Lebanon Electricity Sector

Main Findings from the World Bank’s Public Expenditure Review (PER)

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Outline

• Global energy perspective.
• Overview of issues facing the Lebanese power sector.
• Benchmark with international electricity sector performance.
• Key recommendations to improve service and reduce costs.
Global energy perspective
Today's Energy Issues Are Complex
Development of oil production capacity is forecast to decline.

Source: PFC Energy Global Liquid Supply Forecast
Demand for oil will oustrip supply

IEA Reference case 1.8% demand growth

- OPEC
- non-OPEC
- oil sands

Production (mmb/d)
Let’s turn to Gas: resource rich – production poor…
Carbon emissions have grown as energy supply and use has evolved.

Global Fossil Fuel Carbon Emissions by Source Since 1840

Source: US Department of Energy Carbon Dioxide Information Analysis Center
The R&D effort was more centralized and concentrated, including a significant focus on nuclear technologies.
What is wrong with R&D? Not enough!

Source: PFC Energy 50
Oil prices have surged globally causing an increase in all other fuels.

Natural gas and coal costs less than oil with the exception of some hikes in LNG.

Source: IEA WEO 2007
As natural gas becomes more available on the spot market, prices become more volatile.
Pros and cons with fuel options

- **HFO/diesel:**
  - + security of supply, no additional inv. cost.
  - - exposed to high prices and volatility, environmental disadvantages, higher heat rate.
  - - High cost (diesel)
- **LNG:**
  - + Clean, lower heat rate, unit size flexible.
  - - Large capital costs, requires scale (600 MW+)
  - - possibly availability concerns in short-medium term.
- **Coal:**
  - + security of supply, price competitive, non CO2 emission can be controlled.
  - + positive fiscal impact.
  - - CO2 emissions, perception issues, requires larger unit sizes to be economical.
- **CNG:**
  - + Available in smaller quantities at short distances, priced at par with LNG, limited infrastructure required, transport and other uses. Unit size flexible
  - + positive fiscal impact
  - - Untested in the power sector to date, work underway to make shipping safe.
The choice of technology should consider fuel options

<table>
<thead>
<tr>
<th></th>
<th>LNG/CNG</th>
<th>HFO</th>
<th>Diesel</th>
<th>Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas turbine</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>CCGT</td>
<td>Yes</td>
<td>With difficulty</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Steam turbine</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Wind</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Overview of issues facing the Lebanese power sector
Overview of issues facing the Lebanese power sector

- The sector is in a crisis mode – and has been for some time.
- The pressure on the need for improvement has increased massively with the rise in the international oil price.
- The subsidy burden is huge, with little to show for.
- The tariff level is way below cost-recovery level limiting sector revenues to cover cost (was last changed when oil cost US$21/barrel).
- Power outages are a daily occurrence:
  - Due to significant losses of generated electricity that never reaches the consumer, and
  - Lack of investment in new generation capacity and improvement in the transmission and distribution network.
  - Lebanon has among the world’s largest levels of self-generation.
- Reform and restructuring plans of EdL remain slow to be implemented although the legal framework for it is in place.
The subsidies to the sector are large and growing

- The figure for 2006 was reported to be US$758 million (before debt service) and well over US$1 billion in 2007.

Subsidies to EdL (1982-2005)

Source: MEW.
Lebanon is fuel import dependent and pays market prices for fuel.

- Fuel cost comprise close to 85% of operating cost at EdL.

<table>
<thead>
<tr>
<th>Operating cost</th>
<th>Amount (USD millions)</th>
<th>% of total operating cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel</td>
<td>1,095.4</td>
<td>83.3%</td>
</tr>
<tr>
<td>Power Purchased</td>
<td>117.5</td>
<td>8.9%</td>
</tr>
<tr>
<td>Wages</td>
<td>58.8</td>
<td>4.5%</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>12.4</td>
<td>0.9%</td>
</tr>
<tr>
<td>Other</td>
<td>31.5</td>
<td>2.4%</td>
</tr>
<tr>
<td>Total</td>
<td>1,315.6</td>
<td>100%</td>
</tr>
</tbody>
</table>
EdL is unable to keep up with electricity demand

- In middle income countries, there tends to be a correlation between GDP growth and electricity demand which is greater than 1 (i.e., electricity demand grows by a factor greater than GDP growth).
- The table below shows GDP growth greater than electricity demand met by EdL illustrating EdL’s difficulty in meeting demand (and the large need for self-generation and load-shedding).

### Increase in met demand by EdL and real GDP growth between 1998 and 2006

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in demand met by EdL</td>
<td>0.6%</td>
<td>3.7%</td>
<td>2.5%</td>
<td>7.7%</td>
<td>1.0%</td>
<td>0.9%</td>
<td>1.7%</td>
<td>-7.4%</td>
</tr>
<tr>
<td>Real GDP growth</td>
<td>-1.1</td>
<td>1.5</td>
<td>4.7</td>
<td>3.1</td>
<td>4.1</td>
<td>7.4</td>
<td>1*</td>
<td>0*</td>
</tr>
</tbody>
</table>

Lebanon’s industry suffers the most in the region from power failures

Source: ICA study, 2006
There are also major inefficiencies in the sector and governance problems

- In addition to technical losses (produced electricity that never reaches the consumer), there are major non-technical losses (theft):
  - This electricity has to be produced (and consumed) but does not generate any revenue for EdL.
  - Some billed customers also do not pay for their consumption further deteriorating the financial performance of EdL and increasing subsidy needs.
- EdL has a severe staffing problem with the average age approaching 60 years of age and difficulty recruiting and retaining staff (there is a hiring freeze in effect).
- Finally, it reports to both the MoEW and MoF slowing down decision-making and has a very low threshold (in money terms) on which its Board can take decision.
- The regulatory authority is envisaged in the Law (passed in 2002) but to date no progress has been made on its establishment.
International Comparison
International benchmarking

• The performance of Lebanon’s power sector is very poor compared to international standards:
  – Technical losses in well functioning utilities in developing countries ranges from 8-10% (Lebanon = 15%).
  – Non-technical losses may range between 0-10% (Lebanon = 17%, reported to have increased).

• Cost recovery pricing, for example:
  – Out of 44 countries in Sub-Saharan Africa 24 have fully or extensively passed fuel price increases in the retail prices.
  – Partial adjustment in prices in 15 countries, and only no adjustment of prices in 5 countries.

• Back-up generation is mostly in industry and tourist dependent countries and used only in emergency mode (5-10% per year):
  – In Lebanon, about 33% of electricity consumed is generated by self-generators.
  – This requires households to spend an extra 25% per year on electricity bills and the economic loss to industry may be as high as US$360 million per year (see full report for details).
Key recommendations from the PER
The PER prepared by the World Bank made recommendations in a few key areas:

- The recommendations focus on how to minimize public expenditure of the electricity sector and reduce overall government subsidies.

- How to meet electricity demand:
  - Several options were considered and analyzed and the PER recommends a three-pronged approach:
    - Reduce losses as much as possible.
    - Rehabilitate Jieh and Zouk to extend their life-time.
    - Add new generation capacity, but analyze carefully the (fuel) options.

- Start a path for tariff adjustment:
  - Analyze options to reform the structure and level of tariffs.
  - Provide safety net for the poor.
  - Have a very comprehensive communications plan before/during the adjustments.
Ensuring sufficient future generation capacity

- **Reduction of losses:**
  - The PER estimates that a reduction in technical losses from the current estimated 15% to 10% would free up about 100 MW and avoid investment of about US$80-100 million, and increase the revenue base as the reduced power could be billed.

- **Rehabilitation of Jieh and Zouk:**
  - These two plants represent about half of power capacity installed in Lebanon.
  - The World Bank estimates that they could run for another 10 years if rehabilitated and then properly maintained.
  - The rate of return would be as high as 27% for Zouk, 20% for Jieh and savings of around US$100 million per year as a result of more efficient fuel use, more of oil prices keep rising.
Ensuring sufficient future generation capacity (cont.)

• New generation capacity:
  – Lebanon has not added any new large-scale capacity in several years.
  – This is unusual for a sector of the size of Lebanon and with demand growth.
    • This is due to a number of factors: plans to privatize EdL, lack of funds.
    • Meanwhile supply reliability from EdL has decreased and reliance on self-generation has increased.

• The decision on type of technology for new generation capacity should be driven by a comprehensive fuel supply strategy:
  – That considers least cost, environment and energy security.

<table>
<thead>
<tr>
<th>CCGT</th>
<th>Piped Gas</th>
<th>LNG</th>
<th>HFO</th>
<th>Diesel</th>
<th>Coal</th>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>
• The PER analyses that large sized CCGT running natural gas to be most economical and large sized CCGT running on diesel to be least economical (see PER report of full set of assumptions).
Fuel supply options

• The findings of the PER stresses the following:
  – Lebanon needs to be careful about locking itself into a technology that has limited fuel options (CCGT).
  – CCGT runs efficiently on piped gas or LNG, but very expensive if it uses diesel. It can’t operate on heavy fuel oil or coal.
• Coal has a perception problem. CO2 emissions is an issue. All non-CO2 emissions are controllable.
• Without reduction in losses in transmission and distribution any new generation project would be costly and wasteful.
Tariff restructuring is needed

- The current tariff was adjusted last in 1996.
  - Up to 500 kWh is priced quite low – this is probably too generous.
- The oil price was then US$21/barrel.
- Much of industry self-generate during at peak period since the tariff is 3 times what is charged during off peak period.
  - This reduces EdL’s revenue base and financial performance since industry usually is a reliable consumer in payment terms.
- Bottom line is that the tariff is perceived high in relation to service provided but low in relation to cost.
  - The tariff adjustment and increase therefore needs to be in parallel to system improvements and a communications campaign.
  - As well as targeted assistance to vulnerable consumers.
Thank You