing which is very successful. This credit system provides low interest loans for those interested in renewable energy installations.

7.1 Solar

Adoption of laws similar to those implemented in neighboring countries could give the industry a large boost. Solar thermal water heating is the most promising renewable energy form utilizable today. The experiences gained from neighboring countries only serve to support the need to promote SWH systems at all levels: domestic, industrial and commercial. Environment often conflicts with human requirements and the need for extra cash. In the case of SWH, environmental protection and the use of renewable energy are able to provide residents with their needs in an economical way. This is illustrated in the fact that despite the lack of government subsidy, SWH systems' sales are increasing resulting in job creation and emerging industries. A simple decrease in the Value Added Tax (VAT) on SWH could result in further increase in the rate of adoption of such systems.

SWH installation should be made mandatory on all new buildings and should be included in any renovation plan. This regulation should be accompanied by a certification program that insures product quality for the consumer and that the contractor is abiding by the law.

A strong education campaign should be launched at all levels to promote SWH systems. Based on previous experiences, namely in the leaded versus unleaded gasoline issue, it has already been proven (at least in Lebanon) that years of education about the social, economical and environmental benefits of using unleaded gasoline lead only to 20% adoption of unleaded gasoline (which could be attributed to new cars that require unleaded gasoline). Less than a 10% cost increase of leaded fuel over unleaded fuel lead to 80% adoption of unleaded fuel, further proving that the financial concern plays the most important role in consumer choices.

An increase in electricity prices will result in a definite increase in the demand on SWH systems but that increase will be opposed by increased energy costs on a generally impoverished working class that cannot afford the high upfront costs of such systems. The use of micro-credits will facilitate technology adoption by the lower income and poorer population groups; since the monthly payments would be close to the savings they will be getting on their electricity bills. Increased awareness about the environment and renewable energy may creep in through the intent of citizens to save money.

It remains to be said that without government financial intervention, these systems will not be able to compete with diesel water heating used in large establishments and factories. In such cases, and in urban areas with limited sun exposure, collective and evacuated tube systems will present a viable alternative.

Future Prospects

According to ALMEE, 5% annual growth in installations is expected. Other sources have more optimistic view regarding the future of SWH reaching up to 25% annual increase. According to LSES, figure 17 is suggested to show the increase in annual installation of SWH systems. Regardless of which estimates are more accurate, any effort by the government or local NGO's for the promotion of SWH will greatly and rapidly enhance the use of these systems.

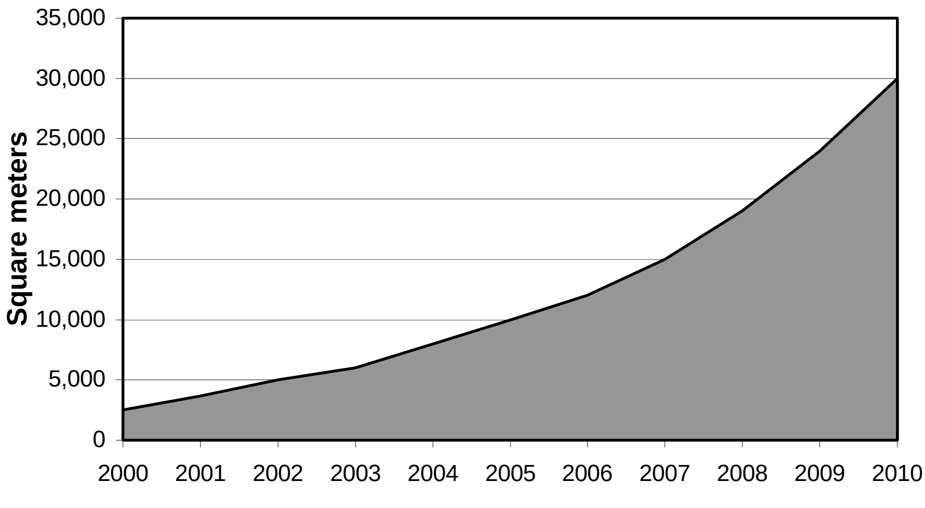

Figure 19: Predictions for SWH systems installations

System effectiveness has spurred an active import trade in various brands of solar thermal collectors. However, with the absence of quality standards, customers were going after the best name or the cheapest product. Some ongoing effort is being made by various organizations such as IRI, LSES and AUB in order to implement quality standards. These efforts are yet to be fruitful.

7.2 Wind

A wind map is the first basic step for promotion of wind energy. Fortunately, a complete wind map is expected to become available by the summer of 2007. This map will be instrumental in identifying general areas of interest which are expected to be mainly in the North (Akkar) area and the South where winds are significant. The utilization of wind energy will only mature if a reasonable feed-in Law is adopted. Alternatively, local municipalities armed with appropriate information and determination may opt to install wind turbines to serve their communities. This will be a major step, and success of any system anywhere in Lebanon will result in a flurry of installations. The best method to initiate this move is to identify an international funder willing to invest in wind energy promotion to buy the first large scale wind turbine and install it. Governments rule in the promotion of wind energy is critical due to the need to link the power generated from these turbines to the power grid. Small scale installations in individual houses and universities, in addition to regular training, are critical in obtaining the expertise needed to operate larger systems in the future.

7.3 Hydropower

The use of Hydropower must take into consideration water needs in various areas. A complete policy will thus be needed and a shift in the consideration of water use for agriculture has to be addressed. The value of the potential energy embedded in water must be levied on farmers of higher lands but not on coastal farmlands. Such a policy will not be popular among farmers but will drive the agricultural sector to use water efficiently, planting trees that do not consume a lot of water similar to what is going on in the town of Aarsal. Alternatively, more efficient irrigation methods like drip irrigation should be used. With the 800 m project planned, 99-105 MCM will be used at a cost of $1360-1442/ha per year.

A first most reasonable step is that the old hydropower turbines should be replaced to take advantage of improved efficiencies in newer system of 88 to 90%

instead of 75% for older systems. This process alone should raise the hydropower generated from 678 GWh in 2002 to 813 GWh in the future with no additional installations. Unfortunately, no plans are currently in place for such a replacement.

7.3.1 Agricultural and domestic needs for water

The discussion of water significance in energy generation would not be complete without analyzing the importance of this same water in fulfilling the immediate needs for the local population. It is important to note that according to ESCWA (2001) "No clear or reliable records on water use are available in Lebanon. Moreover, certain departments are reluctant to provide or release data to users." The need for fresh water is expected to rapidly rise to 2840 MCM by the year 2015 with agriculture accounting for 60% of the consumption assuming constant growth rate and no change in water techniques used. By then, Lebanon will be at a significant water deficit (El-Fadel et al, 2001). The percentage of houses connected to the water network varies between more than 90% in the Beirut area and less than 50% in North Lebanon. Connecting the remaining households to the water mains will result in increasing demand. This increasing demand will consume the additional water provided through water conservation measures in all sectors (aging network, households and industry).

According to the Ministry of Agriclture, the total agricultural area is 248,000 ha, 42% of which is irrigated lands. Green houses occupy between 2018 and 5000 ha. Surface water is used for 48% of irrigated lands while wells irrigate the remaining 52%. Only 36% of the irrigated land uses sprinklers or drip irrigation systems and the remaining 64% is watered by wasteful gravity surface flow. The agricultural sector contributed $1.5 Billion to the national GDP in 1995 (i.e. 12.4%) while consuming around 1000 MCM. With the assumption that irrigated lands contribute two thirds of the total agricultural income, these numbers indicate that each cubic meter used in agriculture adds a total value of $1 to the GDP. One has to seriously consider whether this is the best use for water. Some of the greatest examples of appropriate allocation of resources come from remote areas: two million cherry and apricot trees were planted in Aarsal, north Bekaa, since the sixties and need no irrigation while 52,421 ha of the Lebanese territories are planted with olives which also need no irrigation. Shifting to such agricultures could significantly improve the overall water situation in Lebanon while maintaining rural agricultural income.

While domestic and industrial needs cannot be compromised, the huge water consumption in the agricultural sector needs to be economically scrutinized versus the potential benefits of water use for generation of electricity. The main population centers are on the coast but the largest agricultural areas are in the Bekaa valley and parts of the south. Average altitude of these areas is between 800 and 900 m. This means that water use for irrigation at these altitudes results in a significant loss of potential energy embedded in the water. Qaroun lake capacity is 220 MCM: 160 MCM are used for irrigation and power, 60 MCM are stored over the dry season.

Despite the significant need for water, 140 MCM are wasted from the Qaroun lake over a period of 70 days in an average year. This is because of the need to insure that sufficient water is available in the lake throughout the summer months. Sudden heavy rains sometimes exceed the hydropower plants capacity and the excess water has to be vented through the dam and accordingly wasted to the sea. This problem can be more efficiently dealt with by the construction of more dams downriver, namely near the Khardali area.

7.3.2 Hydropower future scenarios

Future potential for hydropower to fulfill Lebanese energy needs may follow different scenarios. These scenarios are listed below with the main aspects of each one explained. The results are plotted in figure 18 showing the different contributions possible (Houri, 2006).

Scenario 1: Business as usual. This scenario assumes that no hydropower projects will be installed and no major irrigation projects implemented that would affect the amount of water reaching hydropower plants. This scenario would most accurately describe the situation till 2008.

Scenario 2: Focus on hydropower. This scenario assumes that all hydropower plants planned will be constructed within a year; in addition, old turbines will be replaced with new more efficient ones.

Scenario 3: Focus on irrigation. This scenario assumes that irrigation and other water utilization projects will be implemented within a year while no hydropower projects will be constructed. The planned irrigation projects will reduce hydropower output by more than 62%.

Scenario 4: Full water utilization. This scenario assumes that a major decision to use up all the water resources available for irrigation and hydropower is taken. A national effort will be undertaken to insure that minimal amounts of water are wasted into the sea.

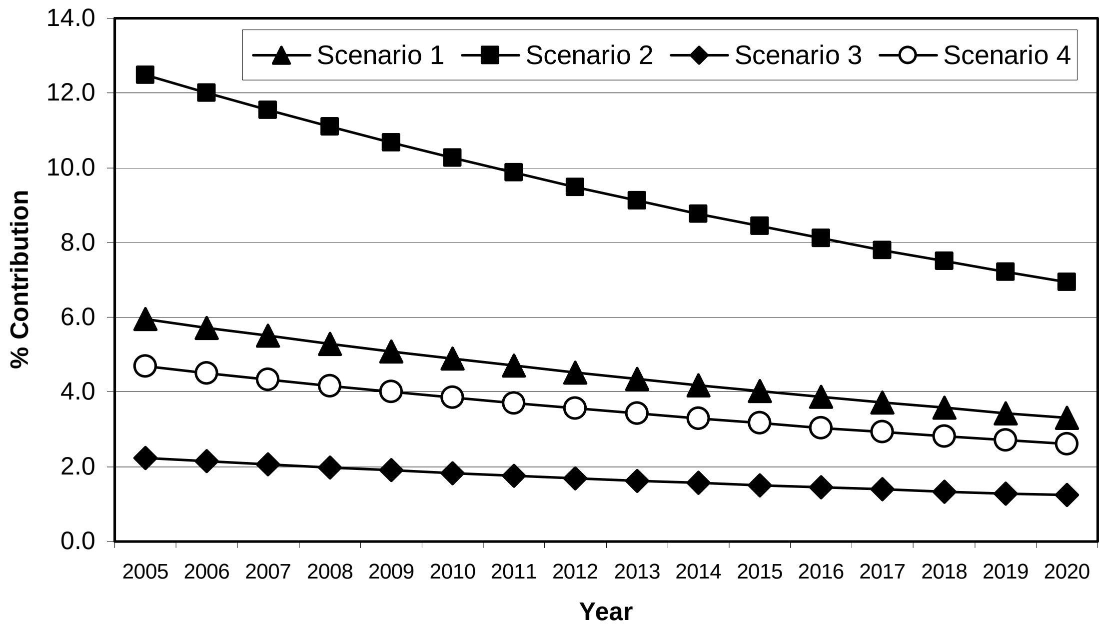

Figure 20: Future percentage contribution of hydropower to total electricity consumption according to four scenarios

These scenarios indicate that hydropower will play a minor, yet important, role in the overall picture of electricity generation in the future. This role will constantly diminish since the water resources are constant and energy needs are increasing. By 2020, scenario 3 indicates that hydropower will constitute a mere 1.2% of electricity generation; while according to the best-case scenario for hydropower, scenario 2, it will constitute 6.9 %.

While water use for hydropower strongly competes with other domestic and agricultural needs at higher altitudes, supplying water to the coastal cities accommodating more than 60% of the population does not exert any significant pressures on the alternative water use for hydropower. Projects aimed at carrying fresh water from Awali River at the outlet of a hydropower plant to Beirut are a clear example that the same water can be used for hydropower and coastal irrigation or domestic applications. The problem arises with the inner parts of the country, namely the Bekaa area that lies above 800 m in altitude. Water use there, greatly diminishes the available hydropower. These areas can greatly benefit from domestic wastewater treatment to provide water for irrigation. Such a plan serves to reduce water and fertilizer demands by the agricultural sector, and improves river water quality. Several scenarios regarding the future of hydropower were presented and, due to the limited supply of fresh water, all of these scenarios show a decreasing percentage contribution from hydropower to the total electricity generation reaching between 1.2 and 6.9% by 2020. Hydropower is definitely an economical alternative but not without some environmental and socioeconomic concern. Hydropower can and should be fully utilized with significant savings to be expected. This utilization should be well thought of in conjunction with other water needs.

7.4 Biomass

Despite its lack of huge forest and water reserves, Lebanon has a potential for the utilization of biomass for the generation of electricity and offsetting oil imports. The distribution of biofuel energy producing facilities around Lebanon will help in minimizing the electric power generation and losses in transmission lines. Further biomass expansion seems to be difficult as most minor wood sources are already being used for rural house heating. Refinement and expansion of the indicated technologies could result in an improvement of the overall output. The raw materials used are generally harmful waste products and the application of the two favored technologies: Biogas and Biodiesel will result in great environmental benefits with minimal damage. These benefits may be summarized as low or zero emissions, reduced methane emissions, minor land use requirements, significant waste minimization, pollution prevention, pathogen control, renewable sources, good public perception, reduced fossil fuel imports, reduced national debt, local production enhancing self reliance and reducing unemployment, and CO_2 neutral. The main drawback is the need for a significant upfront investment.

Demonstration projects on a large scale play an important role in ensuring the success of this technology: a biogas generator in a farm or in a landfill will serve to show the financial benefits of implementing such a system. However, with the lack of any environmental restraints on waste dumping, operators do not feel the need to implement such costly technologies without clear financial returns. Successful experiences of managing olive oil waste products to generate electricity, specifically from Spain, should be transferred as the Lebanese olive oil industry can definitely benefit from those technologies.

8. GENERAL RECOMMENDATIONS FOR LEBANON

In 2006, Green Line organized a national workshop on energy and climate change. Then in January 2007, the Lebanese Committee for Environment and Development, with the collaboration of the Lebanese Environmental Party, conducted another workshop on renewable energy potential. Based on these two workshops and this study, the following recommendations are suggested for the development of renewable energy in Lebanon.

8.1 Policy

On the policy level, the Lebanese government is recommended to:

- Develop a national energy strategy, which includes ambitious renewable energy targets. The energy strategy should take into consideration long-term energy security, as well as, energy efficiency and climate change impact costs.
- Adopt a strong position against climate change, and play an active role in climate change negotiations on regional and international levels. Lebanon should push for a CO_2 reduction target for the developing

target in the second commitment phase of the Kyoto protocol (2013-2017).

- Adopt a policy to gradually transfer subsidies from fossil fuel technologies to renewable energy ones.
- Adopt a decentralized policy for energy production that would allow commercial Renewable Energy investment in power generation and collection of fees.
- Develop a sustainable transport strategy, which encourages non-motorized modes and public transport, as well as, alternative renewable fuels.

8.2 Legislation

On the legislative level, the Lebanese government is recommended to:

- Develop and implement a renewable energy feed-in-law.
- Develop and implement an energy efficiency law, which enforces energy audits, energy intensity taxes for electrical equipment, energy intensity labeling and clear energy efficient targets.
- Fully implement law number 462 by developing the required implementing decrees.
- Develop and implement a renewable energy certification directive, which includes standards and procedures for renewable energy technology production and use.
- Modify the construction law to enforce energy efficiency and renewable energy use in the design of structures.

8.3 Administration

On the administrative level, the government is recommended to:

- Create a renewable energy and energy efficiency and conservation department in the Ministry of Energy and Water.
- Establish the "energy organizational committee" as identified in law 462.
- Increase and facilitate cooperation and communication between the different public authorities and institutes related to the energy and climate change sectors.

8.4 Research and Information

On the research and information level, energy related government authorities, universities and other scientific and research institutes are recommended to:

- Establish and regularly update a national energy database including information on renewable energy and energy efficiency potential.
- Establish and regularly update a national climate change database, which includes all research and scientific studies related to the climate change issue.
- Increase national, regional and international networking and information exchange on energy and climate change issues to enhance local expertise and knowledge.

8.5 Outreach

As lack of awareness has been identified as one of the main barrier to the development of renewable energy, the following recommendations are suggested:

- The establishment of independent institutions, which aim to promote renewable energies for sustainable development, as well as, energy efficiency in public and private institutes.
- The adoption of educational programs that promote energy use awareness and sustainable development through incorporating such programs in schools and other educational institutes.

The implementation of public awareness campaigns to promote renewable energy, energy efficiency and climate change.

III. <u>THE REGION: EGYPT, JORDAN, PALESTINE, SYRIA</u>

9. OVERVIEW OF RENEWABLE ENERGY IN THE ARAB WORLD

9.1 Energy Policy in the Arab World

The Arab energy sector is characterized by a huge oil and gas sector and most of the electrical production is based on fossil fuels. The Arab countries hold 61% of the world oil reserves, and 26 % of the world gas reserves. They produce nearly 30

% of the world oil production, and 11 % of the world gas production. This has made the GCC countries the major contributors to regional economic growth, as well as, the major influencer of energy policy in the region. This was very evident in "the Abu Dhabi Declaration on Environment and Energy 2003" ratified on 3rd of February 2003. The declaration clearly shows that the Arab World energy policy is to have no commitment towards renewable energy development. It states that the Arab countries have the right to undertake the development and use of their energy resources, and that they should not be binded by any CO_2 emissions reduction within a specific time frame. This insured that oil producing countries have no limitation on oil production and use. In the power generation sector, the switch from more carbon intensive fuels to natural gas was the most commonly reported activity.

The political will to develop renewable resources in oil rich countries is very low, and there are no serious plans in the short and medium terms. On the other hand, some small oil producing countries and some oil importing countries have been showing more interest in renewable energy. This trend is also noticeable in the climate change policy of Arab World countries. While most small oil producing and oil importing Arab countries have submitted their first national communications to the UNFCCC on climate change, only one country of the GCC group, Bahrain, has done so.

9.2 Renewable Energy Potential and Projects

The Arab region enjoys tremendous potential for renewable energy resources. Solar potential varies between 1460-3000 KWh/m^2/year, while wind resources are particularly high in Egypt, Jordan, Syria, Morocco and Mauritania. Large-scale grid connected wind power exists in Egypt, Jordan, and Morocco, while stand alone wind units are in use in Morocco, Jordan, and Syria (ESCWA, 2005). Solar Energy applications though have not been widely promoted in the region yet, some solar water heaters, and small scale photovoltaic applications are in use in some countries such as Tunisia, Morocco, Syria, Egypt, and Jordan. Enormous biomass resources in the form of Biogas, agriculture residues, and wood fuel exist in Jordan, Syria, Sudan, Egypt, and Algeria. In addition, in Arab rural areas (46%

of population) the dominant energy source is unprocessed biomass (ESCWA, 2005).

In the transport sector, measures envisioned by Arab countries covered development of road transportation master plans; introduction of electric or compressed natural gas vehicles, encouragement of early adoption of hybrid vehicles, discouragement of the use of private vehicles, improvement of the public transport systems, introduction of vehicle emission standards, improvement of road infrastructure, and switching from diesel to electric traction on railways.

In the demand side, projects included efficient lighting systems, certification and labeling of appliances and building and dissemination of improved stoves for cooking in rural areas (ESCWA, 2005).

9.3 Recommendations and Barriers for the Arab World

Some of the major challenges facing the Arab energy sector as identified by ESCWA (2005) are:

- improving accessibility to modern energy services,
- meeting the growing demand on energy resulting from population and economic growth, and
- switching from fossil fuel based economies to renewable energy systems.

Nevertheless, to achieve the above, a number of barriers need to be overcome. These barriers are: lack of appropriate legislation, lack of market incentives, weak institutional capacities, lack of financing mechanisms, lack of information and awareness, and weak research and development capabilities.

Many Arab countries have stressed their need for transfer of renewable energy technology from developed countries to their own. GEF and other bilateral and multilateral donor organizations have been playing a crucial role in facilitating the technology transfer to some Arab countries, but the effort is still minimal (ESCWA, 2005).

Other than providing financial assistance to renewable energy projects, the International community should support Arab countries in building the needed institutional structures for renewable energy development. It should also provide enhanced assistance to national education systems to increase awareness.

Political will at the country level is essential for renewable energy development. Arab countries are encouraged to participate in the global climate debate. In addition, oil exporting countries should cooperate and facilitate with other Arab countries to develop renewable energy policies and strategies.

10. RENEWABLE ENERGY IN EGYPT, JORDAN, PALESTINE AND SYRIA

10.1 Egypt

Egypt electric generating capacity was 17.06 gigawatts (GW) as of 2004, with plans to add 8.38 GW by mid-2012. Around 84% of Egypt's electric generating capacity is thermal (natural gas), while the rest is hydropower from the Aswan High Dam (EIA, 2006 a). All oil-fired plants have been converted to run on natural gas as their primary fuel. In order to satisfy its energy needs, Egypt is building several new power plants and is considering limited privatization of the electric power sector.

Like most other Arab countries, Egypt is expanding the gas market by developing gas infrastructure, attracting foreign investments, and encouraging private sector participation in different aspects of the gas industry.

What sets Egypt ahead of other Arab countries is renewable energy development. Egypt established the New and Renewable Energy Authority in the late nineties, as well as, a climate change unit in the Ministry of Environment. Egypt has also formed a unique national interagency committee on climate change, which represents governmental and non-governmental stakeholders from scientists, international institutes and the private sector.

This political and administrative support to renewable energy development and increased concern about climate change, coupled with great solar, biomass and wind resources, led to the development of several renewable energy projects. Such projects include large-scale grid-connected wind farms, integrated solar thermal/natural gas power plant, heat supply from solar energy, photovoltaic remote electrification systems.

One example is a part-solar power plant at Kureimat as a BOOT project, which will have 30 MW of solar capacity out of a total planned capacity of 150 MW (EIA, 2006 a). Such technology is hoped to be the main energy supplier in desert areas. Another example is a commercialized and grid-connected wind farm at Zaafarana with a capacity of 225 MW, with plans to expand to 850 MW by 2010.

On the transport level, Egypt has been encouraging the switching to natural gas. It also introduced policies to promote public transport, to develop non-motorized transport facilities in middle size provincial cities, to manage and decrease traffic demand, and to substitute the old vehicle fleet.

On the electrical demand side, Egypt efficiency measures include certification of refrigerators and other home appliances, improvement of building codes to reduce energy intensity, and energy efficiency policies in the industrial and residential sectors.

Egypt has also introduced climate change and renewable energy programs in the educational system, especially at the university level.

10.2 Jordan

Although Jordan lacks resources, the electricity sector has been constantly growing by 5% annual average and covering 99% of the country. Total installed capacity is around 1,636 MW generated by around twelve gas and diesel plants (Abu Ghazaleh, 2005). Gas generation has been on the increase since the gas pipeline hookup with Egypt in 2003. Jordan has little oil and gas resources, but is rich in oil shale which is the third largest reserve in the World. The government is trying to exploit this resource, which can become economically viable with increasing oil costs. Jordan is also trying to privatize the electricity sector.

With the approval of the new energy master plan, Jordan will under go major modernization in the energy sector in the coming 10-15 years. Around $3 billion of public and private sector capital is expected to be spent for the transformation. This plan will generate a huge opportunity for renewable energy development. The plan includes projects related to legislative reform, electricity tariff levels, energy demand, power sector development, gas distribution and renewable energy.

Jordan is showing great interest in exploiting all the available sources of energy, including renewable energy. A comprehensive plan for renewable energy has been prepared, and the government has been studying the commercial viability of large scale electricity generation from renewable resources, including solar energy, wind, and biogas.

According to the Natural Resources Authority, Jordan has huge renewable resources potential, and the government has set a target of having 5% of all energy production to come from renewable energy by 2015. Presently, Jordan has a 1 MW biogas plant that utilizes methane from organic waste decomposition for electricity production. It also has a 2 MW wind farm at Hofa and Al-Ibrahimiyah in the north (EIA, 2006 b). There is an area of 1.35 million m^2 of installed solar water heaters panels in Jordan, and a 150 KWh of installed photovoltaic power. There are 25 solar water heaters factories in Jordan which produce 4000 solar water heater annually.

Future plans include three wind parks with a total capacity of 125-150 MW, and a hybrid Solar Power Plant (CSP) with a capacity of 100-150 MW. 60% of the wind turbine parts in the wind parks are supposed to be provided by local wind turbine manufacturers.

As for Biogas energy, a biogas factory has been operating at Rusaifaeh dump, producing 6 GWh of electricity. Expansions are under way to increase the total capacity of the factory to 5 MW.

In the transport sector, the government passed a law that encouraged taxi owners to replace their old cars with modern cars by exempting the purchase of a new taxi from all taxes and duties.

Other initiatives included geothermal energy research, power supply by PV systems to remote villages, water desalination using renewable energy hybrid systems, energy efficiency program and solar and wind energy resources assessment and mapping.

Jordan has also been playing a role in promoting renewable energy outside the country. In September 2006, Jordan hosted the "global conference on renewable energy approaches for desert regions", which aimed to diversify energy generation by expanding the use of renewable energy resources.

10.3 Palestine

The Palestinian Authority (PA) has been importing most of its energy needs from Israel. There are no power plants in the West Bank, which makes energy security an important goal in Palestine. In late August 2006, Jordan signed a deal with the Palestinian Authority to provide the Jericho region with power imports. The Gaza Strip has a single diesel-fired power plant at Nusseirat which was crippled in a July 2006 bombing. The 140 MW Gaza plant supplied two-thirds of Gaza's power needs (EIA, 2006 b), and was offline at the time this report was written. The Palestinian Energy Authority has negotiated with Cairo to provide a short-term solution to Gaza's power shortages.

Electrification does not reach all Palestinian territories and improving coverage while reducing dependency on electricity imports is the Authority's main goal. This dependence in electricity import has also increased electricity costs making Palestinians pay one of the highest electricity costs in the world (more than 11 cents/KWh) (EIA, 2006 b).

Due to the difficult political and social situation, there is no comprehensive energy strategy in Palestine, and no renewable energy program. Although renewable energy can play a big role in increasing energy security, the Palestinian Authority is not taking renewable energy policy into consideration. Instead, to reduce imports by two thirds, Palestine is looking to exploit natural gas resources found off Gaza's coastline.

Palestine is going through a major reconstruction and development of its infrastructure, including the energy sector. This provides a unique opportunity for the Palestinian Authority to develop a reliable and secure energy system based on renewable energy. Independent renewable energy projects provide decentralized and reliable electricity generation, which is urgently needed in Palestine. This requires a comprehensive assessment of renewable energy potential in all its forms. Unless these issues are tackled, the renewable energy can not be put in use commercially and the energy crisis can not be solved.

Although renewable energy is not doing so well on the policy level, there are several encouraging initiatives in other sectors. The Energy Research Centre (ERC), which was established in 1996 at An-Najah National University (ANNU) has been conducting research, development, system design, feasibility studies and training in renewable energy and energy conservation. The centre has expanded its objectives to include the impacts of energy on global environment, health and social development. It has also been building a strong network between governmental institutes and other NGO's working on energy.

The main renewable energy technology used in Palestine is solar water heating. Due to the high costs and the influence of Israel's enforcement of solar water heating in households, about 70% of households use solar water heaters in Palestine. In addition, there are 15 solar water heating factories in West Bank and Gaza. Still proper legislation is required to further develop this sector.

International renewable energy organizations have been cooperating with authorities and local communities to develop renewable energy and energy efficiency programs throughout the country. Already some biogas pilot projects have been implemented in rural areas.

10.4 Syria

As of 2005, the total installed electric generating capacity in Syria was around 7.5 GW, with fuel oil and natural gas being the primary fuels for 11 thermal facilities, in addition to 1.9 GW of hydroelectric capacity on the Euphrates River. Syrian electric power demand is growing at more than seven percent annually, and many rural areas (around 700 villages) have no access to electricity. This has made satisfying electricity demand a national development priority. According to the Ministry of Electricity, 3,000 MW of capacity are going to be added by 2010, at a probable cost of around $2 billion (EIA, 2006 b). Syria is also converting all its electricity production to be from natural gas.

Syria has also ambitious renewable energy programs. According to the Minister of Energy, Syria aims to produce five percent of total electrical energy production from renewable energies by 2010 (EIA, 2006 b). Also on the policy level, the government has also been developing the required legislation and regulations for renewable energy development, which aim is to encourage the use of renewable energy, as well as, energy efficiency. This includes building insulation code and energy efficiency labeling for home appliances.

Another boost to renewable energy was the development of the Syrian Renewable Master Plan. The plan calls for a US$ 1.48 billion investment in renewable sources, with a focus on wind power, bio-energy, solar hot water systems, and photovoltaic (UN-DESA, 2004). The master plan document was produced with the involvement of different stakeholders, and it outlines plans and programs with specific goals and objectives for renewable energy development.

As a result of this policy, several projects are being implemented, including a program of wind turbines that is supposed to generate around 100 MW of energy by 2008 (EIA, 2006 b), and plans to build two wind farms in Homs with a total power of 250 MW. Syria also has 15 solar water heaters factories, and pilot projects to install solar water heaters in hospitals, university dorms and institutions in the industrial sector are underway. Solar PV development has high potential in rural electrification, especially in Al Badia areas, which is a vast semi-desert region in the central and eastern part of the country. This area supports a large number of Bedouins that currently have no access to electricity. Currently, Syria is producing 80 KWh from the application of PV in rural areas. The country also has several pilot projects which use biogas to produce electricity, including biogas production from the treatment of wastewater in Damascus.

On the administrative level, the National Energy Research Center was established in 2003 to carry out research in the areas of wind, solar and other renewable energy sources. As a result, renewable energy resources in Syria have been surveyed and the potential of solar, wind and biomass applications have been analyzed. The average solar radiation was found to be 5.2 kWh/m^2 per day, while wind speed measurements in some regions of the country reached more than 13 m/sec (Al-Mohamad, 2001). This puts wind as another promising source of renewable energy in Syria. Concerning biogas potential, estimation show that the daily wastes of humans, animals and agriculture is higher than 300 million cubic meters per year (Al-Mohamad, 2001), thus providing, as well, a huge source of energy.

On the educational level, Syria has started in 2005 an EU-funded TEMPUS project, which aims to incorporate renewable energy and energy efficiency programs and trainings in higher education. The TEMPUS project is designed to develop a curriculum for renewable energies, train teaching staff accordingly, establish new experiments, and organize the transfer of knowledge and exchange of experience among the partner universities.

ANNEX 1 – LAW 462/2002: STRUCTURING THE ELECTRICITY SECTOR

تنظيم قطاع الكهرباء

قانون رقم ٤٦٢ - صادر في ٢٠٠٢/٩/٢

اقر مجلس النواب،
وينشر رئيس الجمهورية القانون التالي نصه:

الفصل الأول - أحكام عامة

المادة ١- تعريف المصطلحات
يقصد في هذا القانون بالعبارات التالية:
- الوزارة: وزارة الطاقة والمياه.
- الوزير: وزير الطاقة والمياه.
- الهيئة: هيئة تنظيم قطاع الكهرباء.
- المجلس: المجلس الأعلى للخصخصة المنشأ بموجب قانون الخصخصة.
- الإنتاج: إنتاج الطاقة الكهربائية عبر موارد حرارية، مائية، متجددة أو عبر موارد أخرى.
- النقل: يشمل (١) الشبكات الكهربائية ذات التوتر العالي التي تربط مراكز الإنتاج بمحطات التحويل الرئيسية و(٢) التجهيزات الدولية لنقل الكهرباء الموصولة بشبكات كهربائية لدول أجنبية. لضرورات هذا التعريف فإن خطوط التوتر العالي هي تلك التي تعمل بتوتر ما فوق ٢٤ كيلو فولت ("ك.ف.") وتعتبر خطوط تجهيزات النقل الكهربائية الدولية تلك التي تمتد من نقطة الوصل بين شبكة كهربائية لدول أجنبية إلى محطة التحويل الرئيسية للربط.
- التوزيع: يشمل شبكتي التوتر المتوسط والمنخفض ومحطات التوزيع الهادفة إلى توزيع الطاقة إلى المستهلكين، شبكات التوتر المتوسط والمنخفض تتناول الشبكات من ٢٤ ك.ف. وما دون.
- ترخيص: مستند رسمي تصدره الهيئة إلى شركات مغفلة يمنح حكماً بموجبه وبموجب هذا القانون إمتياز لمدة أقصاها خمسون سنة بإنشاء أو تجهيز أو تطوير أو تملك أو تشغيل أو إدارة أو تسويق أجهزة تدخل في نطاق الخدمات العامة في مجالات الإنتاج والنقل والتوزيع والمتعلقة بقدرة تفوق ١٠ ميغاوات أو حق إستعمال الأجهزة المذكورة بموجب عقد إيجار تمويلي (Leasing).
- صاحب الترخيص: الشخص الحائز على ترخيص صالح منحته إياه الهيئة حسب الأصول.
- إذن: مستند رسمي تصدره الهيئة، يمنح بموجبه الحق بإنشاء أو تجهيز أو تطوير، أو تملك أو تشغيل أو صيانة تجهيزات الإنتاج للإستعمال الخاص بقدرة تتراوح ما بين ١,٥ و١٠ ميغاوات.
- شركة النقل: مؤسسة الكهرباء أو اي شركة أخرى مملوكة من القطاع العام تنقل إليها ملكية تجهيزات النقل.
- مؤسسة الكهرباء: المؤسسة العامة المعروفة بإسم "مؤسسة كهرباء لبنان".
- المستهلك: أي شخص طبيعي أو معنوي تكون تجهيزاته المستهلكة للكهرباء موصولة بشبكة الكهرباء بواسطة نقطة وصل وبموجب بوليصة إشتراك.
- قانون الخصخصة: القانون رقم ٢٢٨ تاريخ ٣١ أيار ٢٠٠ المتضمن تنظيم عمليات الخصخصة وتحديد شروطها ومجالات تطبيقها.
- شركة مخصخصة: معّرف عنها في المادة الرابعة أدناه.

المادة ٢- نطاق القانون
يحدد هذا القانون القواعد والمبادئ والأسس التي ترعى قطاع الكهرباء، بما في ذلك دور الدولة في هذا القطاع، والمبادئ والأسس التي تنظمه وقواعد تحويل القطاع المذكور أو تحويل إدارته كلياً أو جزئياً إلى القطاع الخاص.

المادة ٣- مبدأ إستقلالية كل من نشاطات إنتاج ونقل وتوزيع الكهرباء

تعتبر الطاقة الكهربائية سلعة إقتصادية إستراتيجية وحيوية، وتعتبر النشاطات العائدة لإنتاجها ونقلها وتوزيعها من المنافع العامة ويكون كل منها مستقلاً عن الآخر وظيفياً وإدارياً ومالياً. على أن هذه الإستقلالية لا تحول دون إمكانية قيام مؤسسة الكهرباء بعد تحويلها إلى شركة مخصخصة أو أكثر، بأكثر من نشاط واحد من الأنشطة الثلاثة المذكورة. تحدد أسس هذه الإستقلالية بمراسيم تتخذ في مجلس الوزراء بناء على إقتراح الوزير.

المادة ٤- تأسيس الشركات المخصخصة

١- يمكن بمرسوم يتخذ في مجلس الوزراء، بناء على إقتراح المجلس، تأسيس شركة مغفلة واحدة أو أكثر تخضع لأحكام قانون التجارة بإستثناء المادة ٧٨ منه وفي كل ما لم ينص عليه هذا القانون، تعرف كل منها بـ "شركة مخصخصة" يكون موضوعها القيام بكل أو بعض نشاطات الإنتاج والتوزيع، تمارس نشاطها بعد الحصول على ترخيص يمنح وفقاً لأحكام هذا القانون.

٢- تقدر قيمة الأصول والموجودات والإلتزامات والأعمال الجارية التي يقرر نقل ملكيتها أو الإنتفاع منها إلى شركة مخصخصة من قبل المجلس بالإستعانة بشركة مالية أو شركة محاسبة دولية يعينها المجلس ويحدد لها أسس وقواعد التخمين.

٣- يحدد مرسوم التأسيس رأسمال كل شركة مخصخصة الذي يمكن أن يكون بعملة أجنبية والموجودات والالتزامات التي سيتم نقلها، ويصادق على نظامها الأساسي المقترح من قبل المجلس على أن يؤخذ بالإعتبار أن أسهم كل شركة مخصخصة سوف تعود ملكيتها بالكامل عند التأسيس للدولة اللبنانية أو لأي شخص من أشخاص القانون العام الذي يبقى المساهم الوحيد إلى حين تخصيص الشركة كلياً أو جزئياً.

٤- يجب أن تكون أسهم كل شركة مخصخصة أسهماً إسمية.
خلافاً لأي نص آخر، تكون جميع أسهم كل شركة مخصخصة، بما فيها الأسهم التي تمثل تقديمات عينية، قابلة للتداول فوراً، كما يمكن أن تكون مملوكة بكاملها من قبل اشخاص غير لبنانيين.

٥- يتألف مجلس إدارة كل شركة مخصخصة، ما دامت هذه الشركة المخصخصة مملوكة كلياً من الدولة اللبنانية، أو من شخص من أشخاص القانون العام، من رئيس وأعضاء يتم تعيينهم من قبل مجلس الوزراء. أما بعد الخصخصة الجزئية أو الكلية فيتم إختيار أعضاء مجلس الإدارة من قبل الجمعية العمومية دون التقيد بشرط الجنسية المنصوص عليه في المادة ١٤٤ من قانون التجارة، شرط أن تمثل الدولة طيلة مدة مساهمتها في رأسمال كل شركة مخصخصة بعضو على الأقل يعينه مجلس الوزراء. إذا كان رئيس مجلس الإدارة المدير العام غير لبناني فيعفى من موجب الحصول على إجازة عمل.

٦- تعفى كل شركة مخصخصة من رسوم الكاتب العدل العائدة للدولة ورسوم التسجيل في السجل التجاري بما في ذلك الرسوم العائدة لصندوق تعاضد القضاة ونقابة المحامين ورسم الطابع على رأس المال، وتعفى مقدماتها العينية من كافة رسوم الفراغ. تكون كل شركة مخصخصة معفاة من كافة الضرائب والرسوم ما دامت أسهمها مملوكة بالكامل من قبل الدولة أو أي شخص من أشخاص القانون العام.

٧- تعين كل شركة مخصخصة مفوض مراقبة أساسي لمدة ثلاث سنوات، وتعفى من موجب تعيين مفوض مراقبة إضافي.

المادة ٥- أصول الخصخصة

أ - التجهيزات والمنشآت الموجودة:

للمجلس، تنفيذاً لأحكام قانون الخصخصة (القانون رقم ٢٢٨ تاريخ ٣١ أيار ٢٠٠٠ تنظيم عمليات الخصخصة وتحديد شروطها ومجالات تطبيقها) ولأحكام هذا القانون، أن يقترح خصخصة كل أو بعض النشاطات أو تجهيزات الإنتاج والتوزيع، عن طريق مزايدة أو مناقصة عمومية وفقاً لما يلي:

للحكومة بمرسوم يتخذ في مجلس الوزراء وخلال مهلة أقصاها سنتان من تاريخ إنشاء أية شركة مخصخصة، أن تبيع نسبة لا تتجاوز الأربعين بالمئة (٤٠%) من أسهم كل شركة مخصخصة من مستثمر في القطاع الخاص يتمتع بالخبرة والاختصاص والشهرة في مجال الكهرباء وذلك عبر مزايدة عالمية ووفق دفتر شروط يضعه المجلس الأعلى للخصخصة بعد إستطلاع رأي الهيئة ويقرّه مجلس الوزراء بمرسوم بناء على إقتراح الوزير.

يدعى المستثمر الذي يفوز بالمزايدة الشريك الاستراتيجي، ويتولى هذا الشريك الاستراتيجي إدارة الشركة طالما بقي مالكاً على الأقل لنصف الأسهم التي اشتراها أساساً ومتقيداً بالموجبات المحددة في دفتر الشروط، وطالما بقيت الدولة اللبنانية مالكة لأكثرية أسهم الشركة.

يحدد مجلس الوزراء، بناء على اقتراح الوزير، المواعيد التي تطرح فيها الأسهم الأخرى التي هي ملك الدولة اللبنانية على مستثمري القطاع الخاص.

ب - التراخيص:

للهيئة أن تصدر تراخيص لمدة أقصاها خمسون سنة وفقاً لما يلي:

- عن طريق:
١- إجراء مناقصات عامة للإنتاج بقدرات تتعدى ٢٥ ميغاوات وللتوزيع في مناطق يتجاوز فيها عدد مستهلكي الطاقة الخمسين ألفاً.
٢- إجراء إستدراجات عروض للإنتاج الذي لا يتجاوز ٢٥ ميغاوات وللتوزيع في المناطق التي لا يتجاوز فيها عدد مستهلكي الطاقة الخمسين ألفاً.

ج - شركة النقل:
يبقى نقل الطاقة الكهربائية ملكاً لشركة النقل ويمكن بموجب مرسوم يتخذ في مجلس الوزراء بناء على إقتراح الوزير، إبرام عقود لإدارة أو تشغيل أو تطوير أو تجهيز نشاطات النقل المرتبطة بها إلى القطاع الخاص بما في ذلك أي شركة مخصخصة أو اي شركة يملكها القطاع الخاص.

المادة ٦- صلاحيات ومهام الوزارة
١- تتولى الوزارة، بالإضافة إلى المهام والصلاحيات الأخرى المنصوص عليها في هذا القانون، المهام والصلاحيات التالية:
أ - وضع السياسة العامة للقطاع ووضع المخطط التوجيهي العام ومناقشة الدراسات التوجيهية ووضعها بالصيغة النهائية وعرضها على مجلس الوزراء لإقرارها.
ب - إقتراح القواعد الشاملة لتنظيم الخدمات المتعلقة بإنتاج ونقل وتوزيع الطاقة الكهربائية والإشراف على التنفيذ من خلال التقارير التي ترفعها إليها الهيئة.
ج - إقتراح مشاريع القوانين والمراسيم المتعلقة بقطاع الكهرباء.
د - إقتراح شروط السلامة العامة والشروط البيئية والمواصفات الفنية الواجب توافرها في الإنشاءات والتجهيزات الكهربائية، على أن تصدر بمرسوم يتخذ في مجلس الوزراء بناء على إقتراح الوزير المختص بعد إستطلاع رأي الهيئة والجهات المعنية الأخرى وإصدار التعليمات اللازمة لذلك.
هـ - القيام بالإتصالات اللازمة مع الدول الأخرى لغايات الربط الكهربائي وتبادل الطاقة الكهربائية وإبرام الإتفاقيات اللازمة بعد إجازة مجلس النواب لها بذلك.
و - إتخاذ جميع الإجراءات المتاحة بما فيها تأمين التوزيع وفقاً للقوانين والعقود المبرمة من قبل الدولة لمعالجة أي خلل في أي من نشاطات قطاع الكهرباء من شأنه التأثير سلباً على مصالح هذا القطاع أو على حقوق المستهلكين ومصالحهم.
ز - إقتراح تعيين رئيس وأعضاء مجلس إدارة الهيئة.
٢- تحدد هيكلية الوزارة بموجب قانون خاص يصدر لهذه الغاية.

الفصل الثاني - الهيئة الوطنية لتنظيم قطاع الكهرباء

معدلة وفقا للقانون رقم ٧٧٥ تاريخ ٢٠٠٦/١١/١١
المادة ٧- إنشاء الهيئة
تنشأ بموجب هذا القانون هيئة تسمى "هيئة تنظيم قطاع الكهرباء" تتولى تنظيم ورقابة شؤون الكهرباء وفقاً لأحكام هذا القانون وتتمتع بالشخصية المعنوية وبالإستقلال الفني والإداري والمالي ويكون مركزها في مدينة بيروت. لا تخضع الهيئة لأحكام المرسوم رقم ٤٥١٧ تاريخ ١٩٧٢/١٢/١٣ (النظام العام للمؤسسات العامة).
بصورة مؤقتة، ولمدة سنة واحدة، ولحين تعيين اعضاء الهيئة واضطلاعها بمهامها، تمنح اذونات وتراخيص الانتاج بقرار من مجلس الوزراء بناء على اقتراح وزير الطاقة والمياه

المادة ٨- إدارة الهيئة
١- تتألف الهيئة من رئيس وأربعة أعضاء لبنانيين متفرغين بدوام كامل، يعينون بمرسوم يتخذ في مجلس الوزراء بناء على اقتراح الوزير لمدة خمس سنوات، غير قابلة للتجديد أو التمديد، ممن يحوزون على إجازة جامعية في مجال الكهرباء أو الإلكترونيك أو الاقتصاد أو إدارة الأعمال أو القانون أو المال أو الهندسة ويتمتعون بخبرة في هذه المجالات، ولا يجوز عزل أي منهم أو إنهاء خدمته إلا للأسباب المبينة في هذا القانون.
٢- تعقد الهيئة جلساتها وتتخذ القرارات بالغالبية المطلقة من الأعضاء الذين تتألف منهم الهيئة قانوناً.

المادة ٩- شروط وموانع التعيين

مع مراعاة شروط التعيين المنصوص عليها في المادة الرابعة من المرسوم الإشتراعي رقم ٥٩/١١٢ تاريخ ١٩٥٩/٦/١٢ (نظام الموظفين) بإستثناء شرطي السن والمباراة، لا يجوز تعيين رئيس وأعضاء الهيئة من الفئات الآتية:

١- من له مصلحة مباشرة أو غير مباشرة مع أي شخص يقدم في لبنان أو للبنان خدمات الكهرباء، أو يوفر في لبنان أو للبنان معدات الكهرباء أو معدات المشتركين الخاصة، أو له علاقة بطريقة مباشرة أو غير مباشرة بقطاع الكهرباء في لبنان.
٢- من أعلن توقفه عن الدفع أو أعلن إفلاسه قضائياً.
٣- من صدر بحقه قرار تأديبي قضى بعقوبة غير التنبيه أو اللوم.

المادة ١٠- انتهاء العضوية

١- تنتهي ولاية كل من رئيس وأعضاء إدارة الهيئة بانتهاء الولاية أو بالوفاة أو بالاستقالة أو بإنهاء العضوية أو العزل.
٢- تنهى ولاية الرئيس أو العضو بمرسوم يتخذ في مجلس الوزراء بناء على إقتراح الوزير عند الإخلال الفادح بواجبات الوظيفة أو الإخلال بالشروط المحددة في المادة التاسعة أعلاه، بعد أن تتحقق من ذلك، بناء على طلب الوزير، هيئة مؤلفة من رئيس مجلس القضاء الأعلى، ورئيس مجلس شورى الدولة، ورئيس ديوان المحاسبة بقرار تتخذه بالأكثرية.
٣- في حال شغور مركز الرئيس أو اي من الاعضاء، يقوم مجلس الوزراء بملء الشغور للمدة المتبقية بمهلة شهر واحد على الأكثر ووفقاً لقواعد التعيين المحددة في هذا القانون.
٤- في حال شغور مركز الرئيس ينوب عنه أكبر الأعضاء سناً.

المادة ١١- التعويضات

يتقاضى كل من الرئيس والاعضاء تعويضاً شهرياً مقطوعاً يحدد بمرسوم يتخذ في مجلس الوزراء بناء على اقتراح وزيري الطاقة والمياه والمالية.

المادة ١٢- مهام الهيئة وصلاحياتها

تتولى الهيئة المهام والصلاحيات التالية:

١- إعداد دراسات المخطط التوجيهي العام للقطاع في مجالات الإنتاج والنقل والتوزيع ورفعه للوزير لمناقشته ووضعه بالصيغة النهائية وعرضه على مجلس الوزراء لتصديقه.
٢- إعداد مشاريع المراسيم والأنظمة المتعلقة بتطبيق أحكام هذا القانون وإحالتها إلى الوزير وإبداء الرأي في مشاريع القوانين ومشاريع المراسيم المتعلقة بقطاع الكهرباء.
٣- تشجيع الإستثمار في قطاع الكهرباء والعمل على تحسين كفاءة التشغيل وضمان جودة الخدمات وحسن تأديتها.
٤- تأمين وتشجيع المنافسة في قطاع الكهرباء ومراقبة وضبط التعرفات غير التنافسية وتأمين شفافية السوق.
٥- تحديد وتصنيف مختلف فئات خدمات الإنتاج والنقل والتوزيع التي تعكس بشكل مناسب الفروقات في خصائص إستعمال الكهرباء تبعاً لفئات المستهلكين المختلفة ونوعية الخدمة المعنية وأوقاتها.
٦- تحديد سقف لأسعار خدمات الإنتاج وللتعرفات المطبقة على مختلف خدمات نقل وتوزيع الكهرباء ولبدلات الإشتراك وبدل الخدمات والغرامات وكيفية تحصيلها.
٧- وضع المعايير التقنية والفنية والبيئية وقواعد التثبت من التقيد بها ومراقبة وضبط تطبيقها. تأخذ الهيئة في الإعتبار عند الإطلاع بمسؤولياتها، أفضل المعايير العالمية المتعلقة بتنظيم قطاع الكهرباء.
٨- تحديد قواعد ومعايير التراخيص والأذونات على أن لا تتعارض هذه القواعد والمعايير مع أحكام هذا القانون.
٩- إصدار وتجديد وتعليق وتعديل وإلغاء التراخيص والأذونات. في حال قررت الهيئة تجديد الترخيص أو الإذن على إمكانية التجديد، على الهيئة إبلاغ أصحاب التراخيص والأذونات شروط التجديد قبل سنتين من إنفاذ مهلة الترخيص أو الإذن.
١٠- مراقبة تقيد أصحاب التراخيص والأذونات في مجالي الإنتاج والتوزيع وقطاع النقل بالقوانين والأنظمة والإتفاقيات وشروط التراخيص والأذونات ودفاتر الشروط تأميناً لحسن الخدمة للمشتركين، لا سيما ما يتعلق بأنظمة التعرفات وبوليصة الإشتراك. للهيئة، في حال عدم تقيدهم بما ذكر أعلاه، تطبيق القوانين المرعية الإجراء. وعلى هؤلاء الأشخاص ومؤسسة الكهرباء تزويد الهيئة بالمعلومات والبيانات الفنية والمالية وأي معلومات أخرى تطلبها الهيئة تحقيقاً لأهدافها.
١١- تأمين المساواة بين أصحاب التراخيص والأذونات في الإستفادة من تجهيزات النقل، وفقاً للتعرفات المحددة.
١٢- مراقبة حسن سير خدمات الإنتاج والنقل والتوزيع حتى إيصال التيار الكهربائي إلى المستهلك وذلك بعد التشاور مع الجهات المختصة ومع مراعاة شروط المنافسة الحرة في القطاع وسياسة الحكومة وإستراتيجيتها وشروط

الإتفاقيات والتراخيص والأذونات السارية المفعول وحماية مصلحة المستهلكين وتأمين الإستقرار في قطاع الطاقة الكهربائية وتوازن أسعار الخدمات وذلك وفقاً للقوانين النافذة في هذا الإطار.

١٣- دراسة وإقرار طلبات أصحاب التراخيص والأذونات لتعديل الخدمات المرخص لهم بتقديمها والموافقة عليها عند مواجهة حالات النقص في الإمداد أو العطل في التجهيزات أو في حالة القوة القاهرة.

١٤- وضع تقرير سنوي عن أعمالها يرفع إلى مجلس الوزراء بواسطة الوزير خلال الشهر الثلاثة التي تلي كل سنة مالية وينشر هذا التقرير في الجريدة الرسمية ويتضمن خلاصة عن الإجراءات التي إتخذتها الهيئة تنفيذاً للمهام المنوطة بها، ومدى مساهمتها في تحقيق الأهداف المحددة في هذا القانون.

١٥- العمل كوسيط وكهيئة تحكيمية للبت بالنزاعات الناشئة عن تطبيق أحكام هذا القانون بين اصحاب التراخيص، وكذلك العمل لحل الخلافات ودياً بين أصحاب تراخيص التوزيع وبين المستهلكين.

١٦- إتخاذ أي قرارات أو إجراءات أو أعمال أو مهام أخرى ينص عليها هذا القانون والأنظمة السارية المفعول.

المادة ١٣- النظام الداخلي والأنظمة الإدارية وأنظمة العاملين

تضع الهيئة نظامها الداخلي والأنظمة الإدارية وأنظمة العاملين لديها ويصادق عليها الوزير خلال مهلة ثلاثين يوماً من تاريخ عرضه عليه. وفي حال عدم التصديق ضمن المهلة المحددة، على الوزير أن يحيل النظام إلى مجلس الوزراء لإتخاذ القرار المناسب.

المادة ١٤- الأنظمة المالية والموازنة

١- تتمتع الهيئة بالإستقلال الإداري والمالي، ولا تخضع إلا لرقابة ديوان المحاسبة المؤخرة. وتودع أموالها في حساب خاص يفتح لدى مصرف لبنان.

٢- على أول هيئة وخلال ثلاثة اشهر من تاريخ تأليفها أن تضع نظاماً خاصاً لإدارة هذه الأموال على أن يقترن بمصادقة وزيري الطاقة والمياه والمالية.

٣- تضع الهيئة قبل ثلاثة اشهر على الأقل من نهاية كل سنة مالية موازنة السنة المقبلة تعرضها على الوزير للمصادقة عليها خلال ثلاثين يوماً من تاريخ تسجيلها في الدائرة المختصة في الوزارة. كما تخضع الموازنة لمصادقة وزير المالية وفق الأصول ذاتها.

في حال الخلاف على الموازنة يعرض الأمر على مجلس الوزراء للبت به.

٤- يحق للهيئة اعتباراً من أول كانون الثاني ولغاية المصادقة على موازنتها، أن تجبي الواردات وأن تصرف النفقات على القاعدة الإثني عشرية قياساً على ارقام موازنة السنة السابقة.

المادة ١٥- التمويل

١- تتكون موارد دخل الهيئة من العائدات التالية:

أ - البدلات التي تستوفيها الهيئة عن طلبات الترخيص والأذونات، والبدلات السنوية التي يسددها أصحاب التراخيص والأذونات لقاء مراقبة التراخيص والأذونات والنظر فيها والإشراف عليها وتطبيقها وإطلاع الهيئة بمهامها.

ب - نسبة مئوية على فاتورة إستهلاك الكهرباء لا تتعدى ١ % من قيمتها. تحدد النسبة بمرسوم يتخذ في مجلس الوزراء بناء على إقتراح الوزير بالاستناد إلى تقرير يضعه عن حاجات الهيئة وموازنتها السنوية.

ج - هبات ومساعدات غير مشروطة من مصادر ليس لها مصلحة بصورة مباشرة أو غير مباشرة بقطاع الكهرباء، وذلك بعد موافقة مجلس الوزراء.

٢- بالإضافة إلى العائدات المنصوص عليها أعلاه، يتم تمويل الهيئة إستثنائياً ولمدة أقصاها سنتان من تاريخ تأسيسها، إما عن طريق مساهمات تخصص لها في الموازنة العامة أو عن طريق مساهمات خاصة يقررها مجلس النواب وفقاً لموازنة تضعها الهيئة سنوياً، على أن تموّل جميع أعمال الهيئة وتكاليفها بعد إنتهاء فترة السنتين وفقاً لأحكام الفقرة /١/ من هذه المادة.

٣- يدوّر إلى موازنة السنة التالية للهيئة أي عجز أو فائض سنوي محقق على أن لا يتعدى الفائض المدوّر نسبة عشرين بالماية من موازنة السنة السابقة إلى حساب الخزينة. وللهيئة أن تلحظ في موازنتها إحتياطات ملائمة لأغراضها الخاصة على أن لا تتعدى هذه الإحتياطات نسبة خمسة عشر بالماية من موازنتها السنوية.

٤- يتم تحويل فائض الأموال الناتج عن ممارسة الهيئة لمهامها إلى حساب الخزينة كل سنة.

٥- تخضع حسابات هذه الهيئة لنظام التدقيق الداخلي وللتدقيق المستقل من قبل مكاتب التدقيق والمحاسبة وفقاً لأحكام المادة ٧٣ من القانون رقم ٣٢٦ تاريخ ٢٠٠١/٦/٢٨ (قانون موازنة العام ٢٠٠١).

المادة ١٦- علانية المعطيات

١- بإستثناء ما يمس بالسرية التجارية ومبدأ المنافسة، تضع الهيئة بمتناول الجمهور جميع المعطيات والمستندات والسجلات والبيانات. يحق لكل من يرغب بالإطلاع عليها أو الحصول على نسخ أو صور عنها، أن يتقدم بطلب خطي، على أن تحدد الهيئة البدل المطلوب لذلك بما يتناسب مع الكلفة اللازمة.
٢- تنشر الهيئة عند نهاية كل سنة مالية في الجريدة الرسمية وفي صحفتين محليتين على الأقل بياناً عن وضعية الأصول والموجودات لديها وخلاصة عن موازنتها.

المادة ١٧- قرارات الهيئة
تخضع قرارات الهيئة لمبدأ التعليل، وعلى الهيئة أن تبين في حيثيات القرار المتخذ أسبابه وأهدافه.
لا تصبح قرارات الهيئة نافذة إلا من تاريخ تبليغها أو نشرها معللة في الجريدة الرسمية.

المادة ١٨- طرق المراجعة في القرارات
١- لكل صاحب مصلحة الحق في طلب إعادة النظر في القرارات الصادرة عن الهيئة خلال مهلة شهرين من تاريخ نشرها أو تبليغها. وللهيئة أن تقرر عفواً وخلال مهلة شهرين من تاريخ اصدار القرار، او خلال مهلة شهرين من تاريخ تقديم طلب إعادة النظر، الرجوع عن القرار أو وقف تنفيذه أو إتخاذ أي تدبير مؤقت للحفاظ على واقع الحال وتلافياً لوقوع أي ضرر إلى حين البت بالقرار نهائياً بصورة إدارية أو قضائية.
٢- يتولى مجلس شورى الدولة النظر في المراجعات المتعلقة بالقرارات الإدارية الصادرة عن الهيئة على أن تراعى الأصول والمهل المتبعة أمام هذا القضاء. أما المنازعات بين الهيئة وبين المستخدمين أو العاملين لديها أو المتعاقدين معها فتكون من اختصاص القضاء العدلي. وتراعى البنود التحكيمية عند وجودها في العقود المنظمة مع الغير.

الفصل الثالث - الترخيص والاذن

المادة ١٩- مبدأ المساواة والمنافسة
تأميناً للمساواة وتحقيقاً للمنافسة، تمنح التراخيص والأذونات للذين تتوافر فيهم الشروط والمتطلبات التي تحددها الهيئة، ولا يجوز التمييز أو فرض قيود على توفير الخدمات، كما لا يجوز فرض مثل هذه القيود على تملك أو تشغيل البنى الاساسية اللازمة لتوفير هذه الخدمات.
ويعتبر التقيد بأحكام هذا القانون وبأنظمة الهيئة شرطاً من شروط كل ترخيص يمنح حتى ولو لم يذكر ذلك صراحة في الترخيص.

المادة ٢٠- اجراءات التراخيص والأذونات
١- تتولى الهيئة وضع اصول تقديم طلبات الترخيص والأذونات ومراجعتها.
تصدر بموجب مراسيم تنظيمية، آلية مفصلة لطلب التراخيص والاذونات وشروط منحها وتعليقها والغائها، اضافة إلى بدلات التراخيص، على أن لا تتعارض مع احكام هذا القانون، وعلى أن تراعي الهيئة في وضع هذه الاصول وقبولها للطلبات مقومات الشفافية والتنافسية وذلك وفق معايير تقرر الهيئة اعتمادها وعلى أن تكون هذه المعايير معروفة من الجميع وأن توضع الطلبات في متناول الجمهور لمراجعتها وفقاً لأحكام المادة ١٦ من هذا القانون.
٢- تمنح الهيئة التراخيص بناء على الشروط التالية والشروط الاخرى التي يتم تحديدها بموجب مرسوم يتخذ في مجلس الوزراء:
- الشروط الفنية وشروط السلامة.
- جودة الانتاج والكلفة والاسعار وحماية المستهلك.
- تأمين حماية البيئة.
- برامج التنسيق المتواصل مع قطاعات الانتاج والنقل والتوزيع.
- المواقع الجغرافية للتجهيزات.
- القدرة التشغيلية والمالية لصاحب الترخيص المحتمل.
٣- على الهيئة أن تبت في طلبات الترخيص والاذن خلال ستة اشهر على الاكثر اعتباراً من تاريخ تقديمها لها.
٤- تحدد بقرار من الهيئة مدة الترخيص أو الاذن والتفاصيل اللازمة لتنفيذ البنود الواردة أعلاه.
٥- يتضمن الترخيص الموجبات الاساسية الملقاة على عاتق المرخص له تنفيذاً لأحكام هذا القانون أو التي تحددها الهيئة تحقيقاً لأهدافه، بما فيها الرسوم وتزويد الهيئة بالمعلومات والخضوع للتفتيش، ومدة الترخيص وشروط انهائه أو تجديده، على أن يتضمن الترخيص شروطاً واضحة تضمن استمرار الخدمة عند انتهاء الترخيص.

٦- لا يجوز لأي شخص توفير أو تقديم خدمة من خدمات الكهرباء إلا وفق احكام هذا القانون والأنظمة التي تضعها الهيئة تنفيذاً لهذه الاحكام. كل مخالفة، بما في ذلك توفير خدمة خاضعة للترخيص من دون الحصول على الترخيص، تعرض مرتكبها للعقوبات المنصوص عليها في المادة التاسعة والثلاثين من هذا القانون.

المادة ٢١- الامتيازات الممنوحة
تبقى سارية المفعول الامتيازات الممنوحة قبل صدور هذا القانون وفقاً لأحكام قوانينها الخاصة.

المادة ٢٢- المعدات والمقاييس والشروط التقنية
١- تحدد الهيئة المقاييس والشروط التقنية الواجبة التطبيق على كافة معدات الكهرباء لضمان عدم الحاق أي ضرر بالشبكات أو بالصحة العامة أو بالسلامة العامة أو بالبيئة. ويتعين على كل مرخص أو مأذون له بموجب هذا القانون أن يلتزم بالمقاييس والشروط التقنية كافة التي تضعها الهيئة.
٢- للهيئة أن تشترط موافقتها على انواع معدات الكهرباء المتعلقة بالانتاج والتوزيع قبل بيعها او تشغيلها في لبنان، لضمان عدم الحاق أي ضرر بالصحة العامة أو بالسلامة العامة أو بالبيئة أو بالشبكات. كما يحق للهيئة أن تحدد مقاييس عامة أو خاصة للاداء أو العمل المنسجم والترابط لمختلف فئات المعدات، ولضمان انطباق مواصفاتها مع احكام هذا القانون والقواعد التي تضعها الهيئة تطبيقاً لأحكامه.
للهيئة أن تستعين بالمسؤولين عن الصحة العامة أو بالسلامة العامة وبالمصنعين لتحديد شروط الموافقة على أنواع المعدات، كما لها أن تلجأ إلى أكثر من مجموعة استشارية صناعية لتجربة المعدات وتطويرها وتحديثها.

المادة ٢٣- انتقال والغاء التراخيص والاذونات
١- لا يجوز لصاحب الترخيص أو الاذن التنازل عن الترخيص أو الاذن إلى أي شخص آخر، إلا بعد الحصول على موافقة الهيئة المسبقة وعلى أن يكون الانتقال أو التنازل متوافقاً مع احكام هذا القانون والانظمة الصادرة تطبيقاً له.
٢- يحق للهيئة أن تعلق العمل بالترخيص أو الاذن او تلغيه أو تنهيه في الحالات التالية:
- التخلف المتكرر عن التقيد باحدى الموجبات الملقاة على عاتقه ضمن المهلة المحددة من الهيئة.
- الخرق المتعمد لشروط الترخيص أو الاذن أو لاحكام هذا القانون والانظمة الصادرة تطبيقاً له.
- اعلان تصفية صاحب الترخيص أو الاذن.
- بطلب من صاحب الترخيص أو الاذن.
- في حال افلاس صاحب الترخيص أو الاذن أو عجزه عن تنفيذ موجباته.
- في حال الاستحصال على الترخيص أو الاذن بواسطة الغش.
- في حال الغاء أي ترخيص أو اذن، يتوجب على الهيئة أن تتخذ التدابير اللازمة من اجل تأمين تزويد المستهلكين بالكهرباء بصورة منتظمة.

الفصل الرابع - الانتاج والنقل والتوزيع

أولاً: الانتاج

المادة ٢٤- تعريف الانتاج
الانتاج هو كل نشاط يؤدي إلى توليد الطاقة الكهربائية محلياً، وهو على نوعين:
١- الانتاج العام، وهو المعد للبيع.
٢- الانتاج الخاص، وهو المعد لاستعمالات الجهة المنتجة الخاصة.

المادة ٢٥- الطاقة ذات المصدر النووي
ان الطاقة ذات المصدر النووي غير خاضعة لأحكام هذا القانون.

المادة ٢٦- انتاج للاستعمال الخاص بقوة وتقل عن ١,٥ ميغاوات
لا يخضع انشاء تجهيزات انتاج للاستعمال الخاص بقوة تقل عن ١,٥ ميغاوات لشرط الاذن، على أن تراعى مقتضيات البيئة والصحة العامة والسلامة العامة، وذلك بناء لمعايير محددة تصدر بقرارات عن الهيئة بعد استطلاع رأي وزارة البيئة والادارات والمؤسسات المعنية.

ثانياً: النقل

المادة ٢٧- تعريف النقل
تبدأ شبكة النقل من مخارج النقل في معامل الانتاج وتنتهي عند مخارج خلايا التوتر المتوسط في محطات التحويل الرئيسية. وهي تتألف من خطوط هوائية وكابلات مطمورة ومحطات تحويل رئيسية ومحولات وسواها من العناصر الكهربائية ذات التوتر العالي، ومن أي منشآت اخرى تساهم في تنفيذ مهام النقل وعمليات الربط الدولية مهما كان توترها، كما تشمل شبكة النقل جميع عناصر الوصلات والحماية والاتصالات والرقابة والمركز الوطني للتحكم وغيرها من الخدمات والاراضي والمباني وسوى ذلك مما هو لازم لحسن استثمار منشآت شبكة النقل سواء أكانت كهربائية أم غير كهربائية.

المادة ٢٨- صلاحيات شركة النقل
تكون شركة النقل مسؤولة عن دراسة واقتراح وتملك وتوسيع شبكات النقل ومحطات التحويل الرئيسية وادارة وتشغيل وصيانة النظام الوطني للتحكم والمراقبة لنقل الطاقة، بما في ذلك التنسيق بين الانتاج والنقل والتوزيع على ألا تحول هذه الصلاحيات دون ابرام العقود المنصوص عليها في المادة الخامسة من هذا القانون.
تعمل شركة النقل على تلبية طلبات شركات الانتاج والتوزيع لتصريف الطاقة المنتجة والمطلوبة التي تحددها الهيئة بالاستناد إلى مصادر الطاقة المختلفة. تؤمن شركة النقل استمرارية تزويد المستهلكين بالطاقة الكهربائية ولا سيما بعد صدور المرسوم الخاص به ووضعه موضع التنفيذ ضمن اطار النظام الوطني للتحكم كما تقوم أيضاً بالتنسيق بين شركات الانتاج والتوزيع.
يتوجب على شركة النقل أيضاً تأمين المساواة بين أصحاب التراخيص والاذونات في الاستفادة من تجهيزات النقل، وفقاً للتعريفات التي تحددها الهيئة.

المادة ٢٩- المعايير الفنية
تحدد الهيئة في ضوء احكام هذا القانون المعايير الفنية الدنيا الواجب توافرها في تصميم واستثمار ربط الشبكة بمنشآت الانتاج والتوزيع وبتجهيزات المستهلكين.
توضع هذه المعايير بشكل يؤمن القدرات العملانية المتبادلة ((Inter - Opérabilité لشبكة النقل بصورة موضوعية ومجردة.

المادة ٣٠- واجبات شركة النقل
على شركة النقل تأمين تدفق الطاقة على شبكتها، وعليها تأمين سلامة الشبكة وضمان فاعلية واستمرارية عملها والسهر على جهوزية الخدمات المساعدة كافة.
تلتزم شركة النقل بموجب المحافظة على سرية المعلومات التجارية الحساسة التي تطلع عليها في معرض تنفيذ مهامها (الكلفة، السعر، الخسارة الفنية، الشركاء....).

ثالثاً - التوزيع

المادة ٣١- تعريف التوزيع
يبدأ التوزيع عند مخارج كل محطة تحويل، التي يتم فيها تخفيض الفولتاج إلى ٢٤ ك.ف. وما دون.
تتألف شبكة التوزيع من خطوط التوتر المتوسط والتوتر المنخفض الهوائية والمطمورة ومحطات التوزيع وسواها من العناصر الكهربائية (موجودات غرف العدادات ووصلات المشتركين وكل أجهزة التعداد والقطع) الواقعة ضمن نطاق التوزيع الجغرافي.

المادة ٣٢- مهام التوزيع
تتضمن مهام التوزيع:
١- تجهيز وتمديد شبكات التوتر المتوسط والمنخفض الهوائية والمطمورة، وتجهيز محطات التوزيع والمخارج الارضية والهوائية من محطات التوزيع حتى أبنية المشتركين والانارة العامة، واستعمال اجهزة متطورة للتعداد والقراءة عن بعد وتنظيم الفواتير.
٢- تلقي طلبات الزبائن وتلبيتها وفقاً للأصول ولبوالص الاشتراك.
٣- ايصال التيار الى المشتركين في اسرع وقت ممكن.
عند حصول عجز في تزويد شركة التوزيع للمستهلكين بالتيار، يعود لها القيام بتزويد المستهلك كمرجع أخير.

٤- صيانة شبكات ومحطات التوزيع ووصلات المشتركين وغرف العدادات وأجهزة التعداد والقطع.
٥- تأمين عملية التركيب والصيانة والضبط الدوري لعدادات المشتركين الموصولة بالشبكة وقراءة العدادات والفوترة والجباية.
٦- ضبط المخالفات والتعديات على الشبكة وإزالتها وفقاً للأنظمة والقوانين المرعية الإجراء دون أن تترتب أية مسؤولية على شركة التوزيع في حال قطعه تزويد المستهلك من الشبكة بسبب تمنعه عن تسديد قيمة الخدمات المقدمة على أن يحترم من أجل تطبيق هذا البند، فترة سماح تحددها شركات التوزيع وبموافقة الهيئة. يكون المستهلك المخالف مسؤولاً عن تسديد كلفة إعادة وصله بالشبكة وعن قيمة الطاقة الكهربائية المستهلكة وفقاً لقراءة العدادات والتي تتوافق مع الأنظمة التي تضعها الهيئة.
٧- إجراء العمليات والمناورات بواسطة غرفة عمليات وتأمين سلامة الشبكة والعمل والوقاية البيئية.
٨- تأمين الحق لكل مستهلك في الإستفادة من شبكة توزيع بدون أي تمييز. وتكون شركات التوزيع ملزمة بتأمين التوزيع وإيصال الكهرباء إلى المكان المحدد وفقاً للشروط المذكورة في العقد الموقع مع المستهلك وشروط الترخيص وأحكام هذا القانون، بالإضافة إلى الأنظمة التي تضعها الهيئة.
٩- تأمين التوزيع بدون أي تأخير أو تمييز غير مبرر، وذلك بتمديد وتوسيع شبكتها ليتم وصلها مع أصحاب تراخيص آخرين ومع مستهلكين، تبعاً للمتطلبات المتعلقة بالمساهمات المالية اللازمة لبناء هذه التجهيزات والتي يمكن للهيئة الموافقة عليها من وقت إلى آخر.
١٠- للهيئة أن تمنح ترخيصاً غير حصري لأي طالب ترخيص بغية توفير خدمة مشمولة بالحق الحصري للشركة، إذا تخلفت الشركة عن توفير هذه الخدمة في منطقة أو أكثر، بعد انذارها خطياً.
تقوم شركات التوزيع بالتخطيط والعمل وصيانة وتطوير شبكة التوزيع لديها كي تتكيف بطريقة مناسبة مع الزيادات المتوقعة في الطلبات على خدمات الكهرباء.
تناط بشركات التوزيع الصلاحيات والحقوق ذاتها المناطة بمؤسسة الكهرباء بموجب القوانين والأنظمة المرعية الإجراء.

الفصل الخامس - الحسابات والتعرفات

المادة ٣٣- الحسابات
١- يحق للهيئة الإطلاع على حسابات شركات الإنتاج والنقل والتوزيع، ولها أن تستعين بمن تشاء للتدقيق في حسابات تلك الشركات.
٢- على المؤسسات والشركات والأشخاص العاملين في قطاع الكهرباء تنظيم حساباتهم السنوية وتدقيقها ونشرها وفقاً للقوانين والأنظمة النافذة أو أي أنظمة إضافية موضوعة من قبل الهيئة.
٣- على المؤسسات والشركات والأشخاص العاملين في قطاع الكهرباء أن يمسكوا حسابات مستقلة لكل من نشاطاتهم أكانت عائدة للإنتاج أو النقل أو التوزيع أو غيرها من النشاطات الأخرى الخارجة عن قطاع الكهرباء.

المادة ٣٤- التعرفات
مع مراعاة أحكام المادة الثانية عشرة من هذا القانون لجهة تحديد سقف لأسعار خدمات الإنتاج، تصبح أسعار بيع الإنتاج متداولة بحرية من قبل الفرقاء المعنيين ضمن حدود هذا السقف بعد فترة يحددها مجلس الوزراء بموجب مرسوم يصدر بناء لتوصية الهيئة، وتوافق الهيئة على تعرفات النقل والتوزيع آخذة في الاعتبار بشكل خاص:
١- عناصر الكلفة.
٢- متوسط الأسعار المعتمدة عالمياً.
٣- فئة المستهلكين.
٤- طبيعة و / أو نوعية الخدمات المقدمة.
٥- أوقات الإستهلاك

الفصل السادس - إجراءات المراقبة والتفتيش وفرض العقوبات

المادة ٣٥- مستخدمو المراقبة والتفتيش
يتضمن ملاك الهيئة جهازاً خاصاً بالمراقبة والتفتيش يعتبر أفراده ضابطة عدلية متخصصة في قطاع الكهرباء، وتتمتع المحاضر التي ينظمها هؤلاء بالقوة الثبوتية لمحاضر الضابطة العدلية، كما يمكن للنيابات العامة وقضاة التحقيق الاستعانة بهم في جمع الأدلة وإجراءات التحقيق في القضايا المعروضة أمامهم، شرط أن يكونوا قد أدوا اليمين القانونية أمام محكمة الاستئناف المدنية قبل مباشرة العمل.

المادة ٣٦- إجراءات المراقبة والتفتيش

١- تضع الهيئة نظاماً يخضع لمصادقة الوزير تحدد فيه قواعد المراقبة والتفتيش مع مراعاة أحكام القوانين والأنظمة النافذة، وتنظم برامج عمل دورية للمراقبين والمفتشين، كما تصدر تلقائياً أو بناء على إخبار وارد إليها أوامر طارئة للمراقبة والتفتيش.

٢- للمراقب أو المفتش أثناء قيامه بالمهام المكلف بها رسمياً، وكلما تطلب تنفيذ المهمة ذلك، دخول جميع الأماكن العامة أو الخاصة، ومعاينة او طلب أية معلومات عن الإنشاءات والتجهيزات القائمة أو التي كان من الواجب إقامتها، والإطلاع على السجلات والوثائق والمستندات وله أن يأخذ نسخاً أو مقتطفات عنها، وأن يطلب إبراز أي مستند أو تقديم أية معلومات يراها مفيدة.

تطبق في حالات الدخول عنوة وتنظيم محاضر ضبط عند وجود أدلة ترجح حصول مخالفة الأحكام المنصوص عليها في قانون أصول المحاكمات الجزائية وكذلك الأصول المتبعة لعمل الضابطة العدلية.

٣- تعتبر المعلومات التي يطلع عليها المراقبون والمفتشون في معرض تنفيذهم لمهامهم سرية ولا يجوز لهم البوح بها إلا أمام رؤسائهم التسلسليين أو بناء على طلب المرجع القضائي المختص. كما تطبق أحكام السرية على كل من يطلع على هذه المعلومات بحكم عمله في الهيئة أو الوزارة.

٤- يعاقب كل من يقدم للمراقبين أو المفتشين سجلات أو مستندات أو يدلي أمامهم بمعلومات يتبين أنها غير صحيحة، بجرائم التزوير والإدلاء بشهادة كاذبة.

المادة ٣٧- الإنذار والحل الودي

للهيئة أن تقرر، بعد التثبت من حصول مخالفة، توجيه إنذار إلى المخالف أو المخالفين بوجوب إزالة المخالفة بمدة أقصاها ثلاثون يوماً وفق التعليمات التي تصدرها الهيئة لفرض التقيد بأحكام القانون وشروط الترخيص، قبل اللجوء إلى فرض العقوبة المناسبة.

وللهيئة أن تدعو المخالف أو المخالفين وكل من له علاقة بالمخالفة أو من تضرر منها، إلى جلسة خاصة للاتفاق على حل ودي يؤدي إلى إزالة المخالفة والتقيد بشروط الترخيص وأحكام القانون والتعويض عن الأضرار اللاحقة بالهيئة أو بالغير.

المادة ٣٨- فرض العقوبات

١- للهيئة أن تقرر، بعد التثبت من ارتكاب أية مخالفة لأحكام هذا القانون أو لشروط الترخيص أو الأنظمة الصادرة تطبيقاً له، وبعد توجيه الإنذار والدعوة إلى جلسة للوصول إلى حل ودي أو من دون اللجوء إلى هاتين الوسيلتين، أن تفرض العقوبات المحددة في المادة التاسعة والثلاثون من هذا القانون.

٢- تقبل قرارات الهيئة المتعلقة بفرض العقوبات الطعن أمام محكمة الاستئناف الناظرة بالقضايا الجزائية في محل إقامة المحكوم عليه، وفي حال تعدد المحكوم عليهم بمخالفة واحدة أو بمخالفات متلازمة، تطبق الأحكام العامة للصلاحية القضائية في تلازم الجرائم.

تبقى قرارات الهيئة نافذة ما لم تقرر محكمة الإستئناف وقف التنفيذ.

المادة ٣٩- العقوبات

للهيئة أن تفرض واحدة أو أكثر من العقوبات المبينة أدناه، تبعاً لجسامة المخالفة ولظروف كل حالة:

١- تعديل شروط الترخيص أو فرض شروط جديدة على الترخيص بما يؤمن إزالة المخالفة وتنفيذ أحكام هذا القانون.

٢- وقف الترخيص لمدة محددة أو إلغاؤه بصورة نهائية، وحرمان المخالف من الحصول على أي ترخيص مؤقت أو بصورة نهائية، عند تكرار المخالفة أو ارتكاب مخالفة جسيمة يعود للهيئة تقديرها.

٣- فرض الغرامة التي يعود تقديرها للهيئة في ضوء جسامة المخالفة أو تكرارها على أن يؤخذ بالاعتبار عند فرض الغرامة أصول الشخص الطبيعي أو المعنوي المخالف الواردة في بيان الميزانية، وقيمة المعدات والتجهيزات المستخدمة، والواردات المقدر تحقيقها بسبب المخالفة على أن لا تتعدى الغرامة ربع (١/٤) القيمة الإجمالية لأصول الشخص الواردة في ميزانيته. ويحق للهيئة فرض غرامة إضافية عن كل يوم تأخير في إزالة المخالفة المستمره.

٤- تتولى وزارة المالية إستيفاء مقدار الغرامات المقررة.

المادة ٤٠- الملاحقة القضائية

لا تحول الإجراءات التي تتخذها الهيئة دون الملاحقة الجزائية أمام المحكمة المختصة إذا كانت المخالفة تشكل جرماً معاقباً عليه بموجب أحكام القوانين النافذة، إلا إذا كان الجرم يشكل اعتداء على حق الغير وتمت المصالحة في شأنه بموجب حل ودي رعته الهيئة.
إذا قررت المحكمة المختصة مصادرة التجهيزات أو المعدات المستخدمة في المخالفة، اعتبرت المصادرة لصالح الهيئة وتباع بالمزاد العلني لمصلحة الخزينة.

المادة ٤١- حل النزاعات
١- تفصل الهيئة، بناء على الشكاوى المقدمة إليها، في المنازعات القائمة في ما بين مقدمي خدمات الكهرباء، أو تلك القائمة بينهم وبين المشتركين لديهم أو المستفيدين من خدماتهم، وتراعى أحكام المادتين ٣٩ و ٤٠ في محاولة الوصول إلى حل ودي واحترام حقوق الدفاع عند الفصل في النزاع.
٢- تقبل قرارات الهيئة بفصل النزاع الطعن أمام محكمة الاستئناف المدنية المختصة للفصل في موضوع النزاع.
لا تقبل قرارات محكمة الاستئناف أي طريق من طرق المراجعة العادية أو غير العادية.
٣- يبقى للهيئة سلطة توجيه الإنذار أو الدعوة للوصول إلى حل ودي أو فرض العقوبة المناسبة، وفق أحكام المواد السابقة، إذا تبين لها أثناء النظر في الشكوى حصول مخالفة لشروط الترخيص أو لأحكام هذا القانون والأنظمة الصادرة تطبيقاً له.

<u>الفصل السابع - أحكام مختلفة</u>

المادة ٤٢- حماية البيئة والمواقع المصنفة
يجب مراعاة الأحكام القانونية والتنظيمية، المتعلقة بحماية البيئة والسلامة العامة والمواقع الأثرية والسياحية المصنفة، في جميع أنظمة الكهرباء المتعلقة بإستخدام الأملاك العامة والخاصة وفي التراخيص والأذونات الممنوحة.

المادة ٤٣- شروط إستخدام الأملاك العامة والخاصة
يستفيد ويخضع أصحاب التراخيص الذين يقدمون خدمات التوزيع، من أحكام المراسيم السارية المفعول والتعديلات التي قد تطرأ عليها أو أي مراسيم جديدة تصدر لهذه الغاية بعد تاريخ نفاذ هذا القانون، وذلك لجهة إستخدام الأملاك العامة والخاصة وفي كل ما لا يتعارض مع أحكام هذا القانون ومراسيمه التطبيقية.

المادة ٤٤- إستملاك العقارات
في حال لم يتمكن أصحاب التراخيص من شراء العقارات الخاصة رضائياً من أجل البناء أو التشغيل أو الصيانة أو تمديد شبكات التوزيع، يمكن لأصحاب التراخيص أن يستدعوا الهيئة كي تطلب من الوزير المختص إقتراح إقرار المنفعة العامة وإستملاك العقارات التي يحتاجها أصحاب التراخيص من أجل القيام بعملهم على أن لا تستغرق معاملات الإستملاك أكثر من ستة اشهر وتطبق بهذا الخصوص الأصول المتبعة في قانون الإستملاك. يسدد صاحب الترخيص الذي يطلب الإستملاك لحسابه ومصلحته تعويضات الإستملاك كما تحددها لجان الإستملاك ويسجل العقار المستملك في السجل العقاري بإسم الدولة اللبنانية مع إعطاء حق إنتفاع عليه من دون مقابل لمصلحة صاحب الترخيص ما دام هذا الترخيص قائماً.
ويكون للهيئة بمفهوم هذه المادة صفة الإدارة العامة من أجل الطلب من الوزير المختص إقتراح على مجلس الوزراء إعلان المنفعة العامة ومباشرة وإنهاء معاملات الإستملاك.

المادة ٤٥- أوضاع الموظفين والاجراء والمتعاقدين والمستخدمين لدى الوزارة المعنيين بقطاع الكهرباء والمؤسسة
<u>**أولاً:**</u> المرحلة الإنتقالية:
١- خلال فترة ثلاثة أشهر من تاريخ نشر هذا القانون في الجريدة الرسمية تستصدر الوزارة المراسيم التنظيمية العائدة لها والمحددة لملاكاتها ويجري إلحاق الموظفين والعاملين لدى الوزارة، المعنيين بقطاع الكهرباء، والمؤسسة الذين تحتاجهم ممن تتوافر لديهم الشروط النظامية ويتم نقلهم إلى الملاكات الجديدة وفقاً للأحكام التي تنص عليها المراسيم التنظيمية المذكورة.
٢- أما بالنسبة للهيئة والشركات التي يمكن أن تؤسس فيجري خلال فترة ثلاثة أشهر من تاريخ تعيين الهيئة أو تأسيس الشركة، تحديد شروط إختيار حاجة كل منهما إلى موظفي الوزارة وسائر العاملين فيها، المعنيين بقطاع الكهرباء، وفي المؤسسة وذلك بالتنسيق مع وزير الطاقة والمياه على أن تسوى أوضاع أصحاب العلاقة وفقاً للأحكام المذكورة في الفقرة - ثانياً - من هذه المادة.

٣- يمكن لأي من الموظفين والعاملين في الوزارة المعنيين بقطاع الكهرباء وفي المؤسسة أن يطلب إنهاء خدمته خلال فترة تبدأ من تاريخ نشر هذا القانون في الجريدة الرسمية وتنتهي بعد ستة أشهر من تاريخ تعيين إدارتي الهيئة والشركة ويعطى الموظف أو العامل الذي تقبل إستقالته أصولاً في هذه الحالة تعويضاً إضافياً يوازي مجموع رواتبه وتعويضاته عن ثلاثين شهراً على ألا يقل عن ثلاثين مليون ليرة لبنانية ولا يزيد عن مئتي مليون ليرة لبنانية، إذا كان قد مضى على خدمته أكثر من خمس سنوات. أما إذا لم يكن قد مضى عليه مدة الخمس سنوات، فيعطى تعويضاً إضافياً يوازي راتب شهرين عن كل سنة خدمة على ألا يقل عن / ٣٠ مليون ل.ل . / ثلاثين مليون ليرة لبنانية ولا يزيد عن / ٥٠ مليون ل.ل. / خمسين مليون ليرة لبنانية.
لا يجوز الرجوع عن طلب الإستقالة بعد تسجيله لدى الإدارة المختصة.

ثانياً: تسوية أوضاع الموظفين والعاملين:
تسوى أوضاع موظفي الوزارة وسائر العاملين فيها المعنيين بقطاع الكهرباء وأوضاع العاملين في المؤسسة وفقاً لما يأتي:
أ - في ما يخص موظفي الوزارة المعنيين بقطاع الكهرباء:
١- في حال البقاء في الملاك الجديد للوزارة تبقى أوضاعهم الوظيفية على حالها ولا سيما لجهة رواتبهم ورتبهم.
٢- في حال إختيارهم للعمل في الهيئة، يوضعون خارج الملاك ويلحقون بها وذلك وفقاً للأحكام المتعلقة بالوضع خارج الملاك المنصوص عليها في نظام الموظفين ودون الحاجة إلى تجديده سنوياً على أن لا تقل قيمة تعويضاتهم عن قيمة الرواتب التي كانوا يتقاضونها سابقاً.
٣- في حال إختار الموظف الإلتحاق بأي من الشركات وموافقة هذه الشركات على ذلك تصفى حقوقه وفقاً لأحكام هذا القانون. وينظم له عقد وفقاً للأنظمة المعتمدة من قبل الشركات.
٤- في الحالات الأخرى:
- يجري نقلهم إلى وظائف في ملاكات الإدارات العامة وفقاً لأحكام نظام الموظفين التي ترعى النقل من ملاك إلى ملاك.
- أما الذين لا يتسنى نقلهم فيوضعون بتصرف الوزارة ويستمرون بقبض رواتبهم وتعويضاتهم وتدرجهم حتى بلوغهم السن القانونية، ويعود لمجلس الوزراء أو الوزراء المختصون، في أي وقت، تكليفهم بأي مهمة في الإدارات العامة أو المؤسسات العامة ويتقاضون رواتبهم في هذه الحالة من الجهة المكلفين العمل لديها، على أن يعمل مجلس الخدمة المدنية خلال هذه المدة على نقلهم إلى وظائف شاغرة في ملاكات الإدارات العامة وفقاً لأحكام نظام الموظفين، وكلما أمكن ذلك.
ب- في ما يخص الأجراء والمتعاقدين في الوزارة المعنيين بقطاع الكهرباء والمستخدمين والمتعاقدين في المؤسسة:
١- في حال تمّ إختيارهم للعمل في الهيئة وقبولهم بذلك، يجري ضم خدماتهم السابقة لدى الصندوق الوطني للضمان الإجتماعي إلى خدماتهم اللاحقة. على أن لا تقل قيمة تعويضاتهم الشهرية عن قيمة الأجور والتعويضات التي كانوا يتقاضونها.
٢- أما في حال إختيارهم من قبل أي من الشركات للعمل لديها وقبولهم بذلك تطبق عليهم أحكام القوانين المرعية الإجراء.
٣- في كل الحالات الأخرى تطبق عليهم أحكام الفائض المرعية الإجراء بتاريخ صدور هذا القانون، ووفقاً للأحكام المطبقة في مؤسسة كهرباء لبنان وكهرباء قاديشا فيما يتعلق بتعويض نهاية الخدمة.

المادة ٤٦- حقوق البلديات لدى مؤسسة كهرباء لبنان وشركة قاديشا
عند تخصيص قطاع الكهرباء كلياً أو جزئياً تتحمل الخزينة مسؤولية رصيد أموال البلديات المتوجبة بذمة مؤسسة كهرباء لبنان وكهرباء قاديشا، وتقوم وزارة المالية فور إنتهاء عمليات الخصخصة بدمج هذه الأرصدة وتوزيعها مع حصة كل بلدية من الصندوق البلدي المستقل وذلك حسب المبالغ المتوجبة لكل بلدية من البلديات في ذمة مؤسسة كهرباء لبنان أو شركة قاديشا.

المادة ٤٧- دقائق تطبيق القانون
تحدد دقائق تطبيق هذا القانون بمراسيم تتخذ في مجلس الوزراء بناء على إقتراح الوزير.

المادة ٤٨- المرحلة الإنتقالية
تبقى جميع الأحكام القانونية والتنظيمية المعمول بها قبل نفاذ هذا القانون سارية المفعول إلى أن يصبح القانون نافذاً.

المادة ٤٩ ـ نفاذ القانون
يعمل بهذا القانون فور نشره في الجريدة الرسمية.

بعبدا في ٢ أيلول ٢٠٠٢
الامضاء: اميل لحود

صدر عن رئيس الجمهورية
رئيس مجلس الوزراء
الامضاء: رفيق الحريري

رئيس مجلس الوزراء
الامضاء: رفيق الحريري

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