Jordan Atomic Energy Commission

Financing Perspective for Jordan Nuclear Power Plant

London, May 09, 2012
Agenda

● Jordan’s Nuclear Power Programme

● Financing Challenges

● Financing Options

● Delivering a Financeable Project

● Way Forward
Jordan Country Profile

- Total Area: 89 213 sq. Km
- Sea Port: Aqaba
- Coastline: 26 Km
- Population: 5.96 million
  31% (15-29) 38% (below 15)
- Climate: Mediterranean & Arid Desert
- GDP: $21.5 billion
- Per Capita: $3,554
- Annual GDP Growth: 7% (2000-2009)
Jordan’s Nuclear Power Programme – Why Nuclear Power?

- Growing demand for energy
  - electricity
  - desalination
- Need for Baseload power
- Diversification away from hydrocarbons
  - high and volatile prices
  - greater energy independence/security of supply
- Lack of indigenous fuel options
Energy Mix - 2009

- Natural Gas: 40%
- Oil Products: 58%
- Electricity Imports: 1%
- Renewables: 1%
Electricity Generated by Fuel Type

<table>
<thead>
<tr>
<th>Year</th>
<th>NG</th>
<th>HFO</th>
<th>LFO</th>
<th>Imported Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>89%</td>
<td>7%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>69%</td>
<td>24%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>25%</td>
<td>32%</td>
<td>32%</td>
<td>11%</td>
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</tbody>
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Legend:
- NG: Natural Gas
- HFO: Heavy Fuel Oil
- LFO: Light Fuel Oil
- Imported Electricity
Available and Committed Capacities versus the Electricity Median Load Forecast

- **Existing & Committed Capacity**
- **Capacity Shortage**
- **Peak Load**
Status of Implementing Nuclear Power in Jordan

- Established key bodies:
  - Nuclear Regulator – JNRC
  - Nuclear Procurement Agency - JAEC

- Building the Infrastructure
  - Sites
  - Laws and regulations
  - Education
  - International Collaboration – IAEA, Peer Groups, Collaboration Agreements

- Technology Selection
  - Detailed process using IAEA methodology and supported by experienced advisors
  - Shortlisted two technologies for final negotiations

- Identification of operator/investor partner
Financing Challenges for Nuclear Power in General

- Capital intensity and long pay-back period
- Risk of construction delays and cost increase – potential for stranded investments
- Market risk – requires stable power offtake arrangements
- Nuclear liabilities – spent fuel, decommissioning
- Political and regulatory risks – e.g. Germany’s exit from nuclear
- Accidents – Fukushima-type events affect the whole industry
- Lack of experience in financing nuclear and condition of the capital markets
Financing Challenges for Jordan in Particular

- Scale of the investment relative to Jordan’s GDP
- Limited Government financing available – not like many other Arab Countries
- Jordan’s credit rating and IMF restrictions are hurdles for financing and ability to provide sovereign guarantees (which are likely to be required)
- First nuclear power plant – no track record of construction or operation
- Regional issues
## Financing Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Characteristics</th>
<th>Applicability to Jordan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project finance</td>
<td>Limited or non-recourse financing</td>
<td>Very few, if any examples, worldwide – extremely difficult for new entrant such as Jordan</td>
</tr>
<tr>
<td>Private sector utility financing e.g. EDF (UK), Southern Company (USA)</td>
<td>Large utility finances project all or largely on-balance sheet</td>
<td>Currently, no private sector utilities in Jordan</td>
</tr>
<tr>
<td></td>
<td>Level of pricing certainty/support may be required or cost recovery via regulated customer base</td>
<td>Intention is to establish a nuclear utility owned by Jordan and strategic partner(s)</td>
</tr>
<tr>
<td>Federal/State financed e.g. China, Russia</td>
<td>State-owned utility</td>
<td>Scale of financing required beyond Jordan’s capability</td>
</tr>
<tr>
<td>Finnish – “Exeltium model” e.g. Olkiluoto</td>
<td>Plant built to serve consortia of large power users. (paper mills, aluminium smelter) Plant itself is not for profit</td>
<td>Power required for non-industrial consumers – industrial users not of sufficient scale</td>
</tr>
<tr>
<td>Vendor/Sovereign financing e.g. Turkey</td>
<td>Government of the vendor finances (all or part), builds and operates plant</td>
<td>Attractive to Jordan as long as Jordan participates in project</td>
</tr>
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</table>
Delivering a Financeable Project
Infrastructure Development

- Following IAEA guidelines
- Modern reactor technology - evaluating Gen III+ technologies incorporating latest safety systems
- Thorough site selection and licensing process
- Developing legal and regulatory framework
- Working with the international nuclear community
- Developing nuclear capabilities in Jordan
- Identifying an experienced international nuclear strategic partner
Delivering a Financeable Project

Project Structure

- **Schedule risk** - two project phases:
  - Early Works Phase – develop project definition and reduce project risk
  - Project realization phase for which financing/investment solutions will be investigated

- **Construction risk** - EPC contract with major vendor

- **Political risk** - direct Jordanian government investment in the project

- **Fuel risk** - secure fuel supply agreement

- **Market risk** - Long term power purchase agreement

- **Operating risk** - Strong international operator

- **Nuclear risk** – international treaties, decommissioning and spent nuclear fuel policy
Potential Project Structure

- Government of Jordan
- Private equity investors
- Project Company
- EPC Contractor
- Lenders
- Electricity Off Taker
- Guarantee
- Nuclear Island
- Conventional Island
- Civil Works
- BOP
Next Steps for Jordan NPP

- Strategic Partner
  - Identify Partner
  - Establish Utility

- Technology
  - Select technology vendor
  - Licensing

- Infrastructure
  - Site characterisation
  - Infrastructure development

- Project
  - Early Works Agreement
  - EPC Contract

- Financing
  - Feasibility study
  - Engagement with financial community