The Electricity Problem and Achieving Self-Sufficiency*

First we must point out to the obvious fact known to any observer who is concerned with the availability of conditions of a modern life in societies.

The availability of electricity is a prerequisite in the life of communities. Electricity is necessary for lighting, heating and cooling, etc. The use of electrical power permeates the various means of industrial and financial production, and the provision of education services, hospitalization, communications and even traffic control.

As for water, there is no healthy human life without the availability of sufficient quantities of it, be that for drinking or food preparation, in addition to securing the agricultural seasons, the activity of some industries, and the cleanliness of the environment surrounding every society.

Our topic is limited to the electricity problem. But before we delve into it, we would like to cover the problem of water albeit in passing, by pointing out that water pollution, the wear-out of distribution networks, bad water management, are all factors that damage the lives of the Lebanese people and their future to a greater extent. Worst of all is the fact that among all Middle Eastern countries, we are the only one which is blessed with a lot of rainfall. If only we recognize and implement policies to benefit from the rainfall and prevent the wastage of a large portion of it right into the sea, as well as not continue to allow the contamination of a high percentage of the water available above- and underground, we would be better off.

Realistic indicators for electricity

- Lebanon requires the availability of 3000 MW (MW) of power to meet all the needs of households, offices, banks, financial markets, schools, hospitals, etc.

- We can say that the output of the functioning power plants, even if it falls below their theoretical capacities, does not exceed 1200 MW. In addition, the energy available from two ships contracted to generate electricity until 2017 at a cost of 22-25 cents per kilowatt/hour, is equivalent to 270 MW.

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- Despite the said facts pertaining to the power plants, and the additional supply from both ships, Lebanon's shortage of electricity needs became dependent on being filled by private generators. These range from the small operating generators for apartments and homes to generators with high power to provide electricity to factories, schools, and hospitals, when the supply of the national institution Electricité du Liban (EDL) intermittently goes off. By virtue of their nature and power, these generators need quantities of fuel oil to produce each kilowatt per hour which exceed by 20% the required quantity in production plants, thus participating in pollution to a great extent, and leading to the import of fuel oil, which increases the pressure on the Balance of Payments.

- Electricity is rarely interrupted because the power of private generators has become closer to, or greater than, energy production plants. However, providing electricity from private generators casts a burden on the family budget estimated at the following costs:

550 thousand families in Lebanon, of which 300 thousand families with limited income and which expenditure on electricity from private generators is equivalent to 100 American dollars monthly, i.e.	$ 360 million annually
150 thousand well-off families spend on electricity purchases from generators around 200 American dollars monthly, i.e.	$ 300 million annually
Relatively wealthy families estimated at 50,000 families spend on these purchases a sum equivalent to 300 American dollars, i.e.	$ 150 million annually
Destitute families take electricity illegally and use firewood for lighting and coal for heating and do not need electricity from EDL	-
20 thousand industrial, service, educational, recreational enterprises with monthly costs between 1000/USD and 2000/USD. Their expenditure is obligatory, in order to run their businesses	Between $ 50 and 100 Million annually
As a result: The compensatory spending by 90 percent of Lebanese families and 90 percent of institutions to obtain electricity from	Around $ 900 million annually

- We estimate private generators to be providing 1200 MW, and this number is increasing. This required so far the operators and owners of these generators to spend two billion dollars for their purchase, for equipping them to be linked to the set distribution networks, and for ensuring protection from their noises and harmful emissions (in rare cases).

Suffice it to say (knowing that it is too late), that if such an expenditure level, in addition to the rent of the two ships for three years, would have been invested in proper power generation, it would have provided power equivalent to 3000 MW operating on gas, and made $ 600-800 million savings for Lebanon annually, even after the fall in oil prices. It would have also saved the country a large percentage of the pollution resulting from the presently aging power plants and thousands of private generators.

- It has become known that the production of the outdated factories and the rented ships is being technically wasted, due to the outdated distribution network and failure to equip the power transportation network fully with the 220 Volt such as the case of the Mansourieh extension. Thus 15-17 percent is wasted due to the network's deficiency, and another 40 percent due to theft along its way. Consequently, collection of half of the issued electricity bills is not possible. It should be noted that the bills paid by the subscriber in January 2016 are for the consumption of that month for the year 2015, and the subscriber might have passed away.

- Since 1996, the need to establish new production plants using natural gas in the first place became evident. Prime Minister Hariri conducted several meetings with the State of Qatar to establish an installation to receive liquid natural gas and then gasify it (to transform it again to natural gas) in order to operate the Al Zahrani and Deir Ammar power plants. The Lebanese Government agreed with the manufacturing company of the two plants to produce 450 MW each, provided that they would be capable of using natural gas or diesel in their power generation operations.

At that time, the Qataris were prepared to agree with Lebanon on deliveries sufficient to both power plants, for a price equivalent to 2 dollars per each 1000 square foot. Each 6000 square feet are thermally equivalent to the power of one oil barrel; in other words, the cost on us was equivalent to 12 dollars per oil barrel, whereas we had been paying since 1998 (the year the gas reception facility would have been established) more than 20, 30 and 50 dollars for each oil barrel that would be refined as diesel. Further, that cost was liable to increase by 20 percent due to the costs of refining and shipping to Lebanon, as the two available oil refineries in Lebanon had ceased operations since the late 1970s.

The consumption of both plants, if they had been operated at their full capacity (which could not be achieved due to the high cost of diesel) would have been at 1-1.2 million tons annually i.e. 7.25 million or 9 million oil barrels. The annual savings since 1999 to date would have been equivalent to an average of $ 40-60 per barrel, i.e. $ 300-540 million. If we calculate this savings over the span of the past sixteen years, it would be equivalent to $ 8.64 billion. Thus, after accounting for the debt interests, we would have been able to restrict the electricity's deficit to $ 10 billion, instead of the actual $ 20-21 billion which make for 30% of the public debt.

If the electricity had been available from power plants using gas, and had we amended the electricity bill's tariff and concluded the deal, especially since the proposals to amend the bill were presented, we could have overcome any electricity deficit, and we could most importantly have curtailed the phenomenon of electricity theft that had proliferated since the civil war years.

The question is why were we not able to agree with Qatar at that time? The answer, of course, is clear.

Importation of diesel, at the highest cost, was made from Syria. The Syrians were in control of Lebanese affairs, both in terms of the decisions in the Parliament and in the award of contracts for projects, etc…

Those who were in office, and were empowered by the Syrian authorities, completely opposed the transition to the gas phase. The picture further becomes clear when we examine the four-way agreement in 2005 to import our needs of gas from Egypt through a line extended to Jordan and on to Syria, then connected between Homs and Lebanon. At that time Syria possessed the allocated share for Lebanon and provided us with a paralleled share. In 2005, after the tension between Lebanon and Syria in the wake of the assassination of Prime Minister Rafic Hariri, it became apparent that Syria's needs could be barely covered from its internal production. That's why the said arrangement came about, guaranteeing transit rights on the quantities to Syria, and effectively putting all deliveries to Lebanon under the control and will of the Syrian regime.

The decision to treat the deteriorating conditions of electricity production and distribution was embodied in Program 1993 to repair the damages inflicted on the power plants and distribution networks during the war years. Most works were

completed fast, and the level of electrical supply was improved. The contracting agreements relative to the Deir Ammar and Al Zahrani plants were made on the basis of each plant providing an output of 450 MW.

In 1996 the project to restore and develop the production facilities and distribution of electricity in Lebanon was impeded by the Israeli aggression which had as an objective to stem Hezbollah's ability to confront Israel. The Israeli bombardment raids damaged main transfer stations, and caused the destruction of the fuel tanks used to feed the Jieh power plant.

In 1998, Lebanon witnessed a 24/7 availability of electricity in most of its regions. The Deir Ammar and Al Zahrani power plants had started production. But the works to operate the Baalbeck and Nabatieh plants for a power of 180 MW each were halted due to poor maintenance and the use of inferior-specs diesel.

Since 2001, the interruption of electricity disabled national production and development. Since then, the reliance on small generators for apartments and shops, and bigger generators for schools, hospitals, movie theaters, factories, etc… started to take hold. The process to import these generators and install them became a very lucrative business, through which the Lebanese gained a big experience which enabled them import big power generators for export to Iraq for lighting the American army camps and the official governmental departments.

The generators business resulted in establishing companies with remarkable financial and technical abilities to provide generators quickly. This acquired ability to fill the gap of electricity shortage resulting from rationing, may secure these companies a role in the rebuilding of Syria, in case hopes for its five-year conflict to end in 2016 materialize.

Power from private generators in Lebanon follows a three-category model. The first category comprises individuals who provide electricity to a neighborhood or a number of buildings. They impose subscriptions tailored on the customer's power need, whether the owner of an apartment or a simple store. The charge varies between $ 75 and $ 100 monthly.

The second category is made of companies that provide electric power to hospitals, schools, factories, clubs, as well as provide maintenance. The subscription charges vary between $ 1000 and $ 20,000 monthly for a factory or a shopping mall, etc…

The third category deals with providing electricity at cost price to villages or small towns whose mayors want to participate in improving the living conditions and cleanliness levels of their localities. Cases in point are the summer town of Dhour Choueir and small villages like Ghalboun in the area of Jbeil, or municipalities like Marjeyoun and its suburbs. The people in those locations and other places were thus able to obtain electric power for reasonable costs, and in a continuous manner that does not lead to the damage of electrical appliances such as refrigerators, washing machines, dishwashers or heaters, etc.

Several projects were suggested: Improving the network, the use of gas, flexible bill tariffs along the input prices, involving the private sector in the fields of production, distribution, and collection, even the use of remote electronic meters to gauge consumption, thus dispensing of hundreds of collectors. The collection is made in the bank instead, and if it's not done, power supply is cut off automatically.

Several important developmental and administrative projects were proposed, such as establishing a regulatory authority for electricity affairs. The establishment of this authority was initiated by the second Cabinet of Prime Minister Fouad Siniora. I conducted several interviews with candidates who got aware of the possibility of becoming members of the authority through local and international advertisements. The interviews were conducted without knowing the name and confession of the applicant. A board constituted of 6 members including myself, was notified by PM Siniora of the necessity of selection on non-confessional/non-sectarian grounds. Consequently, the members of the selection committee invited for interviews those candidates whose knowledge and experience, as presented in their résumés, showed them to be the best.

The committee recommended the selection of a number of applicants; they were interviewed at length by the committee members. The committee had to recommend three names for each position, with the Council of Ministers being entitled to decide on the chosen one for each. But the charged political climate at that time, and the closing of Parliament for 18 months, prevented from establishing this authority. It remains non-existent until the present time, and the decisions must be made by the Minister in the first place.

On the administrative level, the foreign experts who were consulted, particularly those ones from Electricité de France which is considered one of the major and most

successful companies in this field, opined that the best idea was to establish an electronic control center through which the administration can see minute by minute the availability of power on any line, and assess the possibility of transferring quantities/loads from one line to another in order to achieve the best use of available energy.

Part of the work to equip this center was carried out; however the overall conditions were not available. But even if they had been available, the network remained incomplete and unequipped to transfer electricity at a high pace. All those factors were indicative of the failure of this attempt.

In addition to what we have mentioned as reasons to discourage the attempts to repair the electricity sector, it is necessary to point out the current positive expectations for the availability of oil and gas in the Lebanese regional waters. It is known that the Lebanese have a tendency towards optimism for the future, and forgetting the past and its disappointments.

The estimations for the availability of oil and gas reserves in the Lebanese regional waters, within the waters that extend from Egypt/South to Gaza, Israel, Syria, Cyprus and Turkey, were made by an U.S. Government institute. Its task was to identify areas of availability of oil and gas fields since 2010.

After encouraging estimates, Israel achieved rewarding discoveries, as Cyprus did when its pursuits succeeded in digging the first testing well. Further, the Italian energy company ENI discovered a huge gas field in the Egyptian regional waters after September 2015.

Compared with the successes of Israel, Cyprus, and Egypt, it is possible for us to succeed in Lebanon. However, the decision to launch the process has not been made yet, due to the disparity in political views for identifying the exploration areas (blocks) for each of the interested parties, and the terms of the exploration contracts, production and future marketing having so far remained pending since at least two years.

A public entity, the Lebanese Petroleum Administration (LPA) was established more than two years ago to supervise the oil and gas affairs. It completed important tasks; however the administrative team of the administration, which is constituted of six persons, was appointed on sectarian grounds. This does not deny the fact that distinctly

capable people sit on its board; however its presidency rotates yearly among its six members, which does not contribute to the acceleration of its productivity.

In fact, the most important matter is that the Council of Ministers was late in deciding the terms of executing the subcontracts for exploration, digging, and sharing of benefits, and the delay has been continuous since 18 months. During that period, the oil prices plummeted from $ 100 dollars to $ 30 per barrel, and the expected benefit from finding oil and gas fields became less than it was calculated to be two years ago. Even though the gas price will not collapse by the same percentage, it will most probably lose 30-40% of its previous level, and the excavation works in the regional waters at 3000-5000 depth entail high costs. In any case, we must await 7-8 years post-contract awards before we make any production, while our electricity and financial problems would still be more persistent. Any delay in reinforcing the production of power from plants using gas can subject the Lebanese economy to various threats. There follows a clarification with figures concerning the current deteriorating situation of the electricity sector.

Today, all plans are in place, even if they came from different technical and pricing assumptions due to technological developments and changes in feedstock prices, to the extent that old plans that date back to two or three years ago have been made invalid.

Three years ago, the allocation of $ 1.2 billion was approved to increase the capacity of electricity production by 700 MW, relying on gas as feedstock. Since 2013, the process for establishing a new plant in Deir Ammar with a 500 MW capacity met with trouble for reasons related to the the VAT rate and which party shall bear it. If it would be shouldered by the Ministry of Energy and Water, it would eventually be channeled to the revenues of the Ministry of Finance, i.e. the money would move from one pocket to another, with both pockets being the State's.

Such a problem prevents the completion of a 500 MW power plant and hinders the completion of necessary works to upgrade the production capacity of the Zouk and Jieh Plants, as well as impedes the upgrading of their deteriorating facilities and the control of pollution resulting from their operations. There is hope that additional energy will be available from both power plants in June and July 2016 by 250 MW which is supposed to be added to the Deir Ammar power plant's output to achieve a noticeable total increase close to 750 MW. The sad truth is that we will raise the power output in

5-6 months with contracts which have been concluded since two years to get an increase of 250 MW. And there's no thought still about the gas which is supposed to be available for the power plants, and other matters as well.

A law was issued authorizing the licensing of private companies to provide electricity within the jurisdiction of their concessions, for a period of two years and not less than 10 MW as production capacity. The operations of these companies would complement EDL's electricity supply levels.

We saw and witnessed the success of Zahlé Electricity in providing power for 24 hours a day and reducing the power charges borne by its beneficiary citizen by 30 percent (Charge from subscription to EDL power supply, plus subscription charge to private generators). The franchisee company in Jbeil is asking for similar privileges. The fact is that the latter was already in the business of compensating for EDL's power shortage, but charging high prices for providing electricity 24 hours a day. Today, the company offers to carry out a role similar to the one carried out in Zahle and its vicinity.

Former Prime Minister Najib Mikati, in collaboration with ex-minister Mohamad Safadi, presented an offer to provide electricity based on private contracting in Tripoli and its vicinity; the offer included the possibility (or not) to own Kadisha Company. It is known that PM Mikati and Minister Safadi are directly concerned with Northern Lebanon and with Tripoli in particular, and in case their project is approved, they plan to establish a facility to receive liquid gas and transform it to gas usable in electricity production plants, and in fertilizer production plants.

After this extended review for the availability or non-availability of electricity, and the numerous interests and increase in activities to provide power, we return to what has been accomplished or is being progressed, before moving on to present what is needed in summary.

The case of availability of electricity at a reasonable and stable cost has become a dilemma, not only a problem. Lebanon has not had power supply all day long or all night long since 1998. The cost to cover the purchases of fuel derivatives to feed the electricity production plants represents 51% of the budget's deficit; as well, the technical waste, thefts from the power lines, and refusing to pay the electricity bills constitute 52% of the revenues. If a solution is not found, it will lead to a financial and production disaster. Here below we refer to the presented projects, their strengths, and their deficiencies.

1. Existing Projects, contracted for a short range plan 2010-2012 but which has been delayed for two years due to the political and security conditions in Lebanon and the region

In Production

- The establishment of a thermal plant in Beddawi with 450 MW output at a cost of $ 470 million. Date of contracting: April 2013.

The contracting company: A Cyprian-Greek group, with turbines made by GE. Delivering the land to begin the works was delayed for nine months; first two due payments were not paid.

- To establish two thermal plants in Jieh and Zouk with 194 MW power for Zouk and 80 MW for Jieh. The cost of the project: $ 348 million. Date of contracting: February 2014. Contracting company: A German-Danish group. The aim from both expansions is to be able to dispense with the existing contract with a Turkish company which has been securing this amount of production from two floating vessels.

- Total of the expected produced power from establishing the above mentioned plants: 750 MW during the years 2015/2016 where it is expected that production would equal consumption at that time.

- Rehabilitation of Zouk and Jieh power Plants in order for the production of Zouk Plant to reach 500 MW funded by the Kuwaiti Fund.

The contracting company for Zouk: ANSALDO/METCO. The contracting company for the Jieh power Plant: Al Kharafi-Nacional.

- Recruitment of two Turkish ships and mooring in Zouk power Plant (4 April 2013) and Jieh power Plant (August 2014) for 188 MW in Zouk and 82 MW in Jieh for a period of three years.

In Transmission

- To start in 2013 to establish power transmission stations in several Lebanese regions.

- Working on commissioning into service (2013) the 220 KVA Beirut link.

In Distribution

Outsourcing distribution services in April 2012 to three companies known as service providers for a period of four years which are: BUS for the North, KVA for Beirut and Bekaa, NEUS for the South, Chouf and Beirut's southern suburb. During their contractual periods, these companies must upgrade, maintain distribution networks,

collect bills, install electronic meters, upgrade prepaid cards, and limit the waste and theft from the network, etc... To date, the operating companies have not achieved any expected improvement, and all the companies complain from the difficulties with the workers, and the insufficiency of the distribution networks, etc.

2. Medium term (2012-2014)

- Establishing a second thermal plant in Beddawi with 450 MW power, and another one in Jieh with 450 MW as well. The contracts for both power plants are not concluded; and if that happens, it will be at the end of the year, which means we will not have any additional power before three years i.e. 2018 at best.

- Rehabilitation of the power plants that work on hydraulic power to raise their capacities from 190 MW to 245 MW. We do not know how we will achieve this, when rain fall has been decreasing.

- Establishing wind turbine farms in Klayaat, Marjeyoun and Hraisheh for 40-60 MW each.

3. Long-term (2015- and beyond)

To establish a second power plant in Jieh and a third one in Beddawi with the collaboration of the private sector, and for 1500 MW. A feasibility study is being prepared.

In Transmission

- To complete the Mansourieh power line. 102 kilometers are missing for the plan to be completed.

- To establish a new high-tension line to transfer the newly produced power.

- To establish new power transfers in Beirut's southern suburb, Achrafieh, Bohsas, Marina Dbayeh. These contracts were concluded with Matelec Company on January 2014.

- Upgrade and reinforce the existing power transfer stations.

- A feasibility study is under preparation to extend a pipeline to transport natural gas under the railway line along the Lebanese coast with a sea link to avoid Beirut. There is also a project under study for the establishment of stations to receive ships carrying liquid gas in Beddawi and Jieh, and then feed the production plants in the South and the North with natural gas to produce electricity with less cost, and reduce pollution.

After the details, what next?

There is no doubt that the road map looks clear, even if three years in delay from the specified objectives. There are many remaining unmentioned and big challenges such as:

- How to solve the issue of the high-tension line in Mansourieh-Beit Mery, and can the transfer be made efficiently without completing this link?
- In case of achieving savings in production costs through the use of imported gas, and in 7-10 years the use of gas produced from our regional waters' reserves: How do we deal with the issue of private generators whose aggregate capacity has become nowadays equivalent to the operating production capacity?
- How do we stop the waste, achievable through reducing the proportion of technical waste and collecting dues from subscribers, and through exercising ideal control between the production and distribution regions?
- After 2017, and in case we achieved self-sufficiency in terms of production and transmission, how can we prepare ourselves for the future, and what are the foundations upon which a partnership between the public and private sectors (PPP) would be set for joint collaboration on projects?

Important questions must be addressed in any research related to the dilemma of electricity which we hope will turn out to be a problem that can be treated.

ANNEX I

(Related to the temporary authorization to grant production permits from the Council of Ministers)

REPUBLIC OF LEBANON
PARLIAMENT
Law No. 288 dated 30/04/2014
(C.R. No. 20 dated 08/05/2014)

LAW
Addition of a paragraph to Article 7 of law No. 462
dated 02/09/2002 (regulation of the electricity sector)

Single Article:
1. Added to Article VII of Law No. 462 dated 02/09/2002 (regulation of the electricity sector) the following paragraph: "On a temporary basis, for a period of two years, and until the appointment of commission members is made, as well as assigning their tasks, permits and production licenses will be granted by the Council of Ministers pursuant to the suggestion of the Minister of Energy and Water and the Minister of Finance".
2. This law is considered effective immediately after being published in the gazette.

ANNEX II

(Accelerated program for electrical works for the production, transmission and distribution of electrical power)
REPUBLIC OF LEBANON
PARLIAMENT
Law No. 181 dated 05/10/2011
(C.R. No. 47 dated 13/10/2011)

LAW
Accelerated program for electrical works for the production, transmission and distribution of electrical power

Article I:
1. Allocation of a total contractual sum of /1,772,000,000,000/L.L. (Lebanese Liras One Thousand Seven Hundred Seventy Two billion Only) for electrical works to produce, transmit and distribute 700 MW of electrical power.

2. It is authorized to the Government to contract this entire appropriation and to start implementation before the availability of the payment credits in the budget.

3. The designated credits for each year shall be distributed in subsequent proportionality as mentioned in Article 18 of the budget.

4. The proportion of payment credits for the year 2011 is determined as such:

PART II – B – Year 2011 (thousands of liras)

Chapter XVIII: The ministry of energy and water

Chapter	110	Electrical works for producing 700 MW
Occupation	324	Electrical power affairs
Clause	227	Construction in progress
Paragraph	5	Electric installations
Brief	1	Electric installations for production plants /385,000,000/
Brief	3	Electric installations for transmission lines
Brief	4	Electric installations for distribution lines /19,000,000 /
Clause	229	Other expenses related to fixed material assets
Paragraph	1	Study, consultancy, and control expenses
Brief	9	Various Study, consultancy, and control expenses /10,000,000/

5. Distribution of payment credits as such: (thousands of liras)

Chap	Function	Works definition	2011	2012	2013	2014	TOTAL
110	324	Electric installations for production plants	385,000,000	368,000,000	303,000,000	226,000,000	1,282,000
	Electrical power affairs	Electric installations for transmission lines	-	41,000,000	185,000,000	146,000,000	372,000,000
		Electric installations for distribution lines	19,000,000	21,000,000	18,000,000	-	85,000,000
		Various Study, consultancy, and control expenses	10,000,000	30,000,000	12,000,000	8,000,000	60,000,000
TOTAL			**414,000,000**	**460,000,000**	**518,000,000**	**380,000,000**	**1,772,000,000**

6. The open credit is covered as per Paragraph 1 of the present article with exceptional revenues. The government is authorized to find financing sources through loans and/or issuing treasury bonds in Lebanese currency or foreign currencies. The prime Minister must seek to provide the necessary financing from various funds, regional or international organizations and other.

7. A ministerial committee is established, presided by the Prime Minister and the membership of the Deputy Prime Minister and the Ministers of: Public Health, Finance, Minister of State for Administrative Development Affairs, Social Affairs, Energy and Water, Labor, Justice, and Economy and Trade, to examine the amendments on Law No. 462 dated 02/09/2002 (regulating the electricity sector) within a maximum period of three months, to abide by the law and form a commission to organize the electricity sector during that period based on the proposal of the Minister of Energy and Water.

8. An administrative board for EDL must be appointed within two months.

9. Tenders are conducted by the administration of tenders in accordance with the proper regulations.

10. The Minister of Energy and Water is requested to inform the Council of Ministers at all stages of application of this law.

Article II:
This law is immediately published in the Official Gazette.