



Electricity

1 - Electricity Sector Overview

Current condition of sector

The main factor for growth, employment and competition lies in the provision of quality continuous electrical power. Developing the electricity sector and finding efficient investments have proven worldwide to have positive effects on national income. Therefore, reforming the energy sector is considered to be one of the main challenges facing the Lebanese Government on the short term.

Hence, during Paris III conference, the Lebanese government engaged in implementing the necessary reforms in order to transform this sector from a burden on the Treasury and economy, into a sector participating in the economic development.

Power generation in Lebanon is mainly based on thermal power generation, whereas the energy generated by hydraulic power plants does not exceed 10% of total generation capacity in the country. Thermal power generation is distributed as follows:

Plant	Compound capacity in MW	Current generation in MW	Used energy	Remarks
Zouk	607	365	Heavy fuel Oil	Comprising 4 power plants
Jieh	331	276	Heavy fuel Oil	Comprising 5 generation power plants
Deir Ammar	435	435	Light gas oil	Comprising two combined cycle generation plants, conceived to work on natural gas, light gas oil as an alternative fuel.
Zahrani	435	435	Light gas oil	Comprising two combined cycle generation plants, conceived to work on natural gas, light gas oil as an alternative fuel.
Haraichet	75	75	Heavy fuel oil	Comprising one plant
Baalback	70	70	Light gas oil	Comprising two plants, usually used during peak times
Sour	70	70	Light gas oil	Comprising two plants, usually used during peak times
Total	2023	1726		



Seven countries interconnection network (400 KV)

Accordingly, the total capacity of combined energy amounts to 2023 MW, while the current generation capacity equals 1726 MW; whereas the current demand is evaluated at approximately 2220 MW.

In addition to above mentioned power generation plants, Lebanon imports energy from Syria and the average imports for 2005-2008 reached approximately 800 GWh (i.e. the equivalent of 90 MW), knowing that the current transmission lines enable the country to import nearly 200 MW per year. Furthermore, through the installation of transmission lines (400 kV) project and the

construction of Ksara station, Lebanon aims at increasing the import capacity from countries of the region by approximately 250 MW.

Main problems

- 1) Increasing power failure and rationing due to:
 - Insufficiency of current generation of energy to meet all the needs, a fact that led to the expansion of private generators.
 - Low public investments (whether regarding works related to rehabilitation and maintenance of plants or construction of new plants) for nearly 10 years
 - Incomplete transmission networks 400 kV and 220 kV

2) High Operational expenses due to:

- Operating two combined cycle generation plants (in Zahrani and Deir Ammar) and two open cycle plants (in Sour and Baalback) with light gas oil instead of natural gas.
- Uneconomic operation of plants due to low efficiency of thermal plants in Jieh and Zouk requiring rehabilitation activities, and because of the use of Sour and Baalback plants as main plants and not peak time plants.
- High technical percentage waste (above 15%) mainly resulting from the incompleteness of the transmission network 220 kV.

3) Decrease in financial yield of EDL due to:

- Global increase in oil prices worldwide
- No reconsideration of the fees for almost 15 years
- Continuous aggressions and illegal connections on the network
- Decline in perception of bills.

4) Institutional main problems in the management of EDL as a result of:

- An insufficient authority for the Board of Directors for taking adequate decisions
- Absence of clear criteria to evaluate the performance of EDL
- Difficulty in recruiting new qualified persons and lack in technical training
- Unavailability of reliable reports (statistics, finance, criteria, performance, etc.)

Vision for the Future

The expected forecast encompasses the achievement of all technical, financial and institutional reforms aiming to put an end to the financial deficit of this sector and ensuring the auto-financing for future investments, as well as securing a good service at reasonable prices. In order to attain this, the following should be achieved:

1) Technical and institutional levels:

- * To establish the regulatory body for the electricity sector mentioned in the Law number 462 issued in 2002, aiming at laying clear foundations for the management of the Electricity sector in Lebanon, protecting the rights of investors interested in this sector while following them

up to fulfill their engagements. In this respect, in 2008, a contract funded by the World Bank has been signed with an international consultant to offer the technical support to the Ministry of Energy and Water.

- * To work on the incorporation of EDL and take the adequate decisions regarding the role the private sector can play in managing this sector, knowing that a contract funded by the World Bank has been concluded in 2007 and an international consultant will offer the technical support to the Higher Council of Privatization in this respect.
- * To implement a modern accounting system and better study the pricing system in order to secure operating and maintenance costs, servicing the debt and providing future funding.
- * To conclude contracts providing electricity upon conclusion of works related to the Seven-country interconnection system.
- * To prevent aggressions on public networks
- * To seek for providing natural gas to generate power in Deir Ammar, aiming at achieving a significant affluence in the operation of this plant, providing technical assistance to the facilities and reducing toxic emissions.
- * To encourage rational consumption of the electric power.

2) Sectoral studies

- * To achieve the master plan to generate and transport energy,

which started in 2007 with the collaboration of the French EDF as a consultant and the financing of the French government.

- * To develop a strategy for fuel supply, knowing that this task is among the consultant's responsibilities; with whom a contract has been signed in 2007 (funded by the World Bank) to provide technical assistance to the Ministry of Energy and Water.
- * To achieve the master plan for the distribution of electricity in regions that witnessed a construction boom, knowing that it is expected to start studying the comprehensive master plan for Beirut and its northern and southern suburbs during the second half of 2009.

3) General investments

- * To rehabilitate the Jieh and Zouk plants according to a specific program, knowing that the Arab Fund expressed its readiness for funding this project.
 - * To equip new energy generation units responding to consumption demand, knowing that numerous financing institutions have expressed their readiness to participate in the funding upon achievement of economic feasibility studies.
- Completion of 220 kV network
- * To establish transmission plants in many regions (El Bahsas, Marina, South suburb, Saida, Baalback).

Completion of the works of the National control and dispatching center and beginning of operations.

2) Main achievements (1992 – 2008)

Main projects implemented by CDR for EDL during the 1992 – 2008 period can be summarized as follows:

1. Generation

- Construction of two combined-cycle generation plants a capacity of 435 MW for each plant in Deir Ammar and Zahrani: US \$ 575 million, achieved in 1999.
- Rehabilitation of thermal and hydraulic plants: US \$ 109 million, achieved in 1998.
- Construction of two open-cycle generation plants with a capacity of 70 MW for each plant in Sour and Baalback: US \$ 61 million, achieved in 1996.

2. Transmission

- Construction of overhead lines network of 220 kV: the network included the installation of 339 km of overhead lines. Currently the achieved overhead lines are from Deir Nbouh to Ksara, from Ksara to Aaramoun, from Aaramoun to Zahrani and Sour, and from El Bahsas to Bsalim passing through Halat.
- Construction of 220 kV plants in downtown Beirut, Aaramoun, Mkalles, El Horsh, Ras Beirut, Halat, Ksara, Bsalim, Sour: achieved between 1999 and 2001.
- Construction of 220 kV network for underground cables in the North and Beirut: the network required the installation of 61 km of buried cables; achieved in 1999.
- Restructuring of 150 and 66 kV transmission networks; achieved in 1997.
- Construction of 400 kV network and substation in Ksara allowing

power exchange between the countries of the region.

3. Distribution

- Rehabilitation of distribution networks: US \$ 112 million; achieved in 1997.

3) Progress of works in 2008 in contracts awarded before 2008

- **Expansion project of electrical transmission network:** all works related to the expansion project of electrical transmission network have been completed as specified above, except for the works regarding the installation of cables on poles in Mansourieh – Ain Saadé – Ain Najm, due to the objections expressed by residents of these regions, and currently work is carried out to try and solve this issue, and it is expected to complete these works during 2009.

- **National control and dispatching center:** works started during the month of July 2006 and the global cost of the project is evaluated to approximately US \$ 25 million, the Arab Fund for Economic and Social Development is funding this project. It is expected to be achieved completely during 2010 after considering proposed amendments.

- Rehabilitation and expansion of transmission and distribution networks in liberated regions:

Work is ongoing at present to award the rehabilitation and expansion works of the 66 kV High Voltage transmission network and 20 and 15 kV Medium Voltage distribution network in the liberated regions. The total cost of the project is estimated at about US \$ 25 million, which will be funded by the Iranian Protocol. Works are

expected to start during 2009.

- **Rehabilitation and expansion of Al-Ayoun and Fneidek transmission and distribution network in Akkar:** a contract was signed directly with the Kuwaiti Fund, the amount of which reached 5150000 euros. This project aims at raising the transmitted and distributed power capacity of this region from 10 to 40 MW. Works are expected to be achieved in the beginning of 2011.

- **Technical assistance within the electricity sector's reform plan:** after conducting international tenders during 2007, three service consultancy projects were awarded aiming at granting technical assistance within the framework of electricity sector reform as follows:

* **Concerning the Ministry of Energy and Water:** to improve the capacities of the Ministry of Energy and Water in order to be able to implement the proposed reforms in the electricity sector policies. Hence, the main functions assigned to the consultant will be in assisting the Ministry in the preparation of a national electricity policy and fuel oil strategy, reviewing proposals related to the supply of liquefied natural gas (LNG) to the Zahrani plant, evaluating proposals aiming to attract private investments and reviewing previous studies regarding the establishment of the Electricity Sector Regulation Authority. Works are expected to be completed in September 2009.

* **Concerning the EDL:** to improve the operational and financial performance of EDL. Hence the main functions of the consultant will be the preparation of a plan for

improving the efficiency of power generation plants and assisting implementation procedures, reorganizing the supply functions of EDL, establishing priorities for reducing technician and non-technical waste, providing assistance to complete current projects, organizing an inventory of assets and survey of audited financial reports and preparing the tender documents for the financial audit contract covering 2005 and 2006. Consultancy services are expected to be completed in May 2009.

* *Concerning the Higher Privatization Council:* to provide the necessary support for incorporating EDL in conformity with the Electricity Sector Regulation Law and the Ministry's plan for restructuring EDL; to propose the organizational structures for companies that will emanate from EDL, together with the detailed description of proposed jobs and procedures to be followed; to prepare the preliminary work plans for these companies; to organize the inventories and determine the capitalization levels and share structure of these companies. Consultancy services are expected to be completed in April 2010.

It should be noted that the estimated total cost of the technical assistance contracts are of approximately US \$ 6.5 million, distributed as follows: World Bank grant of US \$ 5 million, about US \$1 million as a grant from the French Development Agency, and US \$ 500 000 funded locally to cover the local tax expenses.

The designated consultants shall submit reports concerning above mentioned projects, according to

the tender documents, and their revision by the concerned institutions will constitute an opportunity to a better coordination of works, and will facilitate the decision making process in order to adopt the best decisions regarding the electricity sector reform.

* *Study of the master plan for the generation and transmission of power:* Electricité de France (EDF) currently studying the comprehensive master plan for the generation and transmission of power in Lebanon has offered a grant from the French government to draft the report of this plan regarding power generation. This report has been discussed with concerned administrations after consultation and expressing remarks. Accordingly, the consultant issued the second version of his report during June 2008, and the main proposals could be summarized as follows:

- To increase the generation capacity gradually of about 2220 MW to cover expected demand until year 2022, and that by constructing new plants through the adoption of three options regarding Jieh and Zouk plants:
 - First option: aiming at adopting the rehabilitation of Zouk plant (operational until 2022) and gradual shut down of Jieh plant
 - Second option: aiming at adopting the rehabilitation of Jieh plant (operational until 2022) and gradual shut down of Zouk plant
 - Third option: aiming at the rehabilitation of both Jieh and Zouk plants so as to be operational until 2022
- To diversify the use of energy source (fuel, natural gas, coal) in

order to avoid any crisis that could result from an increase in prices or a difficulty in importing any kind of energy

- To insist on the use of renewed energy (water, air, biological gas) wherever possible
- The consultant will issue his report regarding the transmission of energy after notification of the decision of the Lebanese administration regarding the proposed options on energy generation.

4) Main projects under preparation (2009 – 2011)

Generation sector:

Rehabilitation of Jieh and Zouk plants: the compound capacity and the effective capacity of Zouk plant (4 units) and Jieh (5 units) is as follows:

	Unit number	Compound capacity in Mw	Open capacity in MW
Jieh plant	1	62	52
	2	62	38
	3	69	63
	4	69	63
	5	69	60
	Total	331	276

	Unit number	Compound capacity in Mw	Open capacity in MW
Zouk plant	1	145	90
	2	145	100
	3	145	
	4	172	165
	Total	607	365

The total compound capacity of both Zouk and Jieh plants is of 938 MW, whereas the average effective operational capacity is 641 MW. Currently EDL is conducting the rehabilitation feasibility study of

these 2 plants, in addition to detailed studies and the preparation of the award file. The Arab Fund expressed its readiness to finance the 3, 4 and 5 units of Jieh plant (considering that it has been expressed to exchange the 1st and 2nd units that had been established in 1970) and the four units of Zouk plant according to an agenda of 5 to 6 years. Hence, this shall allow increasing the effective capacity of both plants to 800 MW, in addition to the readiness to construct a new plant on units 1 and 2 of Jieh plant. It is expected to start awarding the rehabilitation project during 2010. Construction of new generation plants: in the framework of studying the master plan for the generation and transmission of power conducted by the consultant of EDF, numerous proposals have been issued to construct new plants and it is expected that the Lebanese government will choose during 2009 the best proposal to start executing the construction projects of new plants. Furthermore, the Ministry of Energy and Water is studying the possibility of purchasing generators which will cover a portion of the decrease of generating energy on the short term. It should be noted that CDR has already started contacting numerous Arab and international funding parties to ensure the necessary funds for these projects.

Transmission sector:

Creation of substations in various regions: among the current priorities are 5 substations that have been determined to treat the suffocation witnessed by transmission networks: el Bahsas, Marina (Dbayeh), southern suburb,

Saida and Baalback.

Technical assistance and sectoral studies:

Study of master plan for distribution in Beirut and its suburbs: after EDL asked from CDR to find funds for the master plan to distribute energy in Greater Beirut, comprising the modernization of the master plan of 1998 for Beirut, in addition to the region extending from Mkalles to Aaramoun; as well as the master plan for southern and northern suburbs, the French Agency for Development expressed its readiness to fund this study through a grant. It is expected that EDF will be the consultant, knowing that EDF had already prepared the master plan of 1998 mentioned above. It is expected that the study will start during the 2nd semester of 2009.