Electric Power Development in Bangladesh: Observations and Recommendations

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Professor Saifur Rahman
Director
Advanced Research Institute
Virginia Polytechnic Inst & State University, U.S.A.
www.ari.vt.edu

Presentation Outline

- Structural issues
- Grid expansion vs. distributed generation
- Opportunities for renewables
- Conclusions and recommendations
Access to Grid Electricity in Bangladesh

Only about 35% of population connected to electricity grid

3,500 MW available generation

The country has been unable to meet the electricity demand, including Dhaka

blackouts, load shedding, high system losses (30%), electricity theft and low plant efficiencies

Realities on the Ground

- Energy is a high visibility sector – political implications
- 60 – 70% of total consumption is in the form of traditional energy and comes from biomass
- Rural/urban division, affluent/poor division
**Electric Power Sector Strategic Issues**

- Managing system losses
- Quality of service – system restoration
- Average plant capacity factor: under 50%
- Tariff structure – subsidization of electricity and natural gas
- Managing the IPP’s – payments, contracts, land, infrastructure
- Generation capacity expansion
- Transmission and distribution network
- In-country technical/managerial talent

**Two-pronged Approach**

**Grid Expansion**

**Distributed Generation**

_Distribution Line at Chittagong Hill Tracts  
Source: BD-PDB_
**GDP and Electricity Generation – Historical Trend**


**Natural Gas Consumption (Annual) - History**

- Anomalies in 1988 and 1997 may have been caused by changes in consumption in fertilizer sector
Natural Gas Consumption and GDP

![Graph showing natural gas consumption and GDP over time.]

- What happened in 1988 and 1997?

World Bank Forecast for Electric Power Sector

- 1% growth in GDP needs 2 – 2.5% growth in power supply
- World Bank vision of what can be achieved:
  - 7-8%/yr GDP growth rate through 2020
  - 14-20%/yr growth rate in electricity generation through 2020
- $15 billion total investment in power sector needed by 2020
India - Background

- World’s 6th largest energy consumer
- Gas consumption 800 BCF in 1999, projected to reach 1.7 TCF in 2005 and 2.7 TCF in 2010
- Plans major infrastructure investments to keep up with demand
- 100,000 MW new capacity by 2015
- Imports of LNG by sea to support power projects being encouraged by GOI
- World’s 3rd largest producer of coal, relies on coal for >50% of total energy needs
- Some coal is still imported
- Total installed capacity 128,000 MW (2006)

India – Transmission and Distribution Losses

<table>
<thead>
<tr>
<th>SEB</th>
<th>Losses (%)</th>
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<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>32*</td>
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<tr>
<td>Assam</td>
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<td>Bihar</td>
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<td>Himachal Pradesh</td>
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<tr>
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<td>Orissa</td>
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<td>Uttar Pradesh</td>
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<tr>
<td>West Bengal</td>
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</table>

* 1996/97
** 1995/96
Source: Indian Planning Commission

- Wide variability of T&D losses
- Data available from http://www.indiainfoline.com
- Data accuracy is an issue, actual losses in Orissa and AP may be lower
### Potential for Generation Capacity in Bangladesh

- Natural gas – significant potential
- Coal – significant potential (?)
- Renewables – significant potential
  - Photovoltaics – strong potential in remote areas
  - Wind – moderate potential in coastal areas
  - Biogas – significant potential
- Industrial cogeneration – significant potential
- Hydropower – some room for expansion, uncertain environmental impacts
- Nuclear – low potential
- Petroleum – low potential

### Issues Facing the Electric Power Sector

- Increasing capacity and minimizing losses
- Attracting and retaining private sector investments in energy
## Distributed Generation

- Small gen-sets supplying village markets and small town customers in a distribution network
- Generators could be granted distribution franchises with limited regulations
- Captive generators may be allowed some outside-the-factory sales

## Renewable Energy

- Opportunities in off-grid areas
**Solar Resource in Bangladesh**

- Location:
  - 20.34-26.38° N
  - 88.01-92.41° E
- Average solar radiation:
  - 4-6.5 kWh/m²/day
- Average of bright sunshine hours:
  - 7.55 hrs/day
- Average annual temperature:
  - 23.4°C

![Solar insolation map](image)

**Worldwide Installed Solar Photovoltaics**

*Cumulative Capacity 1992-2004*

![Graph of cumulative capacity](image)

**Source:** BP.com, 2006
PV Project on St. Martin’s Island

Capital costs $5,000-$6,000/kW
Size 50-300 W

Applications: rural electrification of remote off-grid areas of Bangladesh
Wind Energy

Installed Wind Power in the World

Cumulative Capacity 1997-2006

Source: BP.com, 2006 and World Wind Energy Association, Germany as of 29 Jan 2007
Potential of wind energy has not been fully explored.

Very little wind potential for electricity generation annual mean wind speed 2-3 m/s at height 5-10 m

Promising areas are only the districts of Chittagong and Cox’s Bazar.

Wind Turbines

- Capital costs $700- $1,500/kW
- Size >300 watts to 3,000 kW
- Applications: rural electrification, battery charging and wind pumps for lifting water

Biomass

- Biomass = most significant energy resources, accounting for 70% of final energy consumption
- Main biomass resources:
  - Trees and fuel wood (48%)
  - Agricultural Residues (36%)
  - Livestock (13%)
  - Peat (3%)

Land use pattern

Substantial high quality natural gas reserve in the eastern part of the country

Major indigenous non-renewable energy resource (accounting for 70% of the commercial energy supply)

Consumption of natural gas:
- Power sector (48%)
- Fertilizer (23%)
- Other (29%)

Source: Bangladesh Oil, Gas & Mineral Corporation (PetroBangla)

Regional Considerations

- Excess hydropower in Nepal, Bhutan
- Bangladesh-India power exchange
- Regionally integrated transmission grid
- Implementation of joint capacity addition programs
- Attracting and retaining the interests of private partners in energy sector
Focus Areas for National Policy

- Increase plant capacity factors
- Rehabilitate and re-power existing plants
- Manage system losses
- Promote renewable energy, rural electrification, off-grid power or distributed generation

Capacity Expansion

Investments in grid expansion must remain the state’s responsibility
Opportunities must be made available for private sector contribution in generation
Define the necessary boundary conditions
- Power injection points
- Acceptable generation capacity
- Grid integration standards

Develop standard power purchase agreements
Thank You!

Saifur Rahman
Email: srahman@vt.edu