Financing Nuclear Power Projects: Challenges and IAEA Assistance in Capacity Building

International Framework for Nuclear Energy Cooperation
Finance Workshop
London, 9-10 May 2012

Nadira Barkatullah
International Atomic Energy Agency/Department of Nuclear Energy
Member States request for assistance:

- Understand financing of nuclear power projects
- Recognise potential financing structures and packages for nuclear investment
- Understand the challenges and risks associated with financing of a nuclear power project
- Develop the approaches for managing and mitigating these challenges and risks
# Milestones in Development of National Infrastructure of Nuclear Power

<table>
<thead>
<tr>
<th>ISSUES</th>
<th>MILESTONE 1</th>
<th>MILESTONE 2</th>
<th>MILESTONE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>National position</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Funding and financing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legislative framework</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safeguards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory framework</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiation protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human resources development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholder involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site and supporting facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security and physical protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear fuel cycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radioactive waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procurement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Knowledgeable commitment  
Bid Invitation  
Commission and Operation
Nuclear and the cost of financing

- Why is the cost of finance for nuclear higher?
- Why is there a risk premium of x% above other power generation assets leading to a higher interest rate?
The Economics of Nuclear

**Key Advantages of the Nuclear Power**
- Relatively low fuel cost: economic competitiveness
- Suitable for baseload capacity
- Long life time
- Low external costs
- Guarantee for energy supply
- Capacity development: contribution to national high technologies sector

**Key Challenges to the Nuclear Power**
- Highly capital intensive: high upfront capital costs, which are difficult to finance
- Sensitive to interest rates
- Long lead times (planning, construction, etc)
- Long payback periods
- Regulatory/policy risks
- New financing structures required to attract private investors
Challenge: Highly capital intensive
Cost structures of different generating options

Nuclear
- Fuel
- O&M
- Capital

Coal
- Fuel
- O&M
- Capital

Natural gas
- Fuel
- O&M
- Capital
IAEA: Data collected from various publications and studies to keep track of nuclear power plants investment costs, since 2008 (updated Feb 2011), *all data in 2008 USD*
Challenge: GDP varies across the countries

Gross Domestic Product (GDP) in $2010 billions

Source: IMF World Economic Outlook, September 2011

More than 60 (35%) countries have GDP below $10b

More than 50% of countries have GDP below $50b
**Challenge: Market capitalisation and NPP highly capital intensive**

Approximate market capitalisation of the leading EU, US and Asian utility companies

<table>
<thead>
<tr>
<th>Country</th>
<th>Utility</th>
<th>Market capitalisation (USD billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>GDF SUEZ</td>
<td>54</td>
</tr>
<tr>
<td>EU</td>
<td>EDF</td>
<td>40</td>
</tr>
<tr>
<td>EU</td>
<td>Enel</td>
<td>31</td>
</tr>
<tr>
<td>EU</td>
<td>RWE</td>
<td>27</td>
</tr>
<tr>
<td>US</td>
<td>Southern Company</td>
<td>39</td>
</tr>
<tr>
<td>US</td>
<td>Exelon Corporation</td>
<td>25</td>
</tr>
<tr>
<td>US</td>
<td>Dominion Resources</td>
<td>29</td>
</tr>
<tr>
<td>US</td>
<td>Duke Energy</td>
<td>27</td>
</tr>
<tr>
<td>Asia</td>
<td>Korea Electric Power Corporation</td>
<td>12</td>
</tr>
<tr>
<td>Asia</td>
<td>Saudi Electricity Company</td>
<td>16</td>
</tr>
<tr>
<td>LA</td>
<td>Centrais Eletricas Brasileiras</td>
<td>9</td>
</tr>
</tbody>
</table>

*Note: Updated April 2012*
Challenge: Credit rating pressure

- “Moody's Says Substantial Nuclear Plant Cost Overruns Increase TVA's Rate Pressure and Debt Ceiling Risks…” (9 April 2012, Moody’s Investors Service)

- “…..ratings agencies could downgrade French energy giant EDF and British Gas owner Centrica if they decide to build four reactors..” (7 April 2012 This is Money)

- “S&P set to downgrade Italy's Enel rating” (Reuters 12 March 2012)
Major Challenges to Financing NPP

Other Challenges

- Long pay back period
- Foreign exchange rate risk
- Commodity price risk
- Multinational Institutions policy on credit availability
- Uncertainty in the Regulatory process
- Construction Supply Chain risks
- Deregulated electricity market rules and regulation
- Operational performance risk
- Negative Public Perception of nuclear
- Nuclear liability and insurance on how to cap and allocate the “extraordinary nuclear occurrences”
- Management of spent fuel and waste, and decommissioning
Agency Assistance in Capacity Building

How is the Agency assisting the newcomers regarding financing of NPPs?

- Useful information (e.g. documents)
- Workshops, training and analytical tools
- Cooperation with international organizations and others (like, OECD/NEA, OECD/IEA, Global Nuclear Energy Partnerships, Generation IV International Forum)
Agency Assistance in Capacity Building

IAEA publications

- Alternative Contracting and Ownership Policy, Under Preparation

IAEA Nuclear Energy Series
No. NG-T-4.2
Financing of New Nuclear Power Plants

IAEA Nuclear Energy Series
No. NG-T-4.1
Issues to Improve the Prospects of Financing Nuclear Power Plants

IAEA Nuclear Energy Series
No. NG-T-3.9
Invitation and Evaluation of Bids for Nuclear Power Plants
Agency Assistance in Capacity Building
Collaboration with OECD

- OECD Publications

1. The Financing of Nuclear Power Plants
2. Projected Costs of Generating Electricity
IAEA’s Support for Capacity Building
Training and Workshops
Agency Assistance in Capacity Building
Training sessions

Organise training sessions to employ the use of IAEA tools like FINPLAN

FINPLAN - Financial Analysis of Electric Sector Expansion Plans

**INPUT**

- Investment programme (= capacity additions) & operating expenses
- Economic and fiscal parameters (inflation, escalation, exchange rates, taxes)
- Financial parameters (credits, bonds...)

**OUTPUT**

- For each year:
  - Cash flows
  - Balance Sheet, Statement of Sources, Applications of Funds
  - Financial Ratios:
    - Working Capital Ratio
    - Leverage ratio
    - Debt Repayment Ratio
    - ... Global Ratio

- to help assess the financial viability of plans and projects and to analyze alternative expansion plans by evaluating their financial consequences
Agency Assistance in Capacity Building Workshops on Financing

- Financing workshop to meet the requirements of the MSs to support and enhance their understanding of Financing and Financial Risk Management concepts.
Agency Assistance in Capacity Building Workshops on Financing

- Introduced Financial Risk Management Framework

- Identify, Assess and Estimate financial risks

- Allocate risks— who takes on the responsibility? based on the financing model & contractual/ownership structure

- Develop Risk Mitigation Strategy

   Based on FRM Framework developed in Breakout Sessions
<table>
<thead>
<tr>
<th>Name of risk</th>
<th>Risk assessment</th>
<th>Allocation</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction delay</td>
<td>Medium</td>
<td>Owner/Contractor</td>
<td>Qualified third party contractors/PMC</td>
</tr>
<tr>
<td>Credit risk</td>
<td>High</td>
<td>Owner/Lender</td>
<td>Well defined loan agreement</td>
</tr>
<tr>
<td>Foreign Exchange/Currency</td>
<td>Medium</td>
<td>Owner/Lender</td>
<td>FX hedging strategy</td>
</tr>
<tr>
<td>Interest</td>
<td>Medium</td>
<td>Owner</td>
<td>Fixed rate/ECA</td>
</tr>
</tbody>
</table>
Agency Assistance in Capacity Building Workshops on Financing: Some Examples

- Economics and Financing of Nuclear Power, EU Region, February 2009
Fukushima Impact

Are Member States still interested?

- Nuclear Costs to Rise Following Fukushima Disaster (Energy Business Daily, April 25th, 2011)
- “The economics of nuclear power may deteriorate...in the wake of the Fukushima accident (OECD International Energy Agency, 2011 World Energy Outlook)
- Eurozone: S&P downgrades Europe (Reuters, 14 January 2012)

The interest still persists as “Countries tell UN their nuclear plants continue” (Nucleonics Week, 29 September, 2011)
Agency Assistance in Capacity Building
Recent Workshops on Financing


MS - Very enthusiastic to learn about financing structure and financial risk management issues, “more needed than less…”

“…valuable for my country…”

“Very essential to have follow up..”
Key findings of the workshops:

- Governments have a critical role with explicit long-term commitment
- Wide range of overnight capital cost challenging for newcomers
- Financing and construction duration key influencing factors to impact total investment cost
- Other main risks - foreign exchange rate risk, variation in interest rate and funds
- No one-size-fit-all solution, each project is unique
- The Fukushima accident foreseeable risk might lead to unnecessary safety measures, which might increase the cost of NPPs
Key findings of the workshops (cont’d):

- Risk sharing critical among key stakeholders
- Private financing - JV among utilities with robust balance sheets
- Meticulous Financial Risk Management Strategy imminent
- ECA support is vital and ensures bankability of the project
- Strict financial industry regulation, like Basel III to impact liquidity and more vigilance of large scale risky projects
- Governments need to urge multilateral financial institutions like World Bank, to assist with the financing of NPPs
- Construction risk is rated no 1 – so to gain confidence of investors...”more projects on Schedule and within Budget””
Thank you very much for your attention!