**Investment Considerations**

- Outages cost African countries as much as 2% of their gross domestic product.
- Revenues of big businesses down by as much as 6%.
- Sales losses for smaller businesses down as much as 16%.

*"In Africa, Outages Stifle a Boom", The Wall Street Journal, April 17, 2008*

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### Electricity Investment Needs

<table>
<thead>
<tr>
<th>Region</th>
<th>Urban</th>
<th>Rural</th>
<th>Total</th>
<th>People without access</th>
<th>2001-2030 Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Africa</td>
<td>99.3%</td>
<td>79.9%</td>
<td>90.3%</td>
<td>26 million</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan</td>
<td>51.3%</td>
<td>7.5%</td>
<td>22.6%</td>
<td>509 million</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>63.1%</td>
<td>16.9%</td>
<td>34.3%</td>
<td>$609 billion</td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td>68.2%</td>
<td>30.1%</td>
<td>40.8%</td>
<td>801 million</td>
<td>$783 billion</td>
</tr>
<tr>
<td>Latin America</td>
<td>98.0%</td>
<td>51.5%</td>
<td>86.6%</td>
<td>56 million</td>
<td>$744 billion</td>
</tr>
<tr>
<td>East Asian/China</td>
<td>98.5%</td>
<td>61.0%</td>
<td>86.9%</td>
<td>241 million</td>
<td>$2,712 billion²</td>
</tr>
<tr>
<td>Middle East</td>
<td>98.5%</td>
<td>76.6%</td>
<td>91.1%</td>
<td>$298 billion</td>
<td></td>
</tr>
<tr>
<td>Developing Countries</td>
<td>85.6%</td>
<td>51.1%</td>
<td>64.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>91.2%</td>
<td>56.9%</td>
<td>72.8%</td>
<td>1,635 million</td>
<td>$5,106 billion³</td>
</tr>
</tbody>
</table>

Source: The IEA, World Energy Outlook 2002 (Chapter 13) and World Energy Investment Outlook 2003 (Chapter 7)

1. Includes parts of Middle East
2. 18 million in China
3. $1,913 billion is for China alone

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**Figure 2** Investment commitments to electricity projects with private participation in developing countries by segment, 1990-2006

2006 US$ billions

Source: World Bank and PPIAF, PPI Project Database.

* Adjusted by the 2006 US CPI.
Who will meet the gap?

Financing required for the Power Sector in Emerging Markets 1990 - 2020

Cumulative Sum ($Bn)

$2,300 Bn

High Investment Demand Scenario (3%)

$1,900 Bn

Low Investment Demand Scenario (2%)

Private Capital Mobilized in Power Sector

Gap covered by public financing, self-financing, donor funding, and rationing.


The answer: mostly private sector

- There is plenty of capital in the world
- Looking for profitable investment opportunities
- But, competition is, as always, tough
- Most governments do not have financial resources
- Donor funding is limited

Energy investments

- capital intensive
- long lead times
- hence risky
- Project financing is often preferred

What is Project Finance?

- Project Finance is Single Asset, Cash Flow Based, i.e., without reliance on corporate or parental guarantees.
- Project Finance is highly leveraged at financial close because of contracts or because of cost structures that are profitable against commodity prices.
- A debt funding structure that relies on future cash flows from a specific development as the primary source of repayment, with that development’s assets, rights and interests held as collateral security.
**Project Finance Characteristics**

- **Ring Fenced Project** – Legally and economically self-contained; only business is the project. Project is not exposed to risks outside and project cannot rely on financial support if things go wrong.
- Usually a **new project**.
- **High** ratio of **debt to capital and long debt term**.
- **No guarantees** after the project begins operation.
- **Lenders rely on the cash flow** of the project, rather than the value of the assets or the ability to re-finance.
- Exposure to risk of political influence by host governments leading to use of **political risk guarantees** providing a cross-country assessment.
- **Security for debt is the contracts, the resource rights, etc.**
- The project has a **definite life**.

**Delayed Execution Erodes Value**

- Surveys of power sector investors
  - Confirm that adequacy of cash flow is one of the most critical factors in determining success of failure of a project →
  - tariffs should be designed such that
    - costs are recovered and
    - excess capital is generated for new investment to maintain and expand the system
  - collection discipline must be improved
One way to rationalize tariffs

What type of plant?

<table>
<thead>
<tr>
<th></th>
<th>Coal</th>
<th>Natural Gas</th>
<th>Nuclear</th>
<th>Wind</th>
<th>Micro Hydro</th>
<th>Solar</th>
<th>CHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$35-60</td>
<td>$40-63</td>
<td>$30-50</td>
<td>$45-140</td>
<td>$65-100</td>
<td>$200</td>
<td>$30-70</td>
</tr>
<tr>
<td>per MWh</td>
<td>per MWh</td>
<td>per MWh</td>
<td>per MWh</td>
<td>per MWh</td>
<td>per MWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inv</td>
<td>50%</td>
<td>20%</td>
<td>70%</td>
<td>O&amp;M</td>
<td>70%</td>
<td>O&amp;M</td>
<td>O&amp;M</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>15%</td>
<td>20%</td>
<td>10%</td>
<td></td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>35%</td>
<td>73%</td>
<td>10%</td>
<td></td>
<td>40%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With recent cost inflation, these costs have probably increased at least 50%

Natural gas price range of $3.5-$4.5 per MMBtu

Source: Projected Costs of Generating Electricity -- 2005 Update, by IEA and NEA