



# Electricity

## Electricity Sector Overview

The electricity sector constitutes a very sensitive infrastructure directly linked to all the daily activities of the citizens.

All indicators in this sector reveal the importance of numerous and chronic problems that impede the major works, threaten the sector, and inflict heavy damage to the national economy, making it impossible to be resolved unless a radical and gradual reform policy, able to boost the sector, is adopted.

Finance Ministry sources confirm that the amounts transferred to EDL in 2011 exceeded US\$ 1751 million, 96.1% of which, to cover for fuel expenses. It is noteworthy that the financial deficit of EDL reached US\$ 1472 million in 2008 because of the global increase in oil prices, whereas the deficit surpassed the edge of US\$ 1430 million in 2009.

Problems and difficulties endured by the electricity sector have been extended to encompass: technical, administrative as well as financial

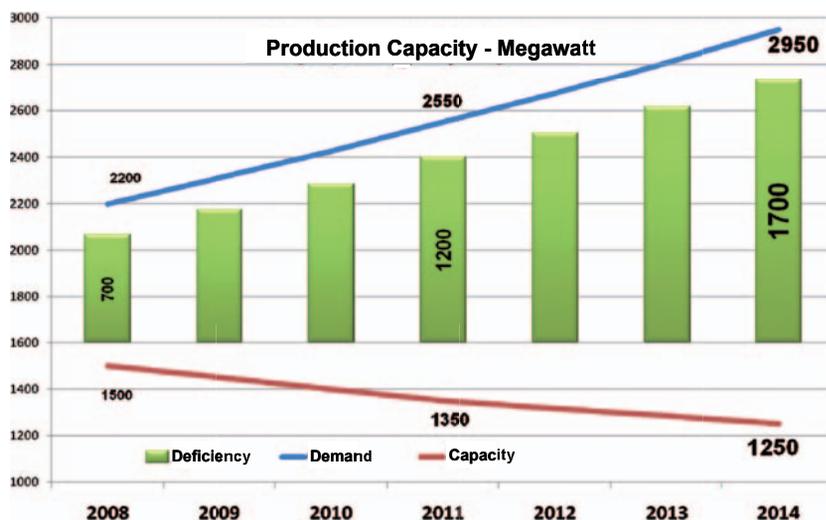
frameworks and whatever links them together. On the technical side, the production, transmission and distribution sub-sectors suffer from several accumulating problems. They start with the unavailability of capacity in energy production to supply the demand; they transit through the existence of obsolete and unreliable equipment and installations, as well as the increase in technical and non-technical loss levels; and they do not end with the decrease in collection levels and human resource problems.

The Current Condition of the Sector EDL's inability to meet the demand, which clearly appeared at the beginning of the last summer, has caused EDL to enter a critical phase. The imperative issue requires: the reconsideration of the priorities in order to prevent further deterioration in the first phase, bridging the deficit in the second, and anchoring the required stability at the end.

Reforming the electricity sector in

Lebanon has become an important challenge for the Lebanese government in the foreseen perspective, particularly after pledging during Paris III to take necessary reform measures in order to be able to transfer the sector from a burden on its treasury and economy into an efficient and sustainable sector, with positive repercussions on the growth of the national income and consequently on the economy.

It has now become clear that the gap between the capacity of supply and the demand has reached, according to Energy and Water Ministry sources, approximately 1200 megawatts of power (about 46% of the demand at peak hours), which is equivalent to 11 hours of daily rationing outside the Beirut administrative and Summer vacation regions. Should this situation prevail, the gap is expected to increase and reach 1700 megawatts in 2014, which is equivalent to 58% of the demand, or about 15 hours of daily rationing. the main effective peak capacity does not exceed 1500 megawatts, including the capacity drawn from Egypt through the Eight-Arab connection. The demand has surpassed 2500 megawatts in 2011. Power generation in Lebanon is mainly concentrated on thermal energy production. Hydropower produced from plants does not exceed 4.5% from the total generation capacity in the country.



### Power Supply from External Sources

Electric power is drawn from Syria to Lebanon through two main connection networks. The first network links Deir Nbough plant in the north with the Tartous plant in Syria through two overhead lines of 120 megawatt capacity working on 220 kV of electrical pressure. The second network has a capacity of 80 megawatts through a single overhead line working on 66 KV of electrical pressure linking Aanjar substation plant with the Dimas plant in Syria. Lebanon has been drawing electrical power from Syria for a long time now. In year 2000, Lebanon drew a peak 1418 million kilowatt-hour of electrical energy. It stabilized, at a later stage, at a yearly average of approximately 800 million kilowatt-hours, only 8% of the total power production or the equivalent of 90 megawatts of continuous power capacity throughout the year. As for the Eight Arab connection network, and the electric energy purchase agreement from Egypt, the construction works and installations of the new Ksara HV substation have been completed. Efforts have succeeded in September 2009 to operate the new 400KV overhead lines, and terminate the new link with the Dimas transmission plant in Syria. In year 2010, Lebanon benefited from approximately 120 megawatts of additional electrical capacity on the grid at an average feed of 21 hours per day, but the withdrawal soon seceded at the beginning of year 2011. The new grid connection

capacity can currently accommodate for up to 300 megawatts of power, and Lebanon continues to seek an increase in the import capacity from the countries of the region to cover for the remaining 180 megawatts.

### The Main Problems of the Sector

#### The existence of high operational expenses:

- The two combined cycle power plants in Zahrani and Deir Ammar, as well as the two open cycle power plants in Sour and Baalback operate on Gas Oil (Diesel) rather than natural gas.
- The Zouk and Jiyeh thermal power plants operate with low efficiency, which necessitate periodical overhauling activities.
- The need to operate Sour and Baalback thermal power plants outside peak times.

#### The existence of rationing and the increase in power failures are due to following reasons:

- Insufficiency of current power generation to meet all the needs, a fact that led to the spread of the local private generation phenomenon.
- Low public investments since at least 12 years (not in the rehabilitation and maintenance of the plants nor in the construction of new ones).
- The incompleteness of the 220 kV transmission networks.
- The presence of the “bottle necks” on distribution networks and the increase of local breakdowns in crowded areas on peak times

during summer and winter peaks.

- Loss of flexibility of electricity links between the old and the new grid.
- The absence of the usage of electronic accounting programs that study and organize the energy flow to ensure the supply and reduce the technical losses such as GIS.
- Deficiency in periodic maintenance operations by technical expertise for the main power plants, the substations, and the transmission network.
- High percentage of technical losses because of the incompleteness of the 220kV distribution grid, which varies from one area to another, exceeding in some areas the 15% average, to reach the 20% line in areas like the Bekaa.

#### The problems in the distribution network include:

- The existence of old rusty steel distribution poles.
- The inexistence of standby systems.
- The inexistence of efficient monitoring of the meters.
- The inability to prevent theft aggressions.
- The inability to carry out required maintenance preventive measures.
- The inability to match the billing preparation measures.
- Collection and payment monitoring.
- The ill issuance and control of bill settlements.
- The loss of network components in some regions.
- Significant shortage of required

equipment tools and machinery necessary to improve and accelerate the needed interventions mainly due to the great financial deficit that EDL is experiencing.

**The decline in financial returns of EDL are due to following reasons:**

- The global increase in oil prices has aggravated EDL's budget and increased the debt and caused a financial shortage, which became an increasing burden and a source of concern for the national treasury.
- The tariff structure hasn't been reconsidered since almost 15 years now. A transparent policy that decides whether electric energy is sold as a commodity or delivered as a service needs to be adopted.
- Continuous aggressions and illegal connections on the network.
- Incomplete bill collections.

**The main institutional problems in the management of EDL are 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.
- Lack in technical training and difficulty in recruiting new qualified personell.
- A huge deficiency in human resources represented by a present body of only 1902 employees out of which, 5027 are needed; a vacancy of 3125 positions. The current body also loses 120 to 150 workers (8%) per annum due to retirement.

**The Vision for the Future**

In order to set in motion an efficient and sustainable sector, future visions to restructure the sector cannot be implemented unless the action plans include reform programs that would work on the short, medium and long terms in parallel. The reforms must encompass all the technical, financial and institutional aspects that would put in place an end to the financial deficit and ensure the auto-financing for future investments, as well as securing the good service at reasonable prices. Coordination efforts with the Ministry of Energy and Water is currently being carried out in order to crystallize a working paper, based on a medium term strategy, that will include working on the technical, economic, financial and institutional levels.

**Main Accomplishments (1992 – 2009)**

Main projects implemented by CDR for EDL during the 1992 – 2009 periods can be summarized as follows:

**1. Generation**

- Construction of two combined-cycle power plants in Deir Ammar and Zahrani with a capacity of 435 MW for each plant at a cost of US \$ 575 million, achieved in 1999.
- Rehabilitation of thermal and hydraulic plants at a cost of US \$ 109 million, achieved in 1998.
- Construction of two open-cycle power plants in Sour and Baalback with a capacity of 70 MW for each plant at a cost of US \$ 61 million, achieved in 1996.
- The initiation of supply of a 120MW of electrical power from Egypt to the new HV transmission

plant in Ksara through the Eight Arab connection network.

**2. Transmission**

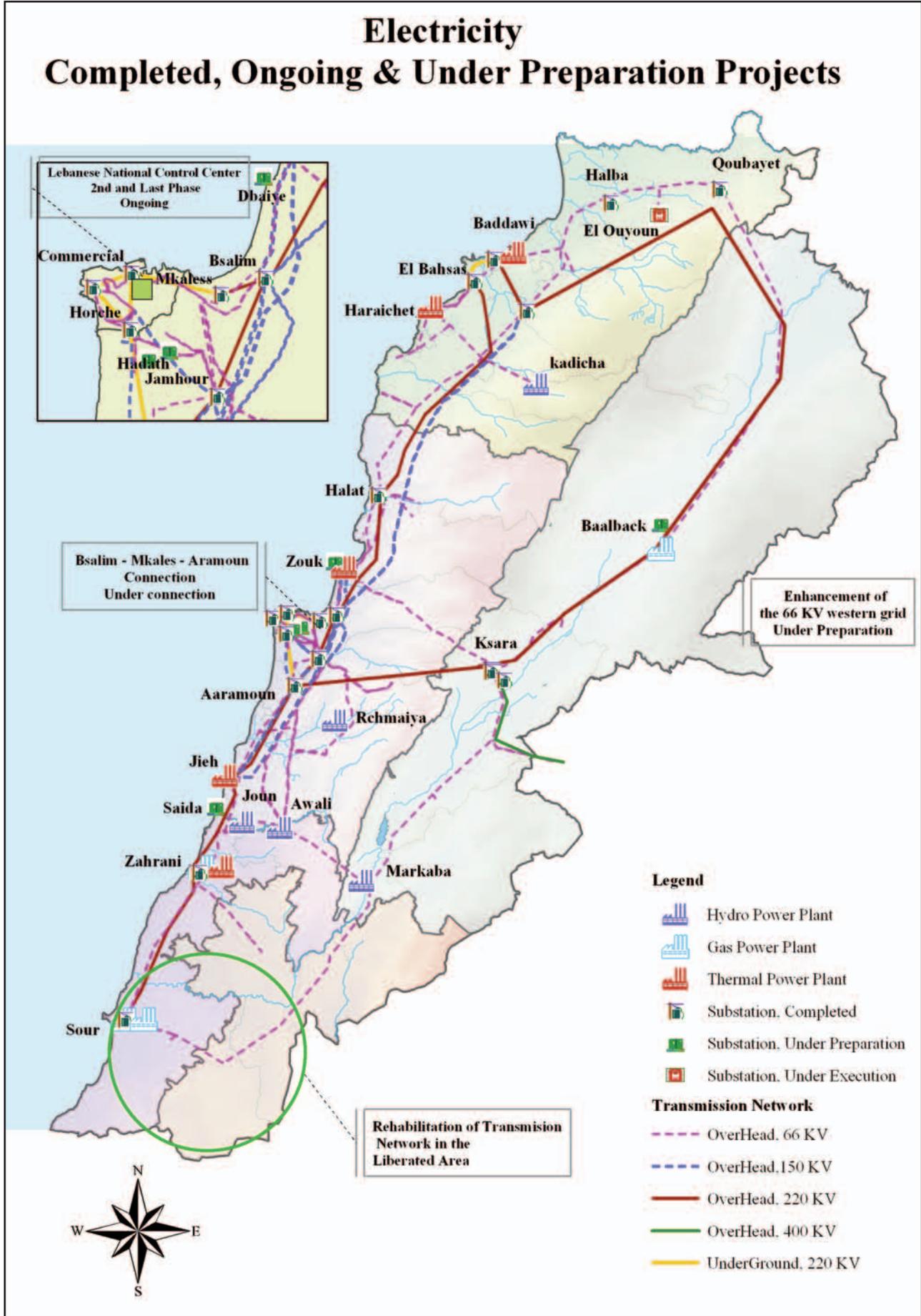
- The construction of the 220 kV network which included the installation of 339 km of overhead lines. Overhead lines that have been completely constructed are: Deir Nbouh to Ksara line, Ksara to Aaramoun line, Aaramoun to Zahrani and Sour line, and the Bahsas to Bsalim line passing through Halat.
- The construction of 220 kV substations in downtown Beirut, Aaramoun, Mkalles, El Horsh, Ras Beirut, Halat, Ksara, Bsalim, and Sour between 1999 and 2001.
- The construction of 61 km of underground buried cables for the 220 kV network in the North and in Beirut in 1999.
- The restructuring of the 150kV and 66 kV transmission networks in 1997.
- The construction of 400 kV network and substation in Ksara allowing for the power exchange between the countries of the region.

**3. Distribution**

- Rehabilitation of the distribution networks in 1997 at a cost of US \$ 112 million.

**Progress of works in 2011 - contracts awarded before 2011**

- Expansion project of electrical transmission network: all works related to the expansion project of the 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 the local



residents of the area. Efforts are currently being made to resolve the issue. Completion of the works is expected to be sorted out in 2012, if all goes well.

- National Control and Dispatching center: works started during the month of July 2006. The project is funded by the Arab Fund for Economic and Social Development and its overall cost is evaluated at approximately US \$ 25 million. The project is expected to be completed during 2011 knowing that the proposed amendments have been considered.

- Rehabilitation and Expansion of Transmission and Distribution Networks in the Liberated regions:

Efforts are currently being taken to award the rehabilitation and expansion works of the 66 kV and the 20KV/15 kV transmission distribution network in the liberated regions. The project, which is expected to start during 2010, will be funded by the Iranian Protocol. The total cost of the project is estimated at about US \$ 25 million.

- Rehabilitation and Expansion Project of Al-Ouyoun and Fneidek Transmission and Distribution Network in Akkar:

The erection of the 66KV grid line in Akkar-Beit Mallat, in the Al-Ouyoun and Fneidek areas is still progressing. Once established, the line will be allowing the Mallat substation, which was constructed in February 2011, to operate fully. Works are expected to be finalized in year 2012, given that the financing and procurement issues with the Kuwaiti fund are

now resolved. This project aims at increasing the transmission and distribution capacity of the grid in the area from 10 to 40MW of electric power.

- The Technical Assistance Projects for the Electricity Sector Reform Plan:

Three service contracts were awarded during 2007 when three international tenders were conducted. The three service consultancy projects aim at granting technical assistance within the framework of the electricity sector reform as follows:

- Improve the capacities of the Ministry of Energy and Water to implement the proposed reform actions in the sector policy statement. The main tasks assigned to the consultant will be in assisting the Ministry in the preparation of a national sector policy and fuel oil strategy. Part of the tasks is to review the proposals related to the supply of liquefied natural gas (LNG) to the Zahrani plant, and evaluate the proposals aimed at attracting private investments and reviewing previous studies regarding the establishment of the Electricity Sector Regulation Authority. Works are expected to be completed in September 2009. In this regard, in coordination with the Ministry of Energy and Water and through funding by the World Bank, CDR entered into a contract with Poten and Partners, a specialized consultant in strategic studies in the field of Liquefied Natural Gas, to provide for the fine support in selecting the most excellent technology and the finest location for the proposed port and facilities at the most

possible economical costs aiming at securing natural gas for powering up the generation plants in Lebanon. The consultant is expected to finalize the vital tasks and submit the required reports in April 2012, which will include:

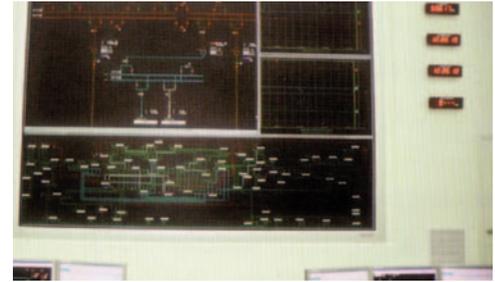
- A summary about the market of LNG worldwide.
- Lebanon's LNG Demand and Needs up to year 2030.
- A summary about the Key producers of LNG.
- A detailed preliminary study to design port facilities upon a thorough and methodical site inspection over three locations (Deir Ammar power plant, Zahrani Power Plant, and Selaata area).
- Three reports linked with the Environmental Impact Assessments over the three selected sites.
- One report on the existing legal conditions and the legal framework that should govern the sector.
- Perform the required training for the specialists at CDR and at the Ministry of Energy and Water.
- Prepare the "Terms of Reference" for the "Expression of Interest" for all of those companies who are interested in being shortlisted for tendering the erection and operation of an offshore port terminal for importing LNG, including the purchasing and operation of the floating regasification vessel and the construction of the offshore Jetty port terminal for receiving the LNG.
- The improvement of the operational and financial performance of EDL, where the main duties of the consultant will be the preparation of a plan for improving the efficiency of power generation plants and for assisting



*Eight countries interconnection network in Kessara Station*



*Power generation plant in Deir Amar*



*National Control Dispatching Center*

in the implementation procedures. Reorganizing the supply duties of EDL, establishing the priorities for reducing technical and non-technical losses, 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 are also included in the tasks. Consultancy services are expected to be completed in May 2009.

- To provide the necessary support for the Higher Council for Privatization for incorporating EDL in conformity with the Electricity Sector Regulation Law and the Ministry's plan for restructuring the sector. The tasks are to propose the organizational structures for companies that will emanate from EDL, including the detailed description of the proposed positions and the procedures to be followed; along with the preparation the preliminary work plans for these companies. It is also required to organize the inventory of assets and determine the capital levels and the share structure of these companies. Despite the finalization of the first phase of the contract, CDR, in coordination with the Ministry of Energy and Water and through a funding from the World Bank, will enter into

contract with another consulting firm (Booz and Co.) for the purpose of presenting another study in this domain, to complement the first phase, and to provide HCP with the required support to help EDL in corporatizing the institution. The reports associated with the detailed execution procedures to implement the plan of the study are expected to be finalized in May of year 2012.

It should be noted that the estimated total cost of the technical assistance contracts are of approximately US \$ 6.5 million, distributed in the following manner:

US \$ 5 million from the World Bank grant, about US \$1 million from the French Development Agency grant, and US \$ 500,000 from local funds to cover for the local tax expenses.

The designated consultants are to submit their reports gradually in due time in accordance with their terms of references, where the revisions by the concerned institutions are expected to constitute an opportunity for a close coordination amongst the involved parties that will facilitate the decision making process regarding the electricity sector reforms.

- The Comprehensive Master Plan for the Generation and Transmission of Power: Electricité de France (EDF), which was placed in charge of

drafting the Master Plan from a grant financed by the French government, has submitted a draft report regarding power generation. Based on the discussions with concerned officials over the remarks, EDF issued the second version of the report in June 2008 with expectations to issue the final version in year 2012.

### **Main Projects Under Preparation (2010 – 2011)**

#### **Generation sector:**

- The rehabilitation of Zouk and Jiyeh power plants: The installed and actual capacities of the Zouk and Jiyeh power plant units are as follows
- The total installed capacity of both Zouk and Jiyeh power plants are 938 MW, whereas the average effective operational capacity is 564 MW. EDL is currently conducting the rehabilitation feasibility study for the 2 plants, in addition to detailed studies and the preparation of the tender documents. The Kuwaiti Fund expressed its readiness to finance the rehabilitation of units 3, 4 and 5 of the Jiyeh power plant and the Arab Fund will be funding for the four units of the Zouk power plant in accordance with a 5 to 6 year work plan schedule. Once fulfilled, the rehabilitation is expected to raise the effective capacity of both plants to 800

MW, in addition to the preparation of the required provisions for the replacement of units 1 and 2 of the Jiyeh power plant. Awarding of the rehabilitation project is expected to start in 2010.

- Construction of New Generation Plants: Based on the first

suffocations witnessed on the transmission networks, mainly at: The Southern Suburbs (Dahieh), Bahsas (Tripoli), Marina (Dbayeh), and Ashrafieh.

#### Technical Assistance and Sectoral Studies:

- The Master Plan Study for

	Unit number	Installed Capacity in MW	Actual capacity in MW		Unit number	Installed Capacity in MW	Actual capacity in MW
Jiyeh plant	1	62	52	Zouk plant	1	145	90
	2	62	38		2	145	100
	3	69	58		3	145	-
	4	69	57		4	172	115
	5	69	54		-	-	-
	Total	331	259		Total	607	305

outcomes of the master plan conducted by EDF, various proposed options to construct new power plants are overlaid. The Ministry of Energy and Water is expected to settle on the most suitable option during 2010 that will lead to the execution of the new plants. Furthermore, the Ministry of Energy and Water is considering the possibility of purchasing special generators that will cover for a portion of the shortage in power generation on the short run. It should be noted that CDR has already started contacting numerous Arab and international funding parties to secure the necessary funds for these projects.

#### Transmission sector:

- Construction of substations in various regions:
- Amongst the current priorities are the five substations that have been determined to treat the

Distribution in Beirut and its Suburbs: Following EDL's request from CDR to seek funding for the Master Plan study for the Power Distribution in the Greater Beirut area, the French Agency for Development (AFD) has expressed its willingness to finance the study through a grant. The consultant EDF, who prepared the Master Plan of 1998, is expected to be nominated to carry out the works, which are anticipated to be finalized in 2012. The Master Plan of the Greater Beirut area includes: the updating of the Master Plan of 1998 for the city of Beirut, the area extended from Mkalles to Aaramoun, in addition to the Master Plan for the southern and northern suburbs.