

# **A review of development trends in the energy sector of Bangladesh**

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**R 2001: 3**

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## **Indexing terms**

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Energy sector

Natural gas

Electric power

Poverty

Bangladesh

## Executive summary

The main objective of this report is to inform key decision-makers of Norwegian development assistance on the development prospects of the *commercial energy* sector in Bangladesh.

Gas is currently the only indigenous non-renewable energy resource in the country that is produced and consumed in significant quantities. Gas constitutes approximately 70% of the commercial energy use in Bangladesh.

Most of the population remains without access to commercial energy for lighting and cooking, but depends primarily on biomass. Thus, *the main challenge* before the country is how to provide electricity to domestic industry and households and to broaden access to natural gas. This review critically examines the gas and power sectors in terms of major actors, current and potential output, generation, transmission and distribution problems and the emerging policy regime.

This summary is structured along the lines of the main report, whose concluding section presents a synopsis.

### **The regional energy market**

Bangladesh and its surrounding areas are thought to be rich in energy resources. In the medium term, demand for power in India and Bangladesh is set to grow quickly.

Three countries (India, Nepal and Bhutan) are likely to be the most relevant for Bangladesh in the development of a regional energy strategy. Nepal and Bhutan are endowed with considerable hydroelectric potential. India is looking for ways to augment its sources of energy and is eyeing Bangladeshi gas with interest.

The economic and technical advantages of a regional electricity and gas grid/pipeline are many. It would ensure a greater supply security and reliability, reduce the reserves needed for meeting peak demands, lower costs through economies of scale, increase the diversification of primary sources of energy and contribute to overall efficiency.

Necessary first steps include the development of an adequate database on regional energy supply-demand, especially demand for power; an examination of development options facing each country and the region as a whole, regulatory policy and price-subsidy practices; and an estimation of gains from regional energy trade. Simultaneously, political irritants have to be removed before real commitment can be generated for cooperation.

### **Energy policy of Bangladesh (NEP)**

NEP is quite ambitious and farsighted regarding objectives and strategies for the reform process, particularly in the power sector. The need for a reform and strategies for implementing it are also underscored in the Fifth Five-Year Plan and through the ADP.

Major bottlenecks are identified and strategies are developed. These strategies are similar to those put forward by the donor community:

- Separation of sector regulation and operation through a regulatory body
- Autonomy and commercial orientation of the sector entities

- Unbundling of generation, transmission and distribution
- Increased private sector participation

What distinguishes the GoB policy from the donor policy is the time frame of the reform process. International financial institutions such as WB and ADB are not only impatient with the reform process, but very disappointed with the past performance of the energy sector. All new projects are therefore linked to the reform process.

### **Gas sector**

Gas production is concentrated in the hands of four suppliers: two international oil companies and two national companies. The international oil companies produce a quarter of total production. Shell produces 16% of the total while Unocal accounts for the remaining 9%. The rest is produced by two Petrobangla firms. Total production has on average increased by 7.1% per year during the last decade and daily production is 900 million cubic feet.

Arrangements with international oil companies are regulated through production sharing agreements. The IOCs cover all costs of exploration and production. When production of gas starts, the cost is reimbursed based on an agreed share of maximum cost oil. The IOCs do not pay any taxes.

The gas market is highly concentrated in production, transmission and distribution and the government lacks a regional perspective on the development of the gas sector.

The market is not viable in the sense that gas prices do not cover the cost of production. For instance, contracts with IOCs are based on a 'take or pay' principle where the price Petrobangla pays to the IOC is higher than its (regulated) selling price. The example illustrates the importance of liberalising distribution along with production (but not with transmission, since it is a natural monopoly).

GoB has a static view on reserves. Petrobangla lacks financial resources to undertake drilling activities while the IOCs are reluctant because they are unsure about the effective market demand for the gas. With activities limited, one can hardly discover new reserves.

### **Power sector**

The power sector in Bangladesh is beset with huge management and institutional problems. The main agency in charge of power is the BPDB (Bangladesh Power Development Board). Over the years BPDB agreed to undertake reforms, e.g. formation of a separate distribution company (DESA) for power distribution in Dhaka, creation of DESCO in 1996 as a subsidiary of DESA, and setting up the Power Grid Company (PGCB) in 1996 to operate and maintain the transmission system. The reforms have been taking place slowly, mainly to meet donor conditionalities.

Power production is mainly based on the transformation of natural gas. BPDB is the main producer of electricity, but production is inefficient. Generators are mainly based on old vintage technology, while proper maintenance is not undertaken. Lack of available reserve capacity has meant that frequently generators cannot be shut down for much needed repair-maintenance work. The problem is compounded by the difficult financial situation of BPDB.

Extensive load shedding, system loss and low collection ratios underscore these problems. Like the gas sector, the power sector is not viable with the current price structure, since prices do not cover costs.

In the future IPPs will play an even more important role as producers of power (on a 'take or pay' basis), leading the GoB into financial difficulties without reforming the sector.

### **Energy and poverty alleviation**

A big challenge facing countries like Bangladesh where access is limited is to provide connections to households and to ensure that the poor are not left out of this process.

In the case of power, some progress has been made under the REB, which has expanded rapidly in recent years. In the case of urban areas, power to poor households is constrained by the fact that most tend to live in squatter slums and do not have legal title to their premises.

The demand for power remains huge and largely unmet. The financial cost of connections and monthly bills are such that even the rural poor can afford these easily. Compared to their urban counterparts or neighbors in India, rural Bangladeshi consumers receive fewer subsidies, pay their bills more promptly and engage in less pilferage.

The REB's institutional structure seems efficient and accountable and has demonstrated good capacity for rapid expansion and recovery of dues.

Gas connections for domestic and industrial use are mainly provided to consumers in urban-industrial concentrations. Given the large infrastructural outlays involved in transporting gas, it is generally considered not economically viable to take pipelines to rural areas.

### **The political economy of energy policy**

The implementation of reforms has been slow because of stiff resistance from the bureaucracy, the officials of the concerned agencies (e.g. Petrobangla and PDB) and their trade unions.

Civil society and the political parties are not very vocal about the question of reforms. There remains a great deal of concern about the presence of powerful IOCs in the country and whether Bangladesh is able to safeguard its national interests and ensure negotiation of an equitable and fair contract.

The power sector has been opened to foreign independent power producers in order to accelerate power generation capacity in the country. Investor response has been excellent. There is a concern regarding the country's ability to muster the necessary foreign currency resources that will be needed to pay the IPPs.

The state of inaction receives support from a host of vested interest groups that stand to gain - trade union leaders and their members, officials of BPDB (and subsidiaries) and a large network of contractors, engineers, suppliers and cadres of political parties. It is likely that corporatization, combined with an appropriate incentive and management structure, can rescue public sector agencies like BPDB.

There is increasing support in Bangladesh for an export-oriented growth strategy to generate employment and improve access to technology and foreign investment. An important sector in this context is foreign investment in and possible exports of natural gas. At the same time, there is a distinct reluctance/conservatism with regard to gas exports from Bangladesh.

A frequent question raised refers to the reliability of the estimate of gas reserves. There is a feeling that the government has inadequate information and should take steps to develop its own capability to enable it to make independent assessments of the reserve position. Other concerns flagged include: the assessment of domestic energy requirements; inadequate discussion and dissemination of information; and lack of a strategic plan in terms of alternative options for gas use.

A number of distinct views emerged about the desirability of exports: that exports may only be undertaken after ensuring that the country is able to meet domestic gas demand for the next fifty years; that limited exports be allowed to bordering regions of India; or that substantial gas exports be permitted by pipeline to India, mainly to the New Delhi market. Most opposition political parties are opposed to exports through a pipeline, while some foreign and local academics advocate a five-year moratorium on exports. Exports after value-addition is much less controversial, so that a serious effort needs to be made to examine the option of e.g. gas-based power exports. There is a feeling that Bangladesh may be forced into a situation where there is no option but to export - if only to pay the IOCs for gas off-takes. There is increasing pressure from powerful quarters to that end.

There are also political-strategic considerations that may be important. This has to do with broader Indo-Bangla relations, including the resolution of outstanding border disputes, access to Indian markets for Bangladeshi products, and fears of Indian domination.

A major concern relates to PSAs and the relationship between the IOCs and their local agents. Many expressed an apprehension that perhaps these contracts are being signed in haste and in a situation of inadequate transparency.

## CURRENCY EQUIVALENTS

(as of May 2001)

Currency Unit = Taka (Tk)

US\$1.00 = Tk 55

## FISCAL YEAR

1 July –30 June 30

## WEIGHTS AND MEASURES

MCF	=	thousand standard cubic feet
MMCFD	=	million standard cubic feet per day
BCF	=	billion cubic feet
TCF	=	trillion cubic feet (1,000 billion) cubic feet
kW	=	kilowatt
MW	=	megawatt (one thousand kilowatts)
KGOE	=	kilogram of oil equivalent
kWh	=	kilowatt-hour
GWh	=	Gigawatt-hour
kV	=	kilovolt

## ABBREVIATIONS AND ACRONYMS

ADB	=	Asian Development Bank
ADP	=	Annual Development Programme
BAPEX	=	Bangladesh Petroleum Exploration Company
BPDB	=	Bangladesh Power Development Board
BIDS	=	Bangladesh Institute for Development Studies
CPD	=	Centre for Policy Dialogue
CMI	=	Chr. Michelsen Institute
DESA	=	Dhaka Electricity Supply Authority
DESCO	=	Dhaka Electricity Supply Company
GoB	=	Government of Bangladesh
GDP	=	Gross domestic product
GTCL	=	Gas Transmission Company Ltd.
HCU	=	Hydrocarbon Unit
IOC	=	International Oil Company
IPP	=	Independent Power Producer
LGED	=	Local Government Engineering Department
LPG	=	Liquefied Nitrogen Gas
LNG	=	Liquefied Natural Gas
LRMC	=	Long-run Marginal Cost
MEMR	=	Ministry of Energy and Mineral Resources
NCG	=	Nordic Consulting Group
NEP	=	National Energy Policy of Bangladesh
NR	=	National Resources
PC	=	Power Cell
PGCB	=	Power Grid Company of Bangladesh
PSA	=	Production Sharing Agreement
Plan	=	Fifth Five Year Plan 1997-2002
RPC	=	Regional Power Companies
PBS	=	Palli Bidyut Samity (Rural Electrification Cooperative)
RE	=	Rural electrification
REB	=	Rural Electrification Board
ROM	=	Rehabilitate Operate Maintenance
WB	=	World Bank
TOR	=	Terms of Reference
SAARC	=	South Asian Association for Regional Co-operation
UAE	=	United Arab Emirates
USGS	=	US Geological Survey



# 1. Introduction and background

The main objective of this report is to inform key decision-makers on Norwegian development assistance of the development prospects of the *commercial energy* sector in Bangladesh.<sup>1</sup> According to the TOR (see Annex 1a), the report should provide a review of the energy sector and discuss emerging *policy challenges* in order to promote optimal utilization of resources, maximize economic growth and reduce *poverty*.<sup>2</sup>

Energy consumption in Bangladesh constitutes only 0.1 per cent of total world energy consumption. Consumption of commercial energy makes up about half of total energy consumption, somewhat less than other South Asian countries, but its absolute level is very low even in comparison with the low South Asian standard (see Annex 2). The two most important energy-intensive sectors are transport and industry, accounting for around 50% and 43% of total commercial energy use in the country (EIA, 2001a). Before the discovery of significant quantities of natural gas, energy supply depended on limited domestic hydro-electricity and coal or fuel-driven power generation based on imports. Gas is currently the only indigenous non-renewable energy resource in the country that is produced and consumed in significant quantities.<sup>3</sup>

Investments in the energy sector constitute a crucial part of a country's infrastructure. For developing countries, the income elasticity of energy is greater than one.<sup>4</sup> Unless energy supplies increase more rapidly than income growth, economic growth could therefore be adversely affected. A well functioning energy sector not only facilitates productive investment in the sector itself (through public investment, foreign aid and FDI), but also facilitates investment in other sectors. The gas and power sector account for most of the foreign investments that have taken place in Bangladesh during recent years.<sup>5</sup> Without appropriate investments in the energy sector, other sectors often suffer. In 1999, Bangladesh experienced only 30 days of uninterrupted power supply. WB estimates that load shedding represents about 0.5 percent loss in GDP and US\$ 1 billion loss in terms of industrial output per year. In particular, the garment export sector of Bangladesh has experienced severe energy problems and has therefore had to invest heavily in spare power aggregates. Power shortages can also have serious social consequences, as observed in the form of violent demonstrations in Dhaka.

Energy accounts for an important part of GoB expenditure, even more than expenditure on health and family planning. Similarly, donors have spent more than 1 billion USD in the power sector. The outcome of these investments has not always been in accordance with the resources applied, and current aid programmes are generally linked to a reform process.

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<sup>1</sup> This study was commissioned with reference to a contract entered with CMI/NCG on 22.4.1999 specifying the objectives of a 2-year programme for strengthening the country-specific knowledge base of NORAD and the Norwegian Ministry of Foreign Affairs. The authors undertook fieldwork in Bangladesh during March/April 2001. A list of persons interviewed is provided in Annex 1b.

<sup>2</sup> An analysis of non-commercial energy consumption (wood, animal waste and crop residues) is outside the scope of this paper.

<sup>3</sup> A small quantity of coal deposits have been found in Barapukuria, in the north and is being currently developed with Chinese assistance. The coal quality is reported to be better than the imported Indian coal.

<sup>4</sup> A recent study of Asian countries found it to be 1.3 (see Pesaran et al, 1998). An income growth of one percent will therefore increase energy demand by 1.3 percent.

<sup>5</sup> See World Bank (1999).

Most of the population remains without access to commercial energy for lighting and cooking, and depends primarily on biomass. Thus, *the main challenge* before the country is how to provide electricity to domestic industry and households and to broaden access to natural gas. This review critically examines the gas and power sectors in terms of major actors, current and potential output, generation, transmission and distribution problems and the emerging policy regime.

Sets of concerns that underpin the more techno-economic debates surrounding the sector relate to political economic considerations, especially in relation to gas exports and regional co-operation. An increasing concern relates to how energy sector developments connect with poverty alleviation and the worry that the poor could be bypassed. On the domestic front, there are serious fears that without clear, transparent governance procedures and independence for relevant agencies/ministries, the country's scarce energy resources may be squandered or misappropriated. This fear has been underscored by public power utilities facing financial distress.

Reforms are clearly urgently needed, although progress has been slow despite quite intense donor pressure. The discussion in this review points to a complex political economy with strong vested interests. Political economy questions are not static, with new actors such as IPPs and IOCs assuming a prominent role in the energy sector. In addition to donor pressure, the GoB faces pressure to reform from the market itself.

The paper is organised as follows. Section two provides background information on the regional energy market and the potential for regional co-operation. Section three discusses energy policy in Bangladesh as revealed by core policy documents and public expenditure data. Sections four and five give an overview of the gas and power sectors respectively. With this background the two following sections discuss the energy poverty linkages and factors contributing to slow implementation of the reform process. The final section concludes this review.

## **2. The regional energy market**

Bangladesh is strategically located in between two great geo-economic areas, namely South and South-East Asia, bordering India to the north, west and north-east, Myanmar to the east and the Bay of Bengal to the south. The Bangladesh landmass also almost entirely separates off the north-eastern Indian states (the Seven Sisters) from the rest of India, save for a narrow strip of land over which a long and precarious road and rail link is maintained.

Apart from its strategic location, Bangladesh and its surrounding areas are thought to be rich in energy resources, which remain largely untapped and unexplored. Bangladesh's own gas reserves appear to be sizeable and have generated considerable interest amongst the large international oil companies. North-east India and Myanmar are well endowed with gas, in addition to possessing significant oil reserves. Neighbouring Nepal and Bhutan also enjoy a huge, largely untapped hydro-electricity potential.

The South Asian economies (especially India and Bangladesh) have been experiencing good rates of growth in recent years, at around 5-7 percent. The huge Indian economy has opened gradually to foreign investment. The demand for commercial energy and power has increased rapidly, leading to large emerging shortages manifested in frequent power outages. Demand

in Bangladesh is also set to rise quickly (at 6-8 percent), although from a much lower base.<sup>6</sup> Thus, in the medium term demand for power in India is likely to rise quickly and the country will need to evolve a policy strategy to ensure adequate supplies. Bangladesh is also concerned about its longer run energy security and may need to look beyond its borders to achieve a sensible and optimal energy strategy.

Economic and population growth has led to rapid increases in commercial energy consumption in South Asia, well above the OECD rate. It has been observed that energy consumption has increased by 50 percent in the region during the 1990s. Different estimates exist for future energy consumption levels. One estimate suggests that per capita consumption of energy will double from 1994 to 2004 (Pesaran et al 1998:168).

South Asia accounted for 3.4 percent of world commercial energy consumption in 1999 (up from 2.4 percent in 1987). However, per capita consumption remains one of the lowest in the world.

South Asia's commercial energy mix in 1999 was as follows: coal (43%), petroleum (35%), natural gas (13%), hydroelectricity (8%), and nuclear (1%). The commercial energy mix in Bangladesh is much less diversified with a preponderant dependence on natural gas (71% in 1999), while India depends primarily on coal (51%).<sup>7</sup> During the 1990s, commercial energy consumption in Bangladesh has increased on average by 7.8% per year.

A recent study highlights the low consumption levels in South Asia through a cross-country regression explaining energy consumption in terms of GDP per capita. It notes that the position of the South Asian countries is far below the level that would be expected for countries at their particular level of GDP per capita, suggesting a huge unmet energy demand (or a supply constraint) in operation.<sup>8</sup>

South Asian consumption per capita is estimated at 443 kgoe, with India having the highest consumption at 479 kgoe and Bangladesh the lowest (at 197 kgoe - refer to Annex 2). In general, Bangladeshi consumption and production of commercial energy is low even compared to the low South Asian regional standards. Thus, per capita electricity consumption in Bangladesh is a paltry 73 KWh, compared to around 423 and 319 kWh for India and Pakistan and 600kWh for Bhutan. The energy intensity (MTOE/GDP) is also extremely low in Bangladesh (see Annex 2 and Pesaran et al. 1998). The low energy intensities reflect a widespread use of traditional biomass by the rural population and an underdeveloped industrial structure.

## 2.1 Potential for regional co-operation

There are significant complementarities in the energy sector amongst the countries of the region. Energy endowments include coal (mainly India), gas (India, Pakistan, Bangladesh) and hydropower (India, Pakistan, Bangladesh, Sri Lanka, Bhutan and Nepal). There are no technical or economic reasons to prevent the development of bilateral or regional agreements to utilise these resources more efficiently and contribute towards the creation of a regional energy hub or an economic growth zone (Sobhan, 1999).

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<sup>6</sup> Energy demand in Bangladesh and India is estimated to increase by 8.5% and 6.5% per year respectively according to a study by Pesaran et al (1998:167).

<sup>7</sup> EIA (2001b).

<sup>8</sup> Wickramasinghe (2001)

The economic and technical advantages of a regional electricity and gas grid/pipeline are many. It ensures greater supply security and reliability, reduces the reserves needed for meeting peak demands, lowers costs through economies of scale (transmission is a natural monopoly), increases diversification of primary sources of energy and contributes to overall efficiency. The formation of a SAARC committee (Technical Committee on Energy) is a small step in the right direction. The prospect of an inter-regional electricity grid has also been put on SAARC's agenda.

In Asia, electricity trade occurs between a few interconnected countries. Interconnections exist between Thailand and Laos, Indonesia and Singapore, Vietnam and Laos, and China and Hong Kong, while it has been considered between Thailand and Malaysia.<sup>9</sup> An ASEAN electricity grid has also been discussed.

Saha (1998) has identified five types of inter-related barriers that constrain regional co-operation in energy: policy barriers, technical barriers, institutional barriers, commercial barriers and financial barriers. We would introduce one other - a political barrier - which in fact may prove to be the most intractable. The main policy barrier is the concept of *self-sufficiency* espoused by each country and the use of different technical *standards* and specifications that make co-ordination difficult. Energy authority officials in these countries rarely meet to co-ordinate policy or design standards. The large financial resources required need not impose a binding constraint as long as markets are identified and firm contracts and guarantees against risk are provided to domestic and foreign investors. Fundamentally, however, there remains considerable *distrust* and sensitivities amongst the countries of the region, which must first be overcome. The largest country, India, probably needs to assume a critical responsibility in this matter. Thus necessary first steps include the development of an adequate database on regional energy supply-demand, especially demand for power; an examination of development options facing each country and the region as a whole, regulatory policy and pricing-subsidy practices; and an estimation of gains from regional energy trade. Simultaneously, political irritants have to be removed before real commitment can be generated for co-operation.<sup>10</sup>

### 2.1.1 Regional supply-demand potential: India, Nepal and Bhutan

These three countries are likely to be the most relevant for Bangladesh in its endeavour to chalk out a regional energy strategy. Nepal and Bhutan are endowed with considerable hydroelectric potential and could compete with Bangladesh in the regional export market for power. Alternatively, cheap power imports from these countries may be something that Bangladesh will need to consider actively in the long term. India, on the other hand, is looking to augment its sources of energy and is eyeing Bangladeshi gas along with possible pipeline gas from Iran (via Pakistan) and LNG from the UAE. As far as Bangladesh is concerned, India represents a potential market for power and gas. Thus, commercial energy demand scenarios in India need to be carefully analysed by Bangladeshi policy makers. Similarly, Bangladesh also needs to focus on potentially energy-rich Nepal and Bhutan to explore the potential for a regional approach to energy security.

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<sup>9</sup> WTO (1998:9).

<sup>10</sup> Frequent "minor" skirmishes along the 4000 km Indo-Bangla border tend to accentuate the feeling of mistrust and are potentially costly in terms of preventing cooperation. The recent border clash on 14 April 2001, which left 19 border guards dead in both countries, serves to underline this concern.

### *2.1.2 Indian energy demand: A window of opportunity?*

Indian power generation capacity has registered dramatic growth over the years - from 5700 MW in 1950 to over 100000 MW today. Underlying this growth, however, there are a complex array of problems from which the sector continues to suffer: a huge power shortage, high pilferage rates,<sup>11</sup> low metering, unequal access, low reliability of supplies and frequent power cuts, financial losses and high subsidy levels. Steps are gradually being taken to address these problems, including strategies for institutional and "functional" reforms, setting up an independent regulatory body and conducting energy auditing. The hitherto "untouchable" question of agricultural subsidies to farmers is increasingly being discussed.

India faces an acute power crisis with current generation being 30 percent below demand,<sup>12</sup> requiring heavy investment in generation capacity. The Indian government has targeted additional capacity investments in the order of 40000 MW over 1997-2002 and forecasts additional needs of 111500 MW by 2007. Overall Indian power demand is projected to increase to 1192 billion kWh in 2020 (i.e. three times the level of 1996).

India generates around 70 percent of power from coal-fired plants, 20 percent from hydroelectric plants and the rest from natural gas, oil and nuclear sources. It is gradually increasing its use of natural gas (both LNG and piped gas) and the scale of future power demand bodes well for a strong gas/power market in India. Should Bangladesh decide to export piped gas, the Indian market holds definite promise. It is being argued by IOCs and other observers that this is a constrained "window of opportunity" that should not be taken for granted.<sup>13</sup>

The main arguments put forward in support of the "limited window of opportunity" hypothesis include the possibility of significant gas discoveries in India itself (especially in the Godavari basin) over the next 5-7 years, piped gas from Iran or Central Asia via Pakistan (if the tense political relations with Pakistan can be improved) and LNG from the Middle East. India will have to find some solution to its energy problem, the argument goes, and once it locks itself into a long-term gas/energy contract with another party, this opportunity will vanish forever. Let us briefly review these options:

At this point in time a meaningful and lasting rapprochement with Pakistan appears unlikely. The last thing India would consider is depending on crucial energy sources via a pipeline that cuts across Pakistan.

The potential for significant discoveries of natural gas always exists. However, even if explorations were to begin now, actual discovery and development of new fields, and setting up transmission and distribution systems, means that the actual availability of gas would take a minimum of 6-8 years. This particular type of threat, therefore, is not of immediate relevance, giving Bangladesh sufficient time to make up its mind about exports.<sup>14</sup>

Cheaply produced LNG is available from the Middle East, but this is mainly a viable option in areas close to the coast rather than at points deeper inland. Thus, a solution would still have

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<sup>11</sup> For example, transmission and distribution losses in Delhi are estimated at 50 percent.

<sup>12</sup> EIA (March 2000) South Asia Regional, [www.eia.doe.gov](http://www.eia.doe.gov).

<sup>13</sup> See Wood Mackenzie (2000).

<sup>14</sup> See Wood Mackenzie (2000).

to be found to meet the energy demand from major urban-industrial configurations (e.g. the Delhi area).

Possible export options for Bangladesh include conversion to power for export, or pipeline exports of gas for ultimate conversion to power or fertiliser. There may also be some demand from Indian fertiliser plants, which are reportedly paying a high price for their input supplies. The option of conversion to LNG has been quite thoroughly appraised and found sub-optimal. Whether power exports are a good, cost-effective option does not appear to have been adequately investigated. A technical feasibility study undertaken suggests that this is feasible since the Eastern grid in India (where initial exports would have to be made) is well under way towards being connected up with the Western and Northern grids, where these exports would ultimately need to be channelled. In other words, the Indian electricity grids are undergoing quite significant changes that will give them the ability to move power around from one part of the country to another. A detailed economic feasibility study of this option, however, remains to be conducted.

### *2.1.3 Energy security and the role of Nepal and Bhutan*

Nepal is primarily dependent on hydroelectricity, in which it has a huge potential, as indicated by an annual average flow of 225 billion cubic metres. In terms of hydropower potential, Nepalese rivers have been graded into three categories, based on their origins. Those originating from the Himalayas have the highest potential (Koshi, Narayani, Karnali, Mahakali), while those originating in the Mahabharat Range come next (e.g. Mechi, Kankai, Kamala, Bagmati). In category 3 are seasonal rivers with the least potential.<sup>15</sup> Category 1 and 2 rivers are thought to have a combined technical potential for generating 83000 MW, of which around half is economically feasible. Projected power demand for 2005 is estimated at 622 MW. A number of projects are under development and mainly aimed for export – around 18,000 MW. In other words, there remains very significant additional potential left for domestic use or further export, including export to Bangladesh.

In the case of Bhutan, the technically feasible hydroelectric potential is around 21000 MW, of which only 334 MW are being generated. Steps have been taken to unbundle the electricity sector and plans are under way to commission a 1020 MW plant in 2003. This will allow Bhutan to undertake additional exports to India. It may be mentioned that the Power Grid Corporation of India awarded a contract to a Japanese firm to provide technical consulting services for the supply of electricity from Bhutan to New Delhi along a 1116 mile route.<sup>16</sup> Given the far closer proximity to Bangladeshi urban-industrial centres, exports to Bangladesh may be economically viable in the long run.

The energy resource base in Myanmar and North-East India is also considerable – a fact that Bangladesh will need to keep in mind while formulating its energy development strategy. A more enlightened approach may well be to link up with the Myanmar gas pipeline, which goes all the way to Thailand – thus providing access to SE Asia. At least one IOC (UNOCAL) has long-term plans for joining up its Bangladesh pipeline with its pipeline in Myanmar.

For Bangladesh, the energy export market in India should it want or need to export in the short to medium term. Basically there are two real options, pipeline exports or power exports, and these need to be carefully assessed, including the institutional and financial strengths of

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<sup>15</sup> Wickramasinghe, 2001.

<sup>16</sup> See above.

the Indian entities with which long-term contracts will need to be signed. If the benefits are about equally distributed between the two options, the latter would be advisable on political grounds.<sup>17</sup> The critical decision variables for Bangladesh are projections of its own demand for power and gas and a good assessment of its reserves. Mention should nevertheless be made of the fact that potential Bangladesh demand growth for power and gas may in fact be higher than the Indian growth rate, for two reasons: (a) low base levels of consumption as a proportion of GDP per capita compared to India, and (b) much lower coverage (25 percent of the population connected in Bangladesh compared to 80 percent for India).<sup>18</sup> Given exhaustible gas resources that could be used up in 20 years (especially if significant exports take place), longer-term energy security for the country will involve tying up in addition with the energy systems of Nepal and Bhutan.

### 3 The energy policy of Bangladesh

This section provides an overview of the energy policy regime in Bangladesh as revealed by core energy policy documents. It first assesses what the GoB *says* is the real energy policy. It will then make an 'expenditure review' by assessing how the government in *practice* allocates funds to the energy sector on the one hand and other public sectors on the other. In this section we also provide a brief overview of the main donor activities in the energy sector since almost one half of the ADP expenditure in the power and energy sectors is financed by project aid.

Our main conclusion is that NEP is quite ambitious and farsighted regarding objectives and strategies for the reform process, particularly in the power sector. Major bottlenecks are identified and strategies are developed. The need for a reform and strategies for implementing it are also underscored in the Fifth Five-Year Plan (Plan) and through the ADP.<sup>19</sup> Based on stated policy prescriptions, we therefore dispute the claim put forward by donors that the GoB has not taken ownership of the reform process. Even so, the actual reform process is slow, partly due to the political economy of the reform process. Inherent perceptions by the GoB of the stages of the reform process also act as an Achilles' heel, since an independent regulatory authority is seen by the GoB as a prerequisite for the reform process. Without such a body, it is difficult to separate operation from regulation. At the same time, the GoB is afraid of giving up control of such an important sector (see the discussion in section 7.1). Without a satisfactory solution to this dilemma, the reform processes will be delayed by postponing the creation of an independent unit. Donors are aware of this and underline the importance of creating an independent unit, while at the same time they link their project aid to the current reform programmes. One weakness with the current energy policy is, however, that it lacks a regional perspective. The possibility of regional co-operation is hardly discussed at all.

#### 3.1 NEP – Reform is necessary

The current national energy policy in Bangladesh is obtainable in GoB (1995). This document also incorporates the petroleum policy as regulated by the Bangladesh Petroleum Act, 1974.<sup>20</sup>

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<sup>17</sup> The political hurdles of pipeline exports are far greater than exports after value-addition – see section 7.2.

<sup>18</sup> Power demand in India has been growing at 9% in recent years and that of gas at 7%. GDP per capita in Bangladesh and India (at PPP, \$) was \$1476 and \$1800 in 1999 (CIA World Fact Book, 2000).

<sup>19</sup> Some decisions are, however, not farsighted, e.g. in contrast to a recent worldwide trend towards reducing the use of nuclear power, the GoB sees the generation of nuclear power as an appropriate option.

<sup>20</sup> We have not analysed Bangladesh's international energy obligations, apart from the fact that Bangladesh has not signed the Kyoto Protocol.

In this section, we will give a brief overview of the NEP and present the main targets of the energy policy as revealed in the Fifth Five-Year Plan 1997-2002.

There are at least three main objectives in the energy policy:

- Provide energy for sustainable economic growth;
- Meet the energy needs of different geographic zones of the country;
- Ensure sustainable operation of the energy utilities and a rational use of total energy sources.

The first objective is linked to the importance played by energy in facilitating economic growth. Lack of power may hamper production, trade and economic growth. Although the relationship between investment in energy projects and economic growth is unclear, partly since the impact depends on how the utilities tackle the maintenance problem, the GoB assumes that the energy supply has to increase 50% more than GDP.<sup>21</sup> The GoB has, in co-operation with ADB, made a masterplan for projecting energy demand from different end-users. Gas demand is derived from the demand in the power sector and in urea production; 45% -50% of gas is earmarked for power generation, and about 25% for fertilisers. The GoB attempts to adjust gas supply to meet the demand from these end-users, in particular that of the power sector, to which a high priority is attached.

The second target is a distributional concern, reflecting the fact that nearly all energy in Bangladesh is produced in the East zone. The third target emphasises that resources as well as institutions must be sustainable and efficient. This has traditionally been a severe problem in the power sector (see section 5.5).

The policy paper highlights the importance of reform in the energy sector, particularly the power sector. The main elements of a reform process are discussed. For instance, to improve management efficiency in public utilities, the policy document argues that production, transmission and distribution systems for gaseous fuels and power should be managed as separate *cost and profit centres* where each of the units would be *corporatised*. Separate profit centres are seen as prerequisites for *unbundling* functional activities such as production, transmission and distribution.

The document encourages *private sector investment* in the power sector as well as in the petroleum industry. It supports incentives for tax exemption, including no duty levied on machinery and equipment for energy-related projects.

Regarding prices, the policy document claims that energy *prices* will be based on economic costs, while potential subsidies will be transparent. The introduction of an *independent regulator* (or a National Energy Authority) with the primary objectives of setting standards and tariffs, reviewing energy demand and allocating the use of primary energy for different end-users is strongly advocated in the policy paper. Both the Electricity Act and the Gas Act, which are currently under preparation, seek a clearer specification of the role of the independent regulator, one of whose main functions is to separate operating and regulating activities.

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<sup>21</sup> At constant prices, energy demand per capita would grow by 90% more than GDP per capita in Bangladesh compared to 20% in the Asian region (Pesaran et al, 1998). The rule of thumb applied in Bangladesh, therefore seem reasonable. The same study found that the price elasticity of energy demand was extremely low in Bangladesh. Although energy prices are low in Bangladesh, increasing prices as a result of a reform process will probably not influence energy demand, but will definitely influence the financial performance of public utilities.



### 3.1.1 The petroleum sector: PSA

The Bangladesh Petroleum Act authorises the Government through the Bangladesh Oil and Gas Corporation (now Petrobangla) to engage in all aspects of petroleum exploration, processing, refining and marketing. Agreements with international oil companies are regulated through production sharing agreements or contracts (PSA). The IOCs cover all the costs of exploration and production. When production of gas starts, the cost is reimbursed based on an agreed share of maximum cost oil. The maximum amount of cost oil normally constitutes about 55% of gas revenue. If the oil company's cost in a particular year constitutes more than 55% of revenue, it will only be reimbursed the maximum amount in this year. Similarly, if it only constitutes 35%, the oil company will be reimbursed 35%. Cost oil is generally high during the early production phases. The difference between revenue and (reimbursed) cost oil is termed profit oil. The oil companies' share of the profit oil is around 20% and the rest accrues to Petrobangla. Increasing the maximum share of cost oil mainly influences the recovery pattern of the IOCs' investments or postpones the income received by the GoB. It is a floor and ceiling on the gas prices received by the IOCs and contracts are based on a take or pay basis. The IOCs do not pay taxes, while 55% of Petrobangla's gross revenues are paid to the government as supplementary duty, and a further 5-10% as income tax and dividends. The excise is based on sales price.

## 3.2 The Fifth Five-year Plan 1997-2002

The Plan underlines the importance of power sector reforms. A total of 3319 MW generation capacity is planned to be added to the system during the Plan, raising the installed capacity to 5875MW in FY2001. Only 1389 KW will be provided from the public sector. The rest has to be provided by the private sector. Total investment requirement in the power sector during the Fifth Plan period is estimated at 117 billion Taka (in 1996/97 constant prices).<sup>22</sup> Given the enormous challenges of integrating private initiatives in power generation of this magnitude, it is remarkable that the Plan acknowledges that neither additional private nor public investments are sufficient solutions to the problems faced in the power sector. The Plan argues strongly that a reform is needed to complement recent private initiatives. The objectives of the proposed power sector reform are to:

- Increase efficiency so as to reduce system loss and attain financial viability;
- Increase production and distribution of electricity for the vast majority of the population in Bangladesh;
- Improve the quality of the existing power supply system.

There are many reasons for the emphasis put on power sector reform, but the *accountability* issue and the non-sustainable *price* structure are particularly emphasised. The accountability issue is related to the question of corporatisation and *unbundling*. The Plan supports the idea of creating cost and profit centres within existing utilities for commercialisation and corporatisation, seen as a preparatory step towards increased private participation. The Plan also supports the idea of unbundling existing utilities along functional lines (generation, transmission and distribution). Institutions have overlapping responsibilities and therefore lack accountability since it is impossible to identify the area of poor performance. For instance, the responsibilities for generation, transmission and a large part of distribution are vested in the same authority. Regarding the unsustainable price structure, the Plan

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<sup>22</sup> This is probably an estimate at the lower end. However, this strengthens the argument that the private sector needs to be more involved.

acknowledges that tariffs are set far too low, on average about 61% of LRMC, but does not say much about how to increase tariffs.

Regarding the development of oil, gas and natural resources, the Plan adds little to what has already been said in the NEP:

- Gas should be developed to meet domestic demand for commercial energy;
- The private sector should be more involved in oil and gas development activities through PSA;
- Gas prices should be adjusted to their economic cost;
- Exploration and appraisal activities should be intensified;
- Imported oil should be substituted by natural gas.

The Plan emphasises that an independent regulatory body should be established *before* the unbundling of functional activities and sees the body as a vital element in whose absence the entire reform process could be put at risk.

In contrast to the power sector, the Plan hardly discusses the potential of reforms in the gas sector.

### **3.3 ADP: Energy and social sectors of equal importance**

The Government's priorities between different sectors can to some extent be revealed from their spending data. The energy sector constitutes one of the most important sectors of public expenditure. More than 16% of public investment is in the energy sector. For the financial year 2001, public investment in the power sector are similar to investment in the education sector (about 22 billion Taka or 12.6% of ADP). It is observed that more resources are spent in the power sector than in the health and family planning sectors.

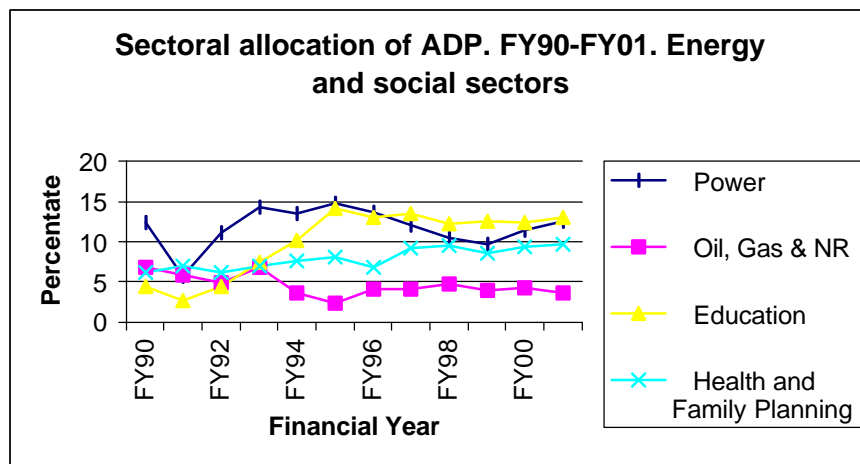
Although the GoB invests a sizeable amount in the energy sector, the data reveal a weak but downward trend in its relative share.<sup>23</sup> On the other hand, the share of the social sectors shows a strong and rising trend. From these figures, one may be tempted to conclude that the GoB attaches a higher priority to the social sectors compared to the energy sector. It can be argued, alternatively, that the GoB rates the potential for quality improvements through sectoral reforms in the energy sector more highly than for the social sectors.<sup>24</sup>

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<sup>23</sup> According to Helal (1999), the current power crisis is the result of a significant reduction in investment during the 1990s compared to the 1980s.

<sup>24</sup> In Wiig (2000) we dispute this by arguing that there is huge scope for quality improvement in the education sector. At the same time, the scope for quality improvement is even higher for the power sector.

**Figure 1: Sectoral allocation of ADP**



Source. Government of Bangladesh, different issues of ADP.

### 3.3.1 The position of donors: ADB and WB

Donors are financing nine billion Tk or 41% of the ADP budget for the power sector in FY01. The main position of the international financial institutions concerning the energy sector is to link all their activities to a reform process.<sup>25</sup> This process has four characteristics:

- Separation of sector regulation and operation through a regulatory body;
- Autonomy and commercial orientation of the sector entities;
- Unbundling of generation, transmission and distribution;
- Increased private sector participation.

According to both ADB and WB, donor projects should be linked to one or more of these functions, but WB is stricter in its conditionalities than ADB.

ADB has, for instance, supported the financing of a Gas Act regulating downstream activities in the gas sector.<sup>26</sup> Such initiatives are taken as necessary steps in order to separate regulation and operation. Similarly, steps have been taken in the power sector through the establishment of the Power Cell. The Power Cell also plays an important role with the increasing number of IPPs investing in Bangladesh.

#### *ADB*

ADB maintains a strong position in the power sector. ADB only provides loans (at 1% interest). Since 1995, all projects have been linked to the reform of the power sector. The ADB has played a major role in drawing up the reform assistance strategy of the funding agencies and has co-ordinated aid meetings in the power sector several times –most recently in 2001.

ADB has financed a number of projects in the power sector including:

<sup>25</sup> See section 7.1.

<sup>26</sup> In similar vein, Norad has supported the establishment of a HCU regulating upstream activities in the gas sector.

- A review of electricity legislation
- Preparation of a power system master plan
- Upgrading of the financial management of BPDB and DESA
- Supported the Meghnagat Project
- Corporatisation of the Ashuganj power station of BPDB.

From the more comprehensive list of project loans provided in Annex 4, it is revealed that ADB has given nearly one billion USD in loans to the power sector since the mid 1970s.

To a question regarding what constitutes the largest challenges in the power sector in the future, two main challenges were mentioned by ADB:<sup>27</sup>

- Sector performance (system losses and tariff restructuring), which is discussed in more detail in section 5.5;
- The fact that BPDB is required to buy from IPPs (see section 7.1)

#### *WB*

WB is extremely clear that they will not support any projects in the power sector unless very substantial progress is made in the reform process. As shown in Annex 5, WB has not given any concessional loans to the power sector since 1990. With its bad experience in the past, WB does not expect that this will change in the future. The Bank will not support new investments in BPDB or DESA, but supports accelerated rural electrification. The Bank's position can therefore be characterised more as a policy advocate than anything else. Measured in terms of financial support, WB plays a minor role. However, WB provides guarantees to the IPPs (Haripur power project) and supports the Meghnagat-1 project. WB is offering transmission loan to PGCB (US\$ 375 million).

*Other donors.* Norway, Netherlands, Kuwait and OPEC provide support to REB.

## **4 Gas**

Exploration activities have been undertaken in East Bengal since the beginning of this century. However, gas production was first started in 1960 at Chattak by Pakistan Petroleum Ltd. The first gas produced was used as feedstock to produce urea (fertiliser). At the same time Shell began oil exploration, but could only find gas, exploitation of which was not commercially viable at the time. The gas in Bangladesh consists of a high level of methanol and cannot be used as an input in the petrochemical industry.

### **4.1 Actors: Petrobangla and IOCs**

The supply chain in the gas sector can be divided into six phases from exploration of gas to its distribution to the final consumer. While transmission and distribution are downstream activities, the other four activities are so-called upstream activities. The following table shows the different actors involved in each stage.

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<sup>27</sup> Interview with Ahmed Shamsuddin 25.3 2001

**Table 1: The supply chain of gas**

Stages	Actors involved in Bangladesh
Exploration (logging, seismic and dwelling)	International energy service providers and Petrobangla
Engineering of a production facility (platform)	International energy service providers and Petrobangla
Construction of production facilities	International energy service providers and Petrobangla
Production	Petrobangla and international oil companies
Transmission	Petrobangla
Distribution	Petrobangla

The main investment costs in the gas sector are related to the construction of the production facilities and pipeline transport. The construction of production facilities is out-sourced to international firms. The capital cost of gas transport is huge and gas producers therefore need long-term contracts with their buyers. Normally, almost 90% of the transport costs are fixed, making the transport of gas a natural monopoly.

The gas sector is controlled by MEMR and has been operated by the Bangladesh Oil, Gas and Mineral Corporation (BOGMC, later renamed Petrobangla). BOGMC was established under the Petroleum Act of 1974 as a state corporation in charge of oil production, the importing, refining and marketing of petroleum products, natural gas exploration and gas production and delivery. Petrobangla conducts its activity through nine state-owned operating companies. These are divided between three gas production companies (see section 4.2) and four gas distribution companies (see section 4.3). There are also an oil exploration company (BAPEX) and a national gas transmission company (GTCL). Each company has a board of directors with members appointed by the government.

The government decides the gas price and exerts substantial control over the activities of Petrobangla. A special department in Petrobangla deals with the international oil companies. More than 8000 employees are currently employed in Petrobangla.

Two particular characteristics of Petrobangla are noteworthy. First, it is a vertically integrated state-owned company. Through its subsidiaries, Petrobangla is involved in all stages from exploration to the distribution of gas. The stages or functions in the supply chain are therefore *vertically integrated* or bundled between companies in the same group. Secondly, in addition to being a producer, it also plays an important role as a *regulator* of gas production and in policy-making in the sector. In other words, Petrobangla faces substantial conflicts of interest arising from its dual role as a producer and a regulator. These characteristics are not atypical for national oil companies in developing countries.

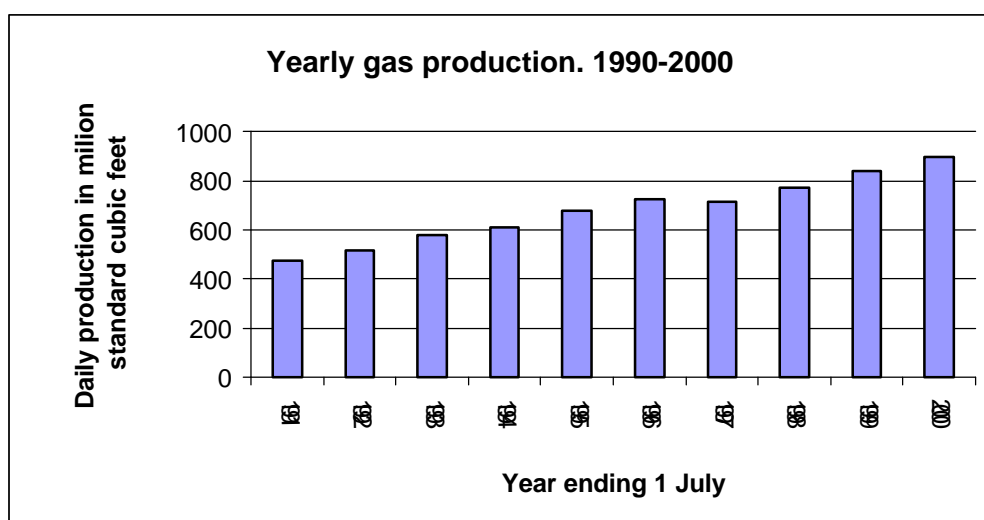
In addition to Petrobangla, there are two IOCs (Shell and Unocol) producing gas in Bangladesh. With the finalisation of the second bidding round of exploration blocks, other oil companies such as Tullow are poised to enter the gas exploration phase. There are also some energy-servicing firms such as Schlumberger which have located themselves in Bangladesh in order to service the gas production industry.

## 4.2 Production: Steady increase in production

There are currently around 20 gas fields in Bangladesh of which 12 are currently producing gas. The official estimate of recoverable reserves is approximately 12 TCF, but since the geological structure in Bangladesh is similar to that found in the Niger delta, there is a strong presumption that future prospects of finding a lot more gas are promising (see section 4.6)

Gas production is concentrated in the hands of four suppliers: two international oil companies and two national companies. The international oil companies produce a quarter of total production. Shell produces 16% of the total while Unocal accounts for the remaining 9%. The rest is produced by the two Petrobangla firms, Bangladesh Gas Fields Company Limited and Sylhet Gas Fields Limited (55% and 20% respectively). Total production has on average increased by 7.1% per year during the last decade and daily production is nearly 900 million cubic feet.

**Figure 2: Yearly gas production 1990-2000**



Source: HCU

## 4.3 Transmission and distribution: Concentrated in the eastern part

There are currently four distribution companies, Bakhrabad (in the south-east), Jalabad (east), Titas (north-east, including Dhaka) and Wesgas (west). These four state-owned companies are both transmission and distribution companies.

The total size of gas pipelines in Bangladesh is 13000 km. Titas franchises 53% of the network (reaching 70% of the domestic customers having access to gas) while Wesgas has only 0.5% of the gas network and a similar share of the gas customers. Plans are under way to build additional pipelines in the western part of the country.

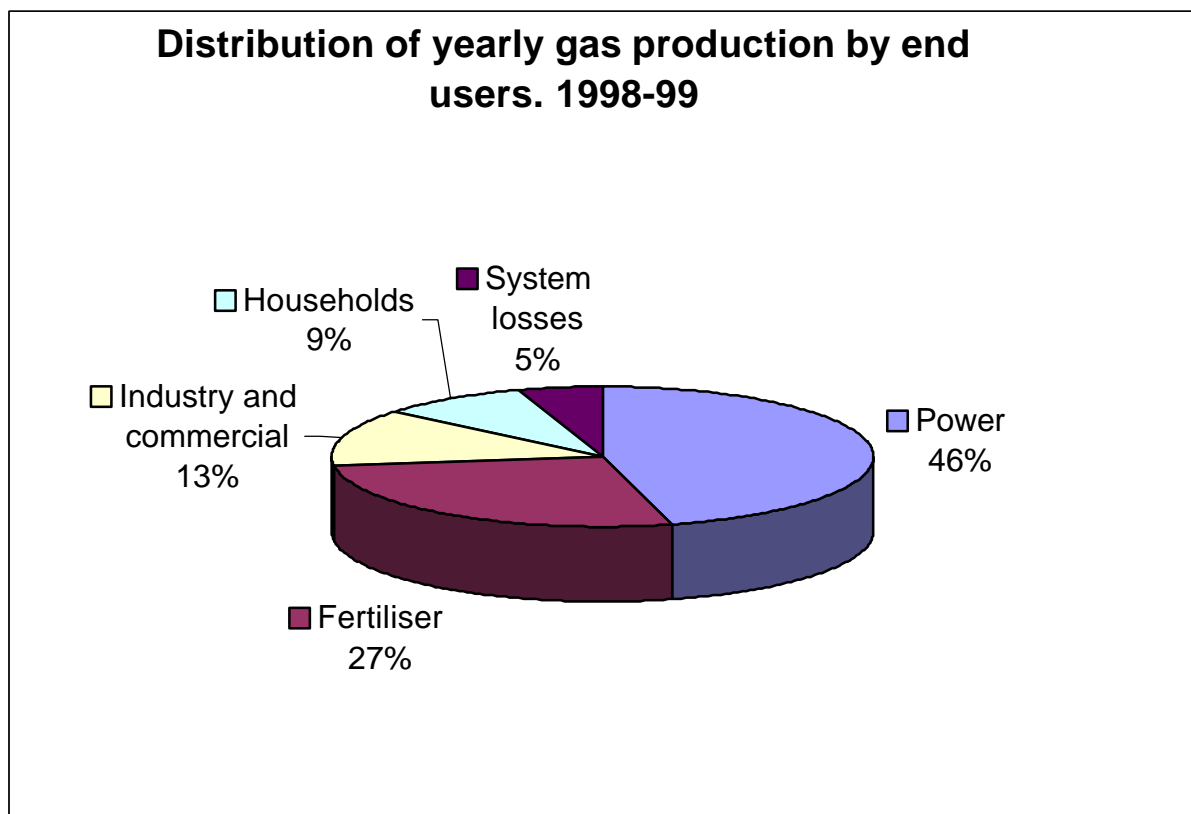
A fifth transmission company, GTCL, has less than five percent of available network. The transmission and distribution networks are skewed and concentrated, particularly along the eastern region of the country. A map of gas lines is provided in Annex 3.

Households play significant roles as nodes in the gas network. Out of 982,000 customers connected to the gas network, 98.7% are domestic. However, the power sector is by far the most important customer for gas.

#### 4.4 Demand: Concentration of sales to few buyers in the power sector

Nearly half of the gas production in Bangladesh is distributed to the power sector as input for generation of electricity, while a quarter is used in the fertiliser industry. As of July 2000, there were 19 customers from the power sector and 8 customers from the fertiliser sector, which together accounted for 75% of Bangladesh's gas production. The gas market in Bangladesh is therefore highly concentrated in production, transmission and distribution, as well as along regional lines.

**Figure 3: Distribution of yearly gas production by end users. FY99**

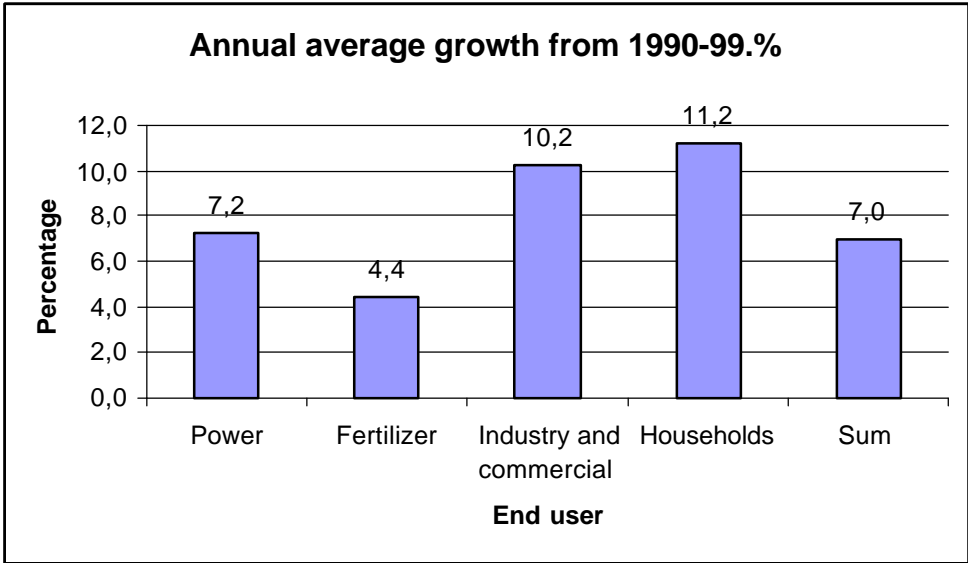


Source: HCU

Although households play a minor role (less than 10%) in terms of the quantity of gas sold, this is the fastest growing consumer group.

The demand from the fertiliser industry has shown a declining trend during the 1990s with a yearly growth rate of 4.4%. The relative importance of the fertiliser industry is therefore reducing.

**Figure 4: Average annual demand growth. 1990-99. %**



Source: HCU

**4.5 Prices are discriminatory and do not cover costs**

There is no readily available international price for natural gas, nor can gas be considered a perfect substitute for all petroleum products. Market prices of gas therefore differ from country to country and between regions depending on supply-demand parameters. Nevertheless, there are some guidelines for setting market prices for gas in a country such as Bangladesh. These are discussed briefly in this section.

Gas has traditionally not been a widely traded commodity owing to high transport costs. In contrast to oil, one needs to develop a market for gas. In order to do so, huge infrastructural investments are needed upfront. The investors are reluctant to proceed without securing long-term contracts with the buyers. Since gas pipelines are characterised as natural monopolies, an extension of the market across national boundaries reduces unit prices (see the discussion in section 2). Some regions have developed a regional gas market quite successfully. Northern Europe and the US have for instance deregulated their gas markets and developed an appropriate infrastructure of pipelines. Pipelines have been constructed in Bangladesh, but the network is purely for domestic use.

It is common in many developing countries for gas prices to be set by the government based on negotiations between state monopolies. This is also the case in Bangladesh where the government sets gas prices, while both the main producer (Petrobangla) and consumer (BPDB) are state-owned monopolies.

It is not always possible to apply a fuel oil-equivalent price for gas. For heating and electricity generation, oil and gas are substitutable. For transport uses, gas is an expensive substitute while the opposite is the case for the production of fertiliser and methanol.

Natural gas is a flexible fuel with many potential uses. Its highest use-value occurs when it substitutes for expensive petroleum products such as diesel fuel (for peak power production) or kerosene and LPG (for cooking). These uses normally constitute a tiny share of the market



while the replacement of fuel oil and coal in the power sector represents the bulk of the market. Gas is also used in fertiliser production to replace imports of such goods. In such cases, the value of gas depends on the market price of fertiliser.

The economic price or opportunity cost of gas depends on the relative importance of supply and demand. Where gas reserves are small and substitute at the margin for some tradable products such as oil or coal, the economic price of gas is the equivalent cost of the tradable product (as long this value is higher than costs). When gas reserves are very large relative to the prospects of increased demand, both domestic and export, then the gas price will be close to the production cost of the gas. Gas prices will vary in between these two extremes.<sup>28</sup>

Insofar as the government does not have any objective of subsidising a particular consumer group, prices should at least reflect the costs of providing the group with the goods, including the transmission and distribution costs. This is generally not the case in Bangladesh where prices are below LRMC. Although no updated data are available, the World Bank undertook an assessment of prices and costs in 1998.<sup>29</sup> Except for commercial and industrial consumers, prices were well below long run marginal costs. Residential customers, power producers and the producers of fertilisers were subsidised.<sup>30</sup>

Although gas prices have increased since then, they are still subsidised by the government. In December 1998, the government increased domestic gas prices on average by 15% compared to the previous tariff levels set in 1994. However, this was not even enough to compensate for the depreciation of the Tk. Despite domestic and international price increases, measured in USD the domestic price of gas was 6% lower in 1998 than in 1994. During the last years, the prices of gas has increased more than the depreciation of the TK.<sup>31</sup>

Since prices do not cover costs, this has led to a financially difficult position for Petrobangla, which is coping partly through cross subsidies. The main factor here is the low costs of production faced by Petrobangla in its older fields (estimated costs are less than a dollar per MCF of gas).

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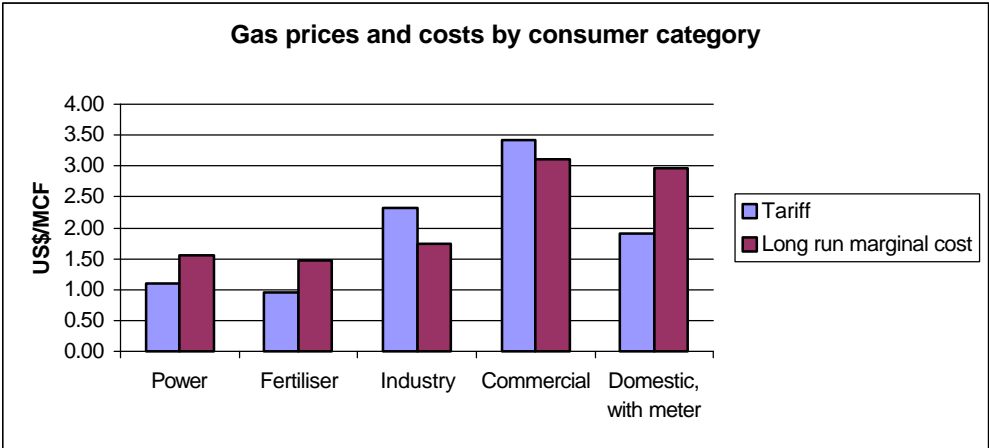
<sup>28</sup> The maximum price consumers would be willing to pay for natural gas is referred to as its netback value – it is the price of gas at which consumers would be indifferent between using gas and other fuels (assuming other fuel prices were exempt from taxes and subsidies).

<sup>29</sup> See also Julius and Mashayekhi (1990:139).

<sup>30</sup> Neither does the price setting take into account that gas is a depletable good and must incur a depletion premium (which normally rises over time) referring to the present value of future forgone consumption.

<sup>31</sup> The gas price increased by 15% in 1999 and then again by 15% in September 2000 while the exchange rate depreciated yearly by around 5% in the same period.

**Figure 5: Gas prices and costs by consumer category**



Source: World Bank (1998).

Prices are also discriminatory between consumers in the same group. For instance, IPPs pay twice the price for gas paid by BPDB. Petrobangla is also obliged to buy gas (they only pay for the profit gas) from the IOCs on a take or pay basis, and the price of the profit gas is higher than the domestic price of gas, escalating Petrobangla's financial distress.

**4.6 Gas reserves are not static**

Estimates of proven gas reserves in the country vary from 12 to 14 TCF. For economic and energy security reasons, the official position is to preserve gas reserves to provide for 50 years of consumption. At the present rate of domestic consumption, the nation's *proven* gas reserves should last 30 years. However, due to an expected increase in consumption, Petrobangla predicts reserves will be exhausted in 17-18 years. Petrobangla expects that Bangladesh's demand for natural gas will rise to 1.8 bn cfpd in 2005 and 2.6 bn cfpd in 2010 (from 0.9 bn cfpd currently).

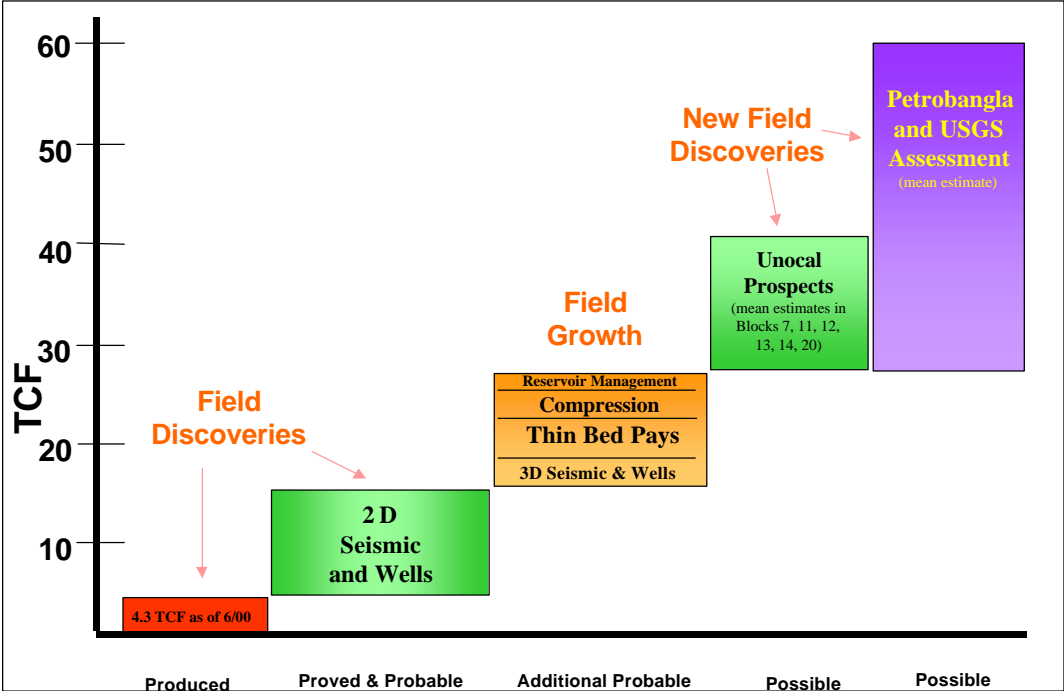
The question of reserves is a controversial issue that will be discussed in more depth in section 7.2. This section will, however, give a brief background to the different approaches towards classifying gas reserves:

- A deterministic classification system distinguishes between proven, probable and possible reserves. The proven are only those reserves proved by production or by wells, while probable reserves also includes hydrocarbons which are most likely to exist. Possible reserves include uncertain reserves.
- A statistical classification system makes an estimate of the probability distribution of the reserves. The resource value having an expectation value of 50% is normally used as a basis for commercial decisions.

A recent US Geological Survey report on new field discoveries indicated that Bangladesh could have 32.1 TCF in gas reserves (with 50% probability). In addition to this, compression, 3D seismic, and better technology and management in existing fields may according to UNOCAL double the proven reserves in Bangladesh. The question of gas reserves is therefore disputed and various positions are taken between the official estimate of 11 TCF and 60 TCF as presented in the figure below. One thing is clear, however: drilling and seismic activities

increase the possibility of expanding the reserves. Currently, Petrobangla is not undertaking any drilling activities due to financial constraints, while the IOCs are reluctant because they are unsure about the effective market demand for the gas.

**Figure 6 :Hydrocarbon Resource Base of Bangladesh**



Source: Estimates by UNOCAL.

## 5 Power

The power sector in Bangladesh faces severe difficulties and is in the middle of a reform process. Power production is mainly based on the transformation of natural gas.

### 5.1 Actors: BPDB

MEMR wholly owns and supervises the three executing agencies:

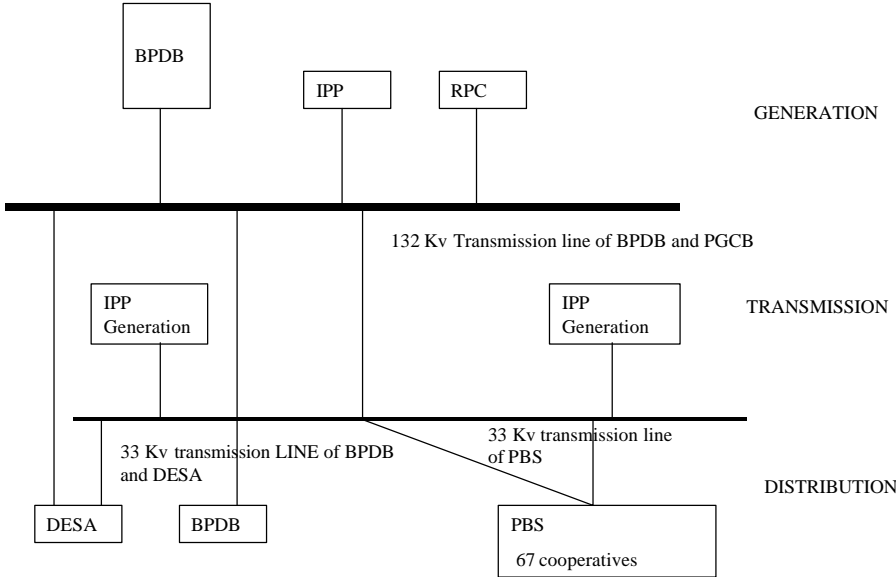
- The Bangladesh Power Development Board (BPDB);
- The Dhaka Electricity Supply Authority (DESA);
- The Rural Electrification Board (REB).

BPDB is responsible for all generation and most of the transmission in the country, and for distribution in district towns, municipalities, and some rural areas. DESA is responsible for distribution in Dhaka. The distribution in rural areas is the responsibility of 67 rural electric cooperatives, the Palli Bidyut Samities (PBS), which are organised and monitored by REB (see sections 5.3 and 6.1).

As part of the sector reform process, new utilities have been created. The Power Grid Company of Bangladesh Ltd (PGCB), the Dhaka Electric Supply Company Ltd (DESCO) as

well as private sector independent power producers (IPP) were created in transmission, distribution and production respectively.

**Figure 7: Organisation of the power sector**



The private sector plays a significant and increasing part in power production. IPPs have been involved through the adoption of a private power generation policy in 1996. The private sector is in the process of being awarded contracts for about 1,800 MW of generating capacity on a build-own-operate basis.

A power system master plan has assessed that the demand for electricity will increase by 8% per year for the next 10 years. Just to provide necessary investment according to the demand estimates from the master plan requires \$6.6 billions USD. Bangladesh therefore needs private investment or foreign assistance in order to reform and develop the power sector. ADB has played a leading role in this process by linking its activities to the reform process (see section 3.2.1).

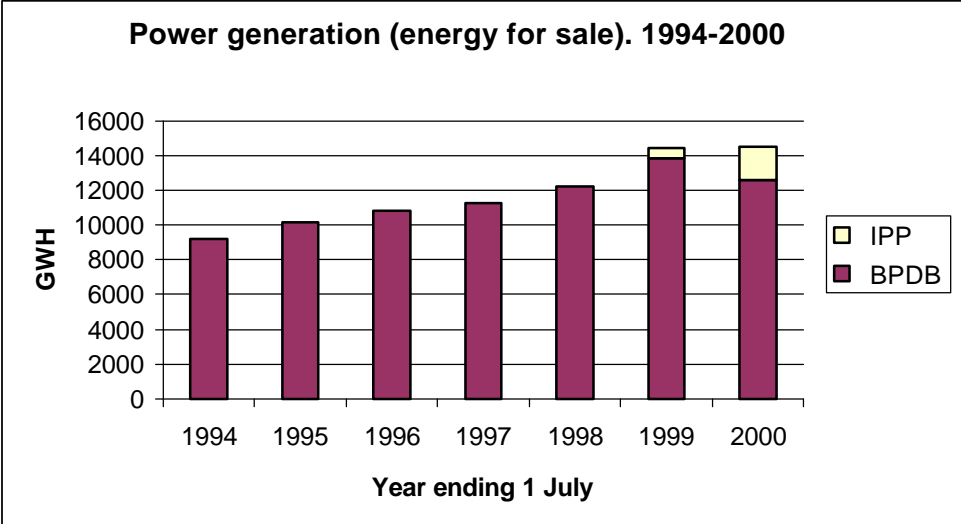
**5.2 Power production: The importance of IPPs**

It is necessary to distinguish between effective capacity and installed capacity in the power sector. The two differ due to technical and other losses. The installed capacity in the power sector has increased from 2908 MW in 1994 to 3555 MW in 2000, which represents an annual increase of 3.3%. The annual increases in *power generation* and *power for sale* during the same period were 7.0% and 7.5% respectively. The increase in generation and sales stems from the introduction of more efficient combined cycle gas fired power plants by the new IPPs.

IPPs have approximately 9% of available capacity while rural companies have 0.5%.<sup>32</sup> The rest is provided by BPDB. There is also some captive capacity in certain industries of approximately 400MW, which makes the total available capacity around 4000MW. The highest electricity generation in Bangladesh is only 2650MW, indicating inefficiencies in the generation of power.

There are two main reasons for these inefficiencies. First, the generators are for the most part based on old vintage technology. Secondly, proper maintenance has not been undertaken. Lack of available reserve capacity meant that frequently generators could not be shut-down for much needed repair-maintenance work. The problem is compounded by the difficult financial situation of BPDB (see section 5.5).<sup>33</sup>

**Figure 8: Power generation (energy for sale). 1994-2000**



Source: ADB.

IPPs are providing an increasing share of the power supply. In 2004, WB expects that more than 50% of the power supply will come from the IPPs. The growth of the IPPs increases competition among power producers by gradually decreasing the monopoly of BPDB. Since IPPs are paid in foreign currency on a take or pay basis, this will put financial pressure on the GoB to adjust market prices of energy towards the costs. If not, the GoB will face a huge financial obligation to the IPPs in the future. The IPPs also represent foreign direct capital investment and bring new technology and skills into the country. All these factors increase the efficiency of the power sector. On the other hand, the IPPs got more favourable treatment than domestic firms due to tax exemptions. Guarantees provided by the GoB and international

<sup>32</sup> Agreements with the IPPs have been signed for the generation of 1188GWH out of which 578 GWH is produced at present.

<sup>33</sup> BPDB supports the recent reform initiatives, particularly that an independent regulatory body set prices. BPDB advocates increasing tariffs and that subsidies should be financed by the Government. According to the Chaiman, certain incentive schemes have been initiated at the branch level in order reduce costs, but it is unclear to us what this means. To a question about the main challenges in the power sector, neither the degree of electrification nor the maintenance and quality problem were mentioned.

financial institutions and selling prices of energy linked to the gas price reduce the risk faced by the IPPs.

Natural gas based plants in the east account for 88% of generated electricity. Except for the hydropower station in the east (generating 6%), the remaining generation is based on imported liquid fuels in the west.

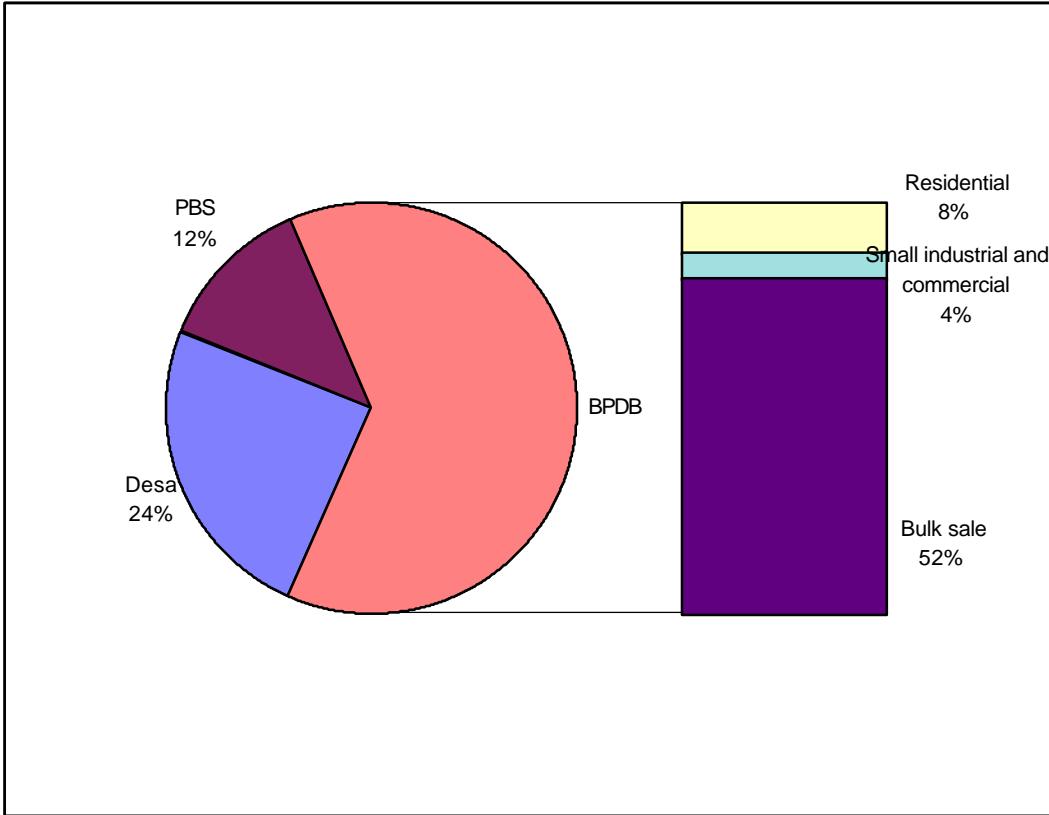
### 5.3 Transmission and distribution

PGCB was created in 1996 in order to operate and maintain power transmission systems. Complete absorption (from BPDB) of transmission lines was expected by FY2002. However, only 20% has been taken over to date.

DESA assumed responsibility for power distribution in Dhaka in 1991. DESCO, a subsidiary of DESA was created in 1996 in order to take over the duties of DESA. DESCO has only taken over two areas, in Mirpur and Gulshan. It has in the meantime built up arrears exceeding Tk. 850 million, which is equivalent to 10 months' sale.

In a process where IPPs will increasingly play a more important role, the future regulation of electricity distribution will be critical. Whether PGCB will do a better job than BPDB is a difficult question, partly because BPDB itself is a defaulter and has fallen back on payments due to PGCB, and partly because it is not known how prices will be regulated.

**Figure 9: Gross sales (MKwH) of electricity. FY 2000**



Source: Power Cell.

BPDB is the largest distributor of electricity (about 64% of gross sales) and sells approximately 50% of its power to DESA and 20% to REB (categorised as bulk sale in Figure 9). The rest is sold to domestic consumers (residential and industrial). The Dhaka area accounts for more than 50% of electricity sales. During recent years, REB has shown the highest growth rates in sales. Just during the last two years, sales have increased by 70%. The figures presented below underestimate the importance of REB in the distribution market since the sales from BPDB zones and from DESA also include sales to REB.

According to the ADB, REB's share of the distribution market has increased from 14% in 1998 to 24% in 2000. It is noteworthy that a large proportion of the electricity distributed by the PBSs is sold to industry.

**Table 2: Sale of energy by rural electric co-operatives (PBSs) (MKWh)**

	<b>Financial Year 1999-2000</b>	<b>Financial Year 1998-99</b>	<b>Financial Year 1997-98</b>
Domestic	973	769	570
Small commercial	149	119	88
Irrigation	262	312	192
Industry	1036	760	565
Others	35	27	20
<b>TOTAL</b>	<b>2455</b>	<b>1986</b>	<b>1434</b>

Source: Power Cell.

## 5.4 Demand, prices and costs

The Power system master plan has assessed the demand for electricity as increasing by 8% per year for the next 10 years. The derived demand for gas is assumed to increase by 6.6% with a reduction to 5% due to improvement in power plant technologies.

Tariffs have declined in constant terms (measured in US\$) from 1995 for all categories of customers, particularly for irrigation purposes (see table 3 below). The tariff revisions, made according to a formula set by ADB, has not compensated for the depreciation of the Tk.

Commercial and industrial customers pay a significantly higher price than households (residential) and agricultural groups (see table 3). Households constitute the largest group of customers (accounting for 43% of electricity sales) and are subsidised the most.<sup>34</sup>

**Table 3: Average tariffs by end users. Use pr KWh**

	1995	1998	2001
Residential	4,11	4,10	3,98
Commercial	9,23	9,50	8,61
Industrial	6,11	6,59	6,11
Agricultural	4,36	3,78	3,24

Source ADB, 2001.

<sup>34</sup> GOB (2000). Statistical Yearbook 1998, table 6.20.

Since households constitute a larger part of DESA's customers than for the other institutions, DESA's average price is lower. Rural consumers pay a significantly higher price for electricity than urban consumers and are subsidised less than their urban counterparts. As seen for the gas case, power prices do not cover costs while some groups manage to receive significant subsidies.

**Table 4: Average tariffs by institutions. FY 2000. Tk pr K Wh**

BPDB	2.98
DESA	2.68
DESCO	2.86
PBS	3.19
Weighted average	2.93
<b>LRMC</b>	<b>3.86</b>

Source ADB, 2001.

## 5.5 Financial performance, system loss and collection ratios

The quality of the power supply is low. In 1999, only 30 days of uninterrupted supply was observed, which increased to 110 days in 2000. Does this indicate a negative trend is turning? Unfortunately not. The financial performance of both BPDB and DESA has been very weak, and is deteriorating further. BPDB already has high levels of debt to Petrobangla and payment obligations to IPPs will increase to 350 million USD in 2005 (from 30 million USD in 1999). Without restructuring, it is difficult to see how the power sector will be able to meet its liabilities and obligations. The financial performance of BPDB is presented below.

**Table 5:BPDB Financial performance 1994-1999 US\$ Million**

Fiscal year ending June 30	1994	1997	1999
<b>Production</b>			
GWh generated	9221	11243	14450
GWh sold	7448	9446	11352
<i>Electricity unaccounted for %<sup>35</sup></i>	19,2	16,0	21,4
Auxiliary consumption as % of generation	5,0	4,3	5,0
<b>Income</b>			
Gross revenue	359	435	490
Total expenditure	336	414	444
Gross income	23	21	46
Interest and other	93	50	110
<i>Net income</i>	<b>-70</b>	<b>-29</b>	<b>-64</b>
Average revenue per unit US c/KWh <sup>36</sup>	4,82	4,61	4,32
Rate of return on assets %	0,9	0,8	1,8

Source: WB (2001:2).

<sup>35</sup> GWh sold in % of GWh generated.

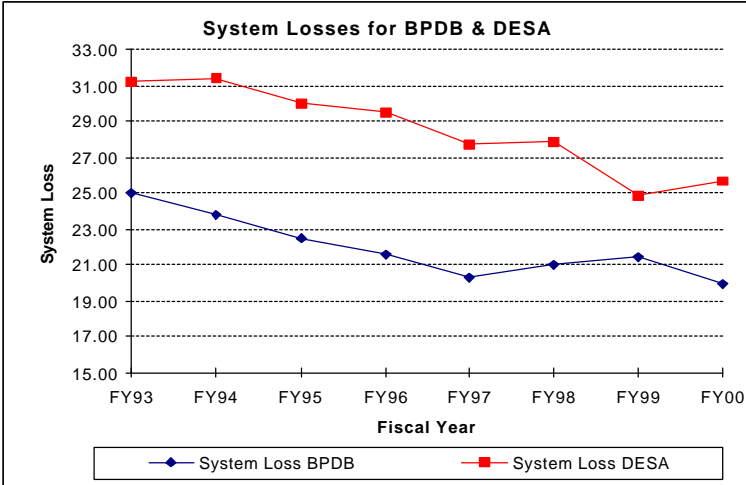
<sup>36</sup> Gross revenue/GWh sold.



There are several explanations for this weak performance. *Inadequate tariffs*, as discussed in the section above, play an important role in explaining the poor financial performance of BPDB. In a situation where both input prices (gas) and tariffs are regulated by the government, and tariffs do not cover the cost of production, it is impossible to create a viable institution without subsidies from the GoB. BPDB should not be blamed for the wrong tariff structure. In fact, BPDB claims that tariffs should be increased and subsidies financed by the Government. BPDB is also obliged to provide free electricity to certain government institutions and to areas prioritised by the government. BPDB is not compensated for these kinds of activities, which are frequently not commercially viable. While REB gets loans at 2% interest, BPDB gets loans at commercial rates. BPDB also claims that tax treatment meted out is unfavourable compared to the IPPs, which are apparently exempted from import duties and taxes. However, BPDB does have a significant advantage from access to gas at a lower rate than the IPPs (less than half the price).

While the above factors are outside the control of BPDB, another factor of major importance in explaining its bad financial performance is the huge *system losses* faced in the sector.

**Figure 10: System losses of BPDB and DESA. FY93-FY00. Percent.**



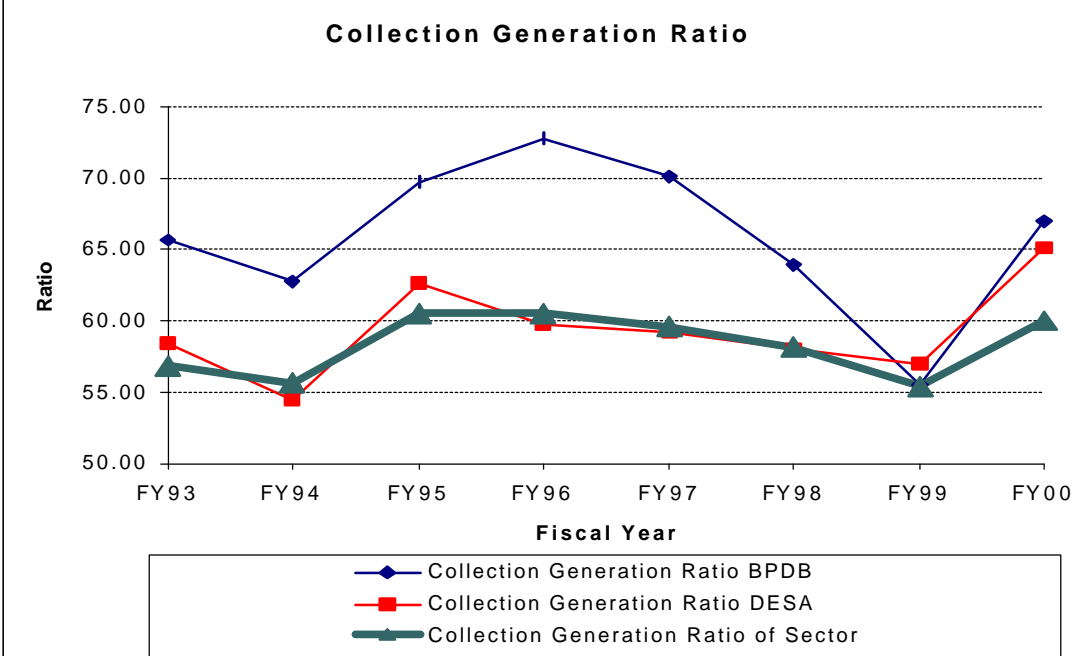
Source: WB

System losses are high, but appear to be decreasing. BPDB claims that they seek to reduce system losses and billing costs by providing incentives for cost reduction at the branch level, but we are unaware of the incentives provided.<sup>37</sup> REB also has a high system loss, but at the same time they have higher collection rates than the other distributors.

<sup>37</sup> Interview with Mr. M.A. Malek. Chairman of BPDB.

Although it is claimed that consumers perceive power as a utility provided free of charge, the main defaulters are industries (90%) and governmental institutions (10%).

**Figure 11: Collection ratios of BPDB, DESA and the power sector. FY93-FY00. Percent**



Source: WB.

## 6. Energy and poverty alleviation

The relationship between access to commercial energy and poverty alleviation is complex. It is essentially viewed in the literature in terms of an energy ladder that moves up from a dependence on biomass fuels, largely collected by women and children, to use of fuel-wood, kerosene, LPG, piped gas and electricity, in stages, as incomes improve and urbanisation expands. Such a representation is somewhat stylised, as in practice multiple energy sources are often used even within the same household (e.g. gas for cooking and electricity for lighting). The factors that promote consumption of certain fuels or contribute to switching from one to another are not well understood. A number of concerns are nevertheless noteworthy, and may be grouped into three categories: (a) basic needs, (b) monetary measures and (c) non-monetary measures.

### 6.1 Basic needs

Basic needs point to the question of access or potential access and the reliability of a particular energy supply regime. The second (monetary measures) relates to income-expenditure incurred or foregone, time spent in energy related activity, relative prices of alternative fuels, capital costs etc. The third category focuses attention on health and education aspects, e.g. indoor pollution, impact on leisure, work and study, etc.

A big challenge that faces countries like Bangladesh where access is limited and per capita consumption is tiny is to provide connections to households and to ensure that the poor are

not left out of this process. Consumption will gradually rise with economic growth and higher incomes.

In the case of power, some progress has been made under REB, which has expanded rapidly in recent years. Currently, REB claims that it has brought power to 44 percent of villages in the country. In terms of population coverage, the figure is around 25 percent. In the case of urban areas, power to poor households is constrained by the fact that most tend to live in squatter slums and do not have *legal title to their premises*. This prevents connections from being given under existing regulations.

The demand for power remains huge and largely unmet. However, REB connections have increased at a faster rate than that envisaged (World Bank, 2000). The financial cost of connections and monthly bills are such that even the rural poor can afford them easily. An initial deposit equivalent to three months' consumption is charged for a connection (approximately Tk. 180 or just over \$3 and the monthly minimum bill is just over a dollar!).<sup>38</sup> Connection fees and charges are uniform for all households, rich or poor, and have been set at a rate that enables access for the poor. There are subsidies involved in the rural electrification programme, brought about by the fact that returns are low in a situation of low consumer density and consumption levels. Thus, even when operating performance is satisfactory new schemes require operating subsidies. The problem is addressed through low interest loans with a substantial grace period while new networks are financed by Government loans at 2 percent (which are on-lent to the co-operatives - the PBS - at 3 percent). It needs to be mentioned however, that compared to their urban counterparts or neighbours in India, rural Bangladeshi consumers receive fewer subsidies, pay their bills more promptly and engage in less pilferage (World Bank, 1998).

The REB institutional structure seems efficient and accountable and has demonstrated good capacity for rapid expansion and recovery of dues through its PBSs (Palli Bidyut Samities or rural co-operatives). The REB is responsible for forming PBSs in rural areas, of which there are currently 67. Grid access is being provided to 37400 villages (44%) serving 25 percent of the rural population. The performance rating of the PBSs is high and appears to be related to greater autonomy, a greater say in the operations of the distributor (REB), absence of unionisation amongst employees and a stricter work ethic. The workers also have a closer sense of personal and community ownership. Each PBS is run by its own board and is free to set its own tariff rates and hiring and paying workers, providing incentive structures and training. They are independently responsible for customer services and network management but reliant on REB for technical and planning support, including putting in place a system of performance targets linked to employee remuneration. They are also encouraged to make profits and invest these wisely - mostly in related activities - a decision that depends on their independent boards comprising beneficiaries. The PBS approach is an excellent example of a co-operative model of community organisation.

Current recovery rates are over 97 percent while the system loss is lower and falling at 8.8 percent. The Chairman of REB, however, mentioned that in order to meet their target of universal coverage by 2020, they would need to expand at a faster rate than currently achieved (i.e. from installation of 12000 km per year to closer to 20000 km per year). Some PBSs (e.g. PBS-I Dhaka) have done very well and have gone into small-scale power

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<sup>38</sup> This may be compared to daily agricultural wages of Tk. 60-80 (\$1-1.5). Non-agricultural wages are somewhat higher. Typical monthly expenditures of poor households were estimated at Tk. 2600 (around \$50) for a sample of households in rural Bangladesh in 2000 (Murshid 2000).

generation, setting up electric pole manufacturing plants and so on. The Government has recently allowed the PBS to invest in small power generation plants (up to 30 MW).

Gas connections for domestic and industrial use are mainly provided to consumers in urban-industrial concentrations. Given the large infrastructural outlays involved in transporting gas, it is generally considered economically non-viable to take pipelines to rural areas. It is also felt that the rural poor can ill afford the costs of connections and monthly bills and would instead prefer to continue to depend on traditional (biomass) sources. It is quite possible, however, to connect rural areas adjacent to main gas transmission and distribution networks, provided there is sufficient demand.

Gas transmission lines have been constructed with a view to connecting with major centres of domestic demand, including possible export demand in India. Distribution lines are mainly urban-based, from where the surrounding rural areas could be developed. To date, however, gas for rural areas in general and for the poor in particular does not enjoy high priority. However, the ADB did undertake a feasibility study to look into the possibility of connecting poor households along the actual/proposed ADB-funded transmission lines under Titas (TGTDC) and Wesgas (Murshid, 2000). The study found that there was a lot of interest in gas from rural households, and even from poor rural households. From an analysis of incomes and expenditures and current levels of indebtedness, the study concluded that most rural households would be able to afford gas connections and pay monthly bills. In the case of poor rural households, a policy of staggered payment of initial capital costs would go a long way towards ensuring access.

## 6.2 Impact of access to power

The poverty impact of commercial energy consumption is notoriously difficult to quantify because the poverty and energy relationship is both a cause and an effect. This study has attempted to quantify the extent of impacts on poverty indicators. Given the acute methodological difficulties associated with such an exercise, these should be viewed carefully and critically. Nevertheless, we believe that the direction of impact indicated is likely to be valid.

A recent USAID-funded study has tried to address the issue using village-level, household survey techniques and comparing households in electrified and non-electrified villages as well as electrified and non-electrified households in electrified villages. Some of the major findings of the study are reproduced below:<sup>39</sup>

*Average Income.* Average income is about 50 percent higher than that of control households in non-electrified villages. However, the study attributes 22 percent of the increase directly to electrification.

*Poverty Rates.* The poverty rate in electrified villages was found to be 34 percent (falling to 27 percent for PBSs with a longer service record) compared to 41 percent in control villages. Although electrification has not reduced the gap between the richest and the poorest (those with an investable surplus tend to reap larger benefits), the level of the lowest 10 percent income group (lowest decile) in electrified villages is much higher than the corresponding group in non-electrified villages.

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<sup>39</sup> This section is based on World Bank 2000 and Unnayan Shamunnay 1997.

*Impact on Irrigation and Rice Production.* The recipients identified irrigation benefits as the greatest single economic impact of electrification. Farmers prefer electric pumps and in spite of the load shedding, 70 percent made the switch from diesel to electricity. Modern Boro cultivation has benefited and productivity is estimated to have increased by 8 percent.

*Off-Farm Income.* Off-farm income has increased by 33 percent compared with control villages.

*Credit.* Electrified households were found to save more and enjoy greater access to credit.

*Turnover and Profits.* Commercial enterprises benefited from longer working hours (up from 9 to 14 hours per day) and increased business turnover by 34 percent. They were also found to hire more employees and pay higher salaries.

*Education.* A significant impact on children's education was found - study hours increased by two hours a day, and children from electrified households have a higher school attendance rate.

*Information Access.* Information access and social awareness has improved as a result of greater access to information; health care appears to have improved.

*Women.* The condition of women appears to have improved substantially. They enjoy greater leisure as well as having more time to engage in activities such as crafts and sewing-embroidering. Even the incidence of violence is reported to have declined in electrified villages!

### **6.3 Impact of access to gas**

An ADB-sponsored study pioneered an investigation into the feasibility of connecting poor households to the national gas grid, and in this context compared poor connected and non-connected households as well as non-poor connected and non-connected households. Natural gas is an environmentally safe, efficient fuel for household cooking. Access to gas makes a big difference to rural and urban as well as to poor and non-poor households. Electricity is much more expensive as a cooking fuel and electrical cooking appliances tend to be much more expensive as well, so that the gas option is much more desirable.

The study was able to detect a strong desire on the part of rural households to obtain access to pipeline gas for cooking. Some better-off households have already switched to CNG available in cylinders despite its higher cost and erratic supply. Those who have seen other households using gas are particularly keen as they see the benefits immediately, in terms of time saved, reduced indoor pollution, cleanliness etc.

A concern of the study was to investigate whether in addition to a desire for gas connections, rural households, both poor and non-poor would be in a position to pay for it. It was noted that the non-poor have the financial ability to meet the full costs involved, including capital and recurrent costs. In the case of the poor, recurrent costs were considered affordable while the full capital outlay was likely to pose difficulties. Some kind of financing arrangement would be very useful in this context.

The demand-side problems of a rural gas distribution network appear to be negligible. The main problems identified were on the supply side, related to lack of transparency regarding

costs and charges, complex official procedures and inordinate delays in application processing. Even better-off clients with influence find it difficult to cut through the official maze to get a connection.

The poor face additional constraints and have certain specific characteristics that make it more difficult for them to benefit. A major problem relates to the absence of land titles, which is a necessary pre-condition for a connection (per existing rules).

The viability of this option was tested through an examination of the current debt burden of poor connected and non-connected households. We can see from the table 6 that the average debt burden (debt servicing ratio) of those poor households who are currently indebted is between 25-35 percent with an average indebtedness level of between Tk.5500-7400. This should be compared with the capital outlay of around Tk. 7400 needed for a connection.<sup>40</sup> On the other hand, the average debt burden of *all* poor households (i.e. indebted or not) is around 10.5 percent. This suggests that there is considerable scope for a large number of poor households, especially those who are not excessively indebted, to finance their capital costs, e.g. through micro-credit. A figure of around 50 percent, under a subsidy scheme, would be well within reach of most.

The evidence on impact is somewhat more circumspect. However, it was clear that once connected, households never went back to the use of traditional fuels, suggesting a huge impact on women and children in terms of their time-use patterns (e.g. related to collection and processing of biomass fuels).

Women's time saved was spent primarily on "housework" and seems to indicate a lessening burden, especially during the difficult rainy season when fuel collection difficulties are compounded by lack of dry fuel-wood. The frequent use of damp fuel-wood results in high smoke pollution levels, poor cooking efficiency and long hours in the kitchen. No direct income effects on women could be discovered.

The main conclusion to be derived from this discussion is that rural effective demand (and desire) for both power and gas is very high. In the case of power, current connection fees and minimum monthly charges are small enough to encourage even poor households to switch to electricity. Gas connections desired primarily for household cooking are somewhat more expensive. The non-poor, it would appear, are able to afford connections at existing rates while the poor are likely to be in need of partial subsidies. The main effort that is needed is on the supply side so that appropriate rural distribution networks can be put in place to meet the huge potential demand.

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<sup>40</sup> Murshid (2000).

**Table 6:Debt Burden of Poor Households**

	Connected poor	Non-connected poor
Credit outstanding		
Per indebted hh	8744	5471
Average - all hh	4080	2240
Repayment burden per month		
Per indebted hh	807	505
Average - all hh	377	207
Average monthly exp-Tk	2285	1976
Debt burden (indebted)	35%	25.5%
Debt burden (all hh)	16.5%	10.5%

Source: Murshid (2000).

## 7. The political economy of energy policy

A review of the energy sector would be incomplete without reference to the political economy aspects of energy policy. This is, in many ways, crucial to an understanding of the nature and pace of reforms and the potential for their successful execution. The purpose of this section is to bring the political economy aspects explicitly on board for this review.

The response to the complex problems faced by the energy sector has been to propose unbundling, corporatisation, privatisation, and the creation of an independent regulatory body, for both gas and power (see section 3.1).<sup>41</sup> However, implementation of the reforms has been slow because of stiff resistance from the bureaucracy, the officials of the concerned agencies (e.g. Petrobangla and PDB) and their trade unions. The Ministry of Energy and Mineral Resources has, in principle, accepted the reforms but feels that there is room for differences of opinion with regard to the pace and speed of implementation. There is also a certain reluctance on the part of the Ministry to devolve power entirely to an independent regulatory body, due in part to a long history of intervention in the sector.

Civil society and the political parties are not very vocal about the question of reform. There is, however, a great deal of concern about the presence of powerful IOCs in the country and whether Bangladesh is able to safeguard its national interests and ensure negotiation of an equitable and fair contract. The memory of a gas-field explosion in Sylhet (Magurchara) is fresh in people's minds. No compensation was paid by the IOC operator concerned, despite the considerable damage caused, due to contractual weaknesses. Similarly, there are concerns that moves taken by IOCs to encourage exports of natural gas to India by pipeline may not be in Bangladesh's best economic and strategic interest, and must thus be handled carefully.

<sup>41</sup> Energy sector reforms by definition include acts to minimise transmission and distribution losses, metering the consumers, removing political interference in running the utilities etc. - measures that would be expected to make the energy authorities financially viable, thereby stimulating further investment in the sector.

The recent opening up of the power sector to foreign independent power producers has been hailed as an important step towards the goal of accelerating power generation capacity in the country. Investor response has been excellent in the face of low risks and high, guaranteed returns. There remains a nagging question, however, regarding the country's ability to muster the foreign currency resources that will be needed to pay for electricity purchased from the IPPs.

A distinction between IPPs investing in barge-mounted operations and those investing in higher capacity combined cycle plants needs to be made. The former have come in for severe criticism because of their high cost and the long-term commitment (15 years) for a short-term need. For example, at 80 percent plant factor, cost (\$ per kWh) of barge-mounted power is between \$0.052 to \$0.069 compared to alternative supply sources costing \$0.0217 (World Bank, 1998). It is therefore not surprising that the fast-track barge-mounted option has come in for severe criticism from the press and civil society.

## 7.1 The power sector: The question of reform

The power sector in Bangladesh is beset with huge management and institutional problems, as revealed in section 5. The main agency in charge of power is the BPDB that has traditionally enjoyed responsibility for power generation, transmission and distribution. Over the years, and mainly under concerted donor pressure, BPDB agreed to undertake certain reforms. These include the formation of a separate distribution company (DESA) for power distribution in Dhaka, the creation of DESCO in 1996 as a subsidiary of DESA, and the setting up of the Power Grid Company (PGCB) in 1996 to operate and maintain the transmission system. In other words, the reforms have been taking place slowly, mainly to meet donor conditionalities.<sup>42</sup>

This is borne out by the fact that DESA, DESCO and PGCB have been slow to act, often prevented from making more rapid progress because of their inability to resolve problems related to the transfer of assets and manpower to these newly established entities. Thus each step of the way has been subject to long, protracted negotiations, both within the different government agencies and with donors, causing lengthy delays. Thus, the Energy Donor's Meeting of March 2001 was constrained to point out:

Reforms have been largely donor-driven, without a detailed road map which has the broad support of the Government and the industry.<sup>43</sup> The reforms got little, if any support at the political level.

It was therefore not surprising that progress was frustratingly slow. The solution favoured by most donors is corporatisation, followed by privatisation of the distribution system. For example, it is argued, "unless a new strategy is adopted for the restructuring/corporatization process of the power sector, the process will continue at a slow pace, leading to uncertain outcomes at an uncertain date in the future."<sup>44</sup>

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<sup>42</sup> The reform process has been under discussion since the mid 1980s. One of its first achievements was the creation of DESA as a separate distribution agency for power in Dhaka city.

<sup>43</sup> The Government-donor relationship is complex, to say the least. The following quote from an ex-Chairman of BPDB is instructive: "The Government is determined to support the power sector. However, major donors have put in strict conditionalities for providing support to the development of the sector. Recently the World Bank and the Asian Development Bank, in an unprecedented move, decided to make a joint policy prescription for the power sector..." The Restructuring of the Power Sector, Report No. 26, Centre for Policy Dialogue, p.8.

<sup>44</sup> Briefing Paper, Bangladesh Energy Sector Coordination Meeting, March 19, 2001 p.3.



The crucial question here is *why are the reforms so difficult to implement?* The answers are complex, but probably involve the following elements detailed below.

The Government knows it is inefficient and that the huge losses being sustained by BPDB and its subsidiaries cannot be borne indefinitely. While it would like to improve matters (i.e. to raise efficiency) it is very unwilling to do so at the expense of losing control over such a critical sector. A solution that provides the Government with enough regulatory power but at the same time leaves enough incentives to improve efficiency has yet to be devised, or even considered possible. A basic element relates to the question of operational independence. BPDB managers have little decision-making authority, e.g. in terms of operating a generation unit. Such lack of independence prevents functional efficiency (CPD 2000). Other countries in the region, especially Malaysia, Thailand and India, have given much greater independence to their power authorities, including commercial independence, which probably accounts for their relative success.

A pre-requisite appears to be a strong government that is able to take the risk of reducing the workforce, providing adequate staff salaries and benefits for the remaining workers, and demonstrating a genuine commitment to deregulate. These are not easy tasks to perform, as highlighted by the painfully slow reforms in other sectors of the economy, especially the nationalised industry sector.<sup>45</sup>

The current state of inaction and lethargy, punctuated by occasional knee-jerk responses made at donor insistence, receives support from a host of vested interest groups deriving benefits from such a state of affairs in BPDB. These include the trade union leaders and their members, officials of BPDB and subsidiaries, and a large network of contractors, engineers, suppliers and cadres of political parties and semi-criminal elements - all of whom have large stakes involved. At stake are public domain resources that can be appropriated, i.e. contracts for construction, equipment supply, deals with rich consumers wishing to lower their bills, inappropriate connections at a price, and so on.<sup>46</sup> Frequently, these "stakeholders" cut across party lines, preventing any meaningful opposition from different political parties. Poor consumers have no clout and are at the mercy of petty (and not so petty) officials of BPDB. More influential or better-off consumers, including institutional consumers, find it easier and much more lucrative to enter into informal negotiations with workers, trade union leaders or corrupt officials to evade paying bills - hence there is no effort on their part to support the reforms.

The most important institutional problem underlying the sector relates to the low pay levels, morale and self-esteem of public sector employees. This is a well-known problem but little has been done to remove this fundamental flaw.<sup>47</sup> The main impact of privatisation will precisely be here - employees will get a living wage and can be made more accountable. Without addressing this basic incentive problem in public utilities and services, no amount of reform will succeed - barring complete transfer of authority to another (private) entity.

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<sup>45</sup> Over the last five years the Privatization Board has been able successfully to denationalise only one industrial unit.

<sup>46</sup> Mr. Siddiqui, ex-Chairman of BPDB, identified "notorious trade unionism and political influence" as the most important reason for the poor position of the sector. He also pointed out that in terms of non-payment of bills, the worst offenders are from industry - a situation resulting in part from corruption amongst "a certain section of BPDB" (see CPD 2000, p.7).

<sup>47</sup> The poor calibre and low morale that has beset the public administration system of Bangladesh is well documented - see Ahmed (2001).

That the public sector can deliver has been demonstrated by a number of agencies – the Rural Electrification Board and the Local Government Engineering Department, to name just two. Thus it is likely that corporatisation combined with an appropriate incentive and management structure can rescue public sector agencies like BPDB. Such an approach is likely to be much more palatable to a Government deeply worried about losing control. This would also allay fears among a section of civil society of foreign dominance over a basic, strategic good. Given the dominant ideology amongst development partners, such innovative approaches have largely been missing and need careful rethinking. The threat from unionised workers is also very real and a genuine constraint to reform. Higher salaries will attract better quality staff and improve motivation, morale and efficiency, but it will also be necessary to weed out corrupt, inefficient staff. This is the challenge that the Government and the development partners must jointly address.

## 7.2 The gas sector: The question of exports

The main controversy surrounding the gas sector, however, relates to the optimal use of Bangladesh's 'only natural resource'. The IOCs are keen to export gas to India by pipeline while local opinion varies considerably.<sup>48</sup> The *political and civil society views* on this vexing matter are discussed below, under three heads: (a) the question of gas exports, (b) gas pipeline to India, and (c) gas production sharing.<sup>49</sup>

### 7.2.1 Export of gas

There is increasing support in Bangladesh for an export-oriented growth strategy to generate employment and improve access to technology and foreign investment. An important sector in this context is foreign investment in and possible exports of natural gas. There is, however, a popular perception that gas reserves are finite and exhaustible, and that there are a number of options available, including domestic consumption. For this and other reasons, there is a distinct reluctance/conservatism with regard to gas exports from Bangladesh. The reasons given by leading members of civil and political society, as well as ordinary citizens, touch upon economic and, more importantly, political and strategic grounds.

A frequent question raised refers to the reliability of the estimate of gas reserves. It is felt that not enough data is available on this critical aspect to allow any meaningful decisions to be reached. There is a widely held perception that entities that are likely to have access to the relevant data are not sharing it with the government or the public. There is an uneasy feeling that the government has inadequate information and should take steps to develop its own capability to enable it to make an independent assessment of the reserve position.

Other concerns have also been flagged. There is a need for an assessment of domestic energy requirements under alternative development scenarios. There is a view that even if such estimates/studies exist, there has been inadequate discussion and dissemination of their findings. On the basis of domestic requirements a strategic plan should therefore be chalked out in terms of alternative options - conversion to power, CNG, LNG or fertiliser etc. It is felt

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<sup>48</sup> Seven distinct positions have been identified with respect to the question of gas exports - see Hossain, J. (2001).

<sup>49</sup> This part is based on interviews conducted by one of the authors in the context of another study (Sirius 1998) as well as on dialogue and discussion papers emanating from CPD.

that once supply and demand parameters have been solidly established, the surplus, if any, could be exported.<sup>50</sup>

There is a clear, albeit implicit, notion that it is preferable to use the nation's gas reserves directly for its own development. Thus, comments like "we should not squander our natural resources" are frequently made. It is likely that these views are predicated upon anxieties about the ability of Bangladesh to secure fair, advantageous terms in negotiations with powerful foreign entities. Moreover, there is the implied fear of India, the obvious customer for natural gas exports, which is deemed to be a powerful neighbour that tends to pursue a policy of regional dominance over the smaller countries in the region. Thus a number of distinct views have emerged about the desirability of exports:

The official position of the Government of Bangladesh is that exports may only be undertaken after ensuring that the country is able to meet domestic gas demand for the next fifty years. This position reflects the popular as well as the political mood in the country. The difficulty of this position is that much depends on an accurate estimate of proven gas reserves as well as establishing demand parameters with some degree of accuracy - both extremely difficult tasks.<sup>51</sup>

The ADB seems to be striking a moderate stance and advocates limited exports to bordering regions of India. This position finds some support amongst some observers in the local academic community.

The IOCs and the World Bank advocate substantial gas exports by pipeline to India, mainly to the New Delhi market. Thus some IOCs (e.g UNOCAL), along with the World Bank and a small section of the academic community, support gas exports of up to 3.5 TCF. Others like Shell, with support from the World Bank, would like to export up to 7 TCF.

Most opposition political parties, including the Left, Jamaat-e-Islami and the BNP, appear to be entirely opposed to exports through a pipeline. This position is privately supported by many adherents of the ruling party as well. The preponderant view is that the gas should be used for local consumption, e.g. for power generation and fertiliser production, or in the manufacture of gas-based products. A slight deviation from this position is taken by some who feel that exports may be permitted only after value-addition, e.g. as LNG.<sup>52</sup>

Another view that has found some favour among some foreign and local academics is to have a five-year moratorium on exports, presumably to give adequate time to the government to explore all the alternatives carefully before a decision is reached.<sup>53</sup>

Public opinion regarding gas exports may have softened over the years to some extent - but almost certainly there remains sizeable opposition to large-scale exports. Thus, the limited

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<sup>50</sup> This notion of an "available surplus" featured prominently in most of the discussions and was repeatedly put forward as a key decision variable.

<sup>51</sup> See the discussions in section 4.6. The best possible estimates will still remain good guesses, which may not satisfy domestic critics. Thus, reserve estimates will become more reliable as explorations and development take place - putting us into a catch 22 situation.

<sup>52</sup> This view is shared amongst others by Professor N. Islam of Bangladesh University of Engineering and Technology (see Hossain 2001). In practice, this is not a helpful option as LNG exports appear not to be economically viable.

<sup>53</sup> Conference on gas exports organized by IUBAT, Dhaka, and Simon Fraser University, Canada, 2001 (see Jaccard et al, 2001).

export argument could be sold if adequacy of reserves could be convincingly demonstrated. In general, exporting after value-addition is much less controversial, so a serious effort needs to be made to examine the option of gas-based power exports.

### *7.2.2 The pipeline option*

There is a feeling that the structure of the PSA, under which gas has to be purchased in US dollars and, according to many observers, at a high price, and the discovery of large gas fields imply that Bangladesh will be forced into a situation where there may be no option but to export - even if only to pay the IOCs for gas off-takes. There is increasing pressure on Bangladesh, not only from IOCs but also from powerful donor agencies and foreign governments, notably the US, to agree to exports - preferably pipeline exports.<sup>54</sup> The motivations are clear. It may also be perfectly correct that this would be a win-win situation for all concerned - however, as matters currently stand this is not self-evident to a large number of people.

Quite apart from the economics of gas pipelines, which may well be attractive, there are political-strategic considerations that may be important. They have to do with broader Indo-Bangla relations, including resolution of outstanding border disputes, access to Indian markets for Bangladeshi products, which India has repeatedly promised but never delivered, and vague fears of Indian domination - fears that cloud the entire debate as India is perceived with suspicion. There is the added problem of insurgency in India's Northeast, close to Bangladesh's north-eastern and eastern borders, and suggestions that a pipeline to mainland India could invite attacks on it. In the same vein, it is debated whether India may send in its army to protect access to a strategic good like gas if supplies become threatened. The main point is that unless Indo-Bangla trust improves, the potential for reaping the benefits of regional co-operation will remain small, even in the face of sizeable economic benefits. The fact that at least one major political party has made a career out of an anti-Indian stance does not help matters.<sup>55</sup>

### *7.2.3 Production sharing contracts*

A major concern that evoked much comment relates to PSCs and the relationship between the IOCs and their local agents. Many expressed an apprehension that perhaps these contracts were being signed in haste and in a situation of inadequate transparency. There was a strong feeling that the people had a right to know about the details of these contracts, although some acknowledged that it was not practicable, or even desirable, to keep the public informed about the painstaking and complex process of negotiations on a day to day basis.

A consistent and pervasive theme relates to suspicion of sell-outs to IOCs. Thus some opposition leaders even suggested that if they come to power and find that unfair contracts have been awarded, they reserved the right to revoke them. The question of local agents and

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<sup>54</sup> There has been a spate of diplomatic activity initiated by the US State Department and intended to persuade Bangladesh to change its mind about exports of gas, culminating in President Clinton's brief visit to Bangladesh last year. In a recent press conference, the US ambassador to Bangladesh, Mary Ann-Peters, stated that irrespective of which party forms the next Government in Bangladesh, she hopes that it will take a bold and appropriate decision about gas utilisation! (BBC Bangla broadcast monitored on 2 May, 19:45 GMT).

<sup>55</sup> The main opposition party, the Bangladesh Nationalist Party (BNP), was founded by General Zia, an ex-freedom fighter in 1977. He introduced the concept of Bangladeshi nationalism as opposed to Bengali nationalism. Bangladesh was founded on the basis of the latter. Thus, Bangladeshi nationalism was seen as a move away from secularism and an attempt to bring pro-Islamic ideology back in Bangladesh. The BNP has also taken a sharp anti-Indian (and implicitly) pro-Pakistani stance ever since.

their role was also raised. It was asked why these agents were recruited by the IOCs in the first place, even before a contract was drawn up. This leads to unnecessary lobbying and attempts to influence the course of negotiations and to gain favours. Indeed, often the proteges of powerful ministers operate as local agents, a situation that serves to heighten unease and fears of a sell-out.

There was a concern about monopolistic tendencies emerging in the gas market. Most argued that more rather than fewer companies should be awarded contracts. There was also a view that the presence of US companies might act as a deterrent to potential Indian intentions of asserting control over Bangladeshi gas resources. Generally, it was felt that Bangladesh could engage in effective negotiations given the will and perhaps the disposition to seek expert help when needed.<sup>56</sup>

At a more tactical level, there is a school of thought that believes in accelerating the whole process in order to cash in on the excellent response from international IOCs. Inability to do so may mean that these companies will go away to other areas. The acute poverty in Bangladesh also indicates that the country needs to act fast to take appropriate action. As against this, there is the feeling that the gas wealth could be squandered (the Nigeria syndrome), especially in the absence of a clear plan about how to invest the profits once they begin to accumulate. As long as there is a clear lack of strategy in this regard it may be better to keep the gas resources under the ground. The middle opinion favours a cautious approach whereby Bangladesh enters into contractual negotiations on the basis of equitable distribution of risks and benefits while at the same time developing the capacity to absorb and manage a large addition to its capital flows.

The media interest in the gas sector has ensured a steady, sometimes erroneous stream of information on virtually all aspects of gas sector development. Moreover, a series of seminars, workshops and dialogues, widely reported in the media, have taken place in the country and have helped to generate a more informed debate. Thus, the process of discussion and exchange across academia, journalists, civil society, policy-makers and the IOCs continues to occur - a trend that can only be good for transparency and public awareness regarding the critical issues. Compared to two or three years ago, distinct progress has been made towards arriving at an operational consensus, although the level of effort will need to be maintained to arrive ultimately at a solution. Further work in the form of solid technical studies would certainly be very useful.

## **8. Conclusion**

The public utilities in the energy sector in Bangladesh are in a deep financial crisis, partly due to an inappropriate tariff structure, problems with maintenance, system loss and low collection rates. At the same time, consumers' access to electricity and gas is constrained, while load shedding reduces the quality of the power supply.

The GoB is well aware of these problems, but still adopts a go-slow policy regarding the reform process. Regarding production, the GoB has opened up the market to IOCs and IPPs. Tax policy towards multinationals seems quite attractive and to discriminate against domestic firms.

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<sup>56</sup> One of the authors recalls a comment made by a senior official with a multilateral agency to the effect that they were ready to provide the necessary expertise to Bangladesh in conducting these negotiations but their offers were not taken up.

The reform progress in transmission and distribution has been far from successful. Liberalisation of production without distribution may lead BPDB and Petrobangla into an even more difficult financial situation than before the reform process started, since contracts with the multinationals are based on a take or pay principle.

The donor response, at least from ADB and WB, to the slow reform process is to link their aid programmes to the current reform processes. The establishment of an independent regulatory body is of high priority.

Several political reasons for the slow implementation of the reform process and the 'nationalistic' position regarding the use of the gas reserves are discussed. We argue that the implementation of reforms have been slow because of stiff resistance from the bureaucracy, the officials of the concerned agencies and the trade unions.

The debate about the use of gas is political (whether or not to trade with India) more than economic (the opportunity costs of domestic use in terms of lack of export revenue and transfers of technology). Energy, like other commodities, is to some extent a tradeable good, at least in a regional context. The energy policy lacks a regional economic perspective.

In contrast to many other developing countries facing the same types of problem with their public utilities, Bangladesh is in the favourable position that nature has provided the country with a significant volume of hydrocarbons in terms of gas. Although the size of these reserves is disputed, the gas represents an additional energy supply in Bangladesh as well as for the whole region.

We have argued that the main challenges for Bangladesh in the energy sector are to provide electricity to domestic industry and households and to broaden access to natural gas. Although the theoretical and empirical relationship between access to energy and poverty is unclear, different empirical studies from the Bangladeshi context, referred to in this report, demonstrate that a positive relationship exists. Questions have also been raised whether the poor can afford commercial energy. In Bangladesh it seems like they can and that they are willing to pay for it, but the supply is constrained.

Three cost elements are involved in the power supply: a fixed cost, a variable cost and a transaction cost. Regarding the fixed element, the population density in rural Bangladesh is significantly higher than in most other countries. Since the transmission of electricity and gas establishes natural monopolies with high fixed costs, the high population density in the rural areas reduces unit costs, making it less costly for the power company to serve the poor. Regarding the variable costs, these can be reduced by limiting customers' energy use to particular purposes (electricity for lightning) or scale (e.g. a few lamps for a few hours per day). Regarding the transaction costs, REB's institutional structure seems efficient and accountable and has demonstrated excellent capacity for rapid expansion and recovery of dues.

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# Annex 1 a: Terms of Reference

7 March 2001

## **A REVIEW OF DEVELOPMENT TRENDS IN THE ENERGY SECTOR OF BANGLADESH**

**A background study commissioned in accordance with the agreement between NORAD  
and CMI/NCG to strengthen the country-specific knowledge base**

### **1 BACKGROUND**

This study is commissioned with reference to contract entered with CMI/NCG on 22.4.1999 specifying the objectives of a 2-year programme for strengthening the country-specific knowledge base of NORAD and Ministry of Foreign Affairs. The contract envisaged the development of an annual country report with two main elements; firstly, an updating of and commentary to recent development trends, and secondly, a more thematically focused part of particular interest for Norwegian development assistance.

In consultation with CMI, in the case of Bangladesh, it has been agreed to focus the work of year 2 exclusively on the thematic part, and address development trends in the energy sector.

### **2 OBJECTIVES**

The objective of this assignment is to inform key decision-makers of Norwegian development assistance to Bangladesh on the development prospects of the commercial energy sector in Bangladesh. The study shall highlight policy challenges in order to enable the growth of a domestic industry, and ensuring the sector's contribution to poverty reduction.

The assignment shall result in:

- A report not exceeding 30 pages, excluding appendices
- Seminar presentations in Dhaka of preliminary findings, and in Oslo based on the final report.

### **3 SCOPE OF THE STUDY**

This is an explorative study carried out within a limited resource frame, and it is not possible to outline in detail the content of the report. It envisaged that the team, upon completion of the fact finding mission in Bangladesh, will present to Norad a proposed outline of the report.

It is envisaged that the report might include:

- An overview of the current political, economic and legislative context and the structure of the energy sector.
- An overview of the key actors in the sector – domestic as well as international. This will include activities of transnational corporations as well as the main donor agencies and international finance institutions.

- A formulation of possible development scenarios for the sector in a 5-10 years perspective.
- A discussion on the prospects of enhancing the potential of developments in this sector contributing to poverty reduction. This may relate to revenue issues, the potential for direct and indirect creation of employment, and equitable distribution of energy.

The study will contribute important background information to the formulation of mandates for subsequent studies or missions preparing for a possible Norwegian involvement in the sector.

## 4 APPROACH

### 4.1 Methods

The study will make use of three main sources of information:

- Research reports of relevance
- Recent policy related reports and commissioned reports
- Interviews with key stakeholders

### 4.2 Duration, reporting, time schedule and resources

The study should be carried out in the course of a two-month period, with the Draft Final Report being submitted to NORAD by 10 May 2001, provided the work is commissioned at the latest by end-February.

The work will involve two researchers, one from CMI – Dr. Arne Wiig, and one from BIDS – Dr. K.A.S. Murshid.

The work will be carried out within the following work plan and resource frame:

	Wiig	Murshid
Preparation of the study, including meeting in Oslo in January (4 days)	4/5	-
Collection/review of relevant literature (3 days)	3/5	1
Fieldwork in Bangladesh, incl. Travel and drafting the report. During weeks 12-13-14.	3	3
Editing of Draft Final Report	8/5	1
Comments on Report	By NORAD	
Finalising Report and presentation in Oslo	1	
Total in person-weeks	7	5

## Annex 1b: List of persons interviewed

Name	Date	Institution	E-mail	Position
Berg, Erik	21.3	Norad	erik.berg@dac.norad.no	Councillor
Chapman, Peter	24.3	Shell	Peter.chapman@sbed.shell.com	Gas and power manager
Shamsuddin, A.H.M	25.3	Unocol	ashamsuddin@unocol.com	Chief geologist
Barber, Scott		Unocol	sbarber@unocol.com	President and managing director
Shamsuddin, Ahmed	25.3	ADB	sahmed@adb.org	Head energy
Kicker, Scott	26.3	AES	<a href="mailto:skicker@aesc.com">skicker@aesc.com</a>	
Shamsuddin, A.K.M	26.3	MEM Hydrocarbonunit	heu@bttb.net.bd	Director, Hydrocarbon unit
Elahi, Raihan	27.3	WB	relahi@worldbank.org	Consultant
Iqbal, Md	27.3	WB	miqbal@worldbank.org	Energy specialist
Hussain, Mosharraf Md	28.3	Petrobangla	<a href="mailto:petchair@dotbd.com">petchair@dotbd.com</a>	Chairman
Rahman, Mizanur	29.3	Ministry of Energy and Mineral Resources		Joint Secretary
Malek, M.A	29.3	Bangladesh Power Development Board	chbpdb@bol-online.com	Chairman
Huq, M. Moinul	5.4	Bapex	geobapex@bangla.net	General manager, exploration
Rahman, K.M. Faizur	5.4	Power Cell	dgpcmemr@citechco.net	Director General
Kabir, A.S.M. Alamgir	5.4	Power Cell	dgpcmemr@citechco.net	Director, tariffs
Ahmed, Mesbah Uddin	5.4	Rural Electrification Board	chairman@citechco.net	Chairman
Abdullah, Syed Abu	5.4	Rural Electrification Board	rebpp@citechco.net	Director, Programme Planning
Islam, Md. Tauhidul	5.4	PBS	asifmt@bttb.net	Member PBS

## Annex 2: Key Energy Indicators in South Asia

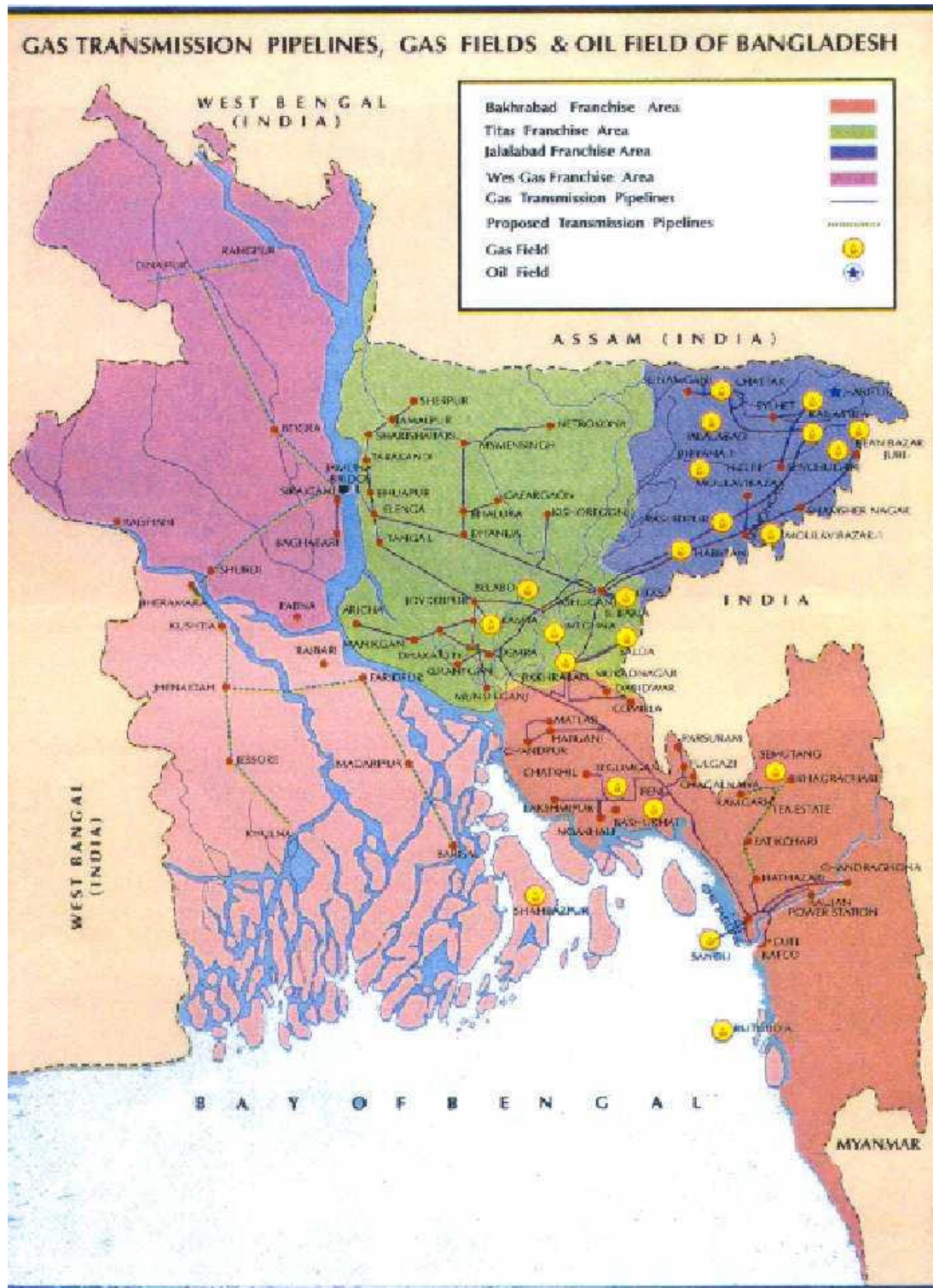
	B'desh	India	Nepal	Pak	Sri Lanka	S. Asia	E. Asia
Commercial energy use per cap (kgoe, 1997)	197	479	321	442	386	443	942
Commercial energy prod. ('000 mtoe, 1997)	21894	404503	6559	42048	4345	479349	1535331
Commercial energy use, 1997 ('000 mtoe)	24327	461032	7160	56818	7159	556496	1647182
Net oil imports (as % commercial energy use)	10	12	8	26	39	15	-
GDP per unit of energy use (ppp \$ per kgoe, 1997) <sup>57</sup>	6.8	4.2	3.7	3.9	7.6	-	-
Traditional fuel use <sup>58</sup> (% of total energy)	43.3	21.2	90.9	17.3	48	23	-
Carbon dioxide emission per capita MT, 1996	0.19	1.05	0.07	0.75	0.39	0.9	2.66

Source: World Development Indicators, 2000 CD Rom, World Bank

<sup>57</sup> This measure is the inverse of the energy intensities discussed in section 2.

<sup>58</sup> The rest is commercial energy.

# Annex 3



## Annex 4: Past ADB loans to the power sector

Project Name	Loan No.	Original Loan US\$ Million	Board
West Zone Power	141	9.25	10/17/73
West Zone Power	142	1.20	10/17/73
West Zone Power- Supplementary	212	4.55	12/19/74
Chittagong Power	325	27.75	12/9/77
Power System Rehabilitation & Expansion	523	26.50	09/22/81
Ashuganj Project	587	35.00	10/21/82
Power Transmission a Distribution	636	82.00	09/13/83
Sixth Power (Sector Loan)	683	120.00	06/14/84
Seventh Power	151	40.50	10/31/85
Eighth Power	963	165.00	07/11/89
Rural Electrification	1356	50.00	05/30/95
Ninth Power Project	1505	134.4	11/96
Dhaka Power System Upgrade Project		151	12/99
<b>TOTAL</b>		<b>853.15</b>	

Source: ADB- Dhaka Power Svstem Upgrade Project

## Annex 5: Past IDA credits to the power sector

Project Name	Credit No.	Total Credit Amount	Board
Greater Khulna Power Distribution	934-0	28.0	6/14/79
Ashuganj Thermal Power	1254-0	87.5	6/1/82
Rural Electrification Rural	1262-0	39.9	6/15/82
Electrification [Supplemental]	1504-3	8.0	6/19/84
2 <sup>nd</sup> Rural Electrification	1633-0	61.6	11/12/85
Power Transmission and Distribution	1648-0	43.4	1/14/86
Power Distribution 116 Towns)	2016-0	87.0	5/16/89
3 <sup>rd</sup> Rural Electrification	2129-0	105.0	5/1/90
		460.4	

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# Summary

This is the second report under the CMI/NCG contract for strengthening the country-specific knowledge base of NORAD and the Norwegian Ministry of Foreign Affairs. This energy review examines the gas and power sectors in terms of major actors, current and potential output, generation, transmission and distribution problems and the emerging policy regime.

The main challenge for Bangladesh is how to provide electricity to domestic industry and households and broaden access to natural gas. Consumers are willing to pay for electricity, but are constrained by supply.

Bangladesh has undertaken reforms in production by providing favourable treatment for international oil and power producers. Reforms in the distribution of energy have not been as effective. It is argued that the implementation of reforms has been slow because of stiff resistance from the bureaucracy, the officials of the concerned agencies and their trade unions.

Gas is currently the only indigenous non-renewable energy resource in the country that is produced and consumed in significant quantities. The report discusses alternative options for the use of this resource (power production or gas export). The report also underscores the importance of coming up with a regional perspective on the use of energy resources.

## Recent Reports

- R 2000: 4 Hildegunn K. NORDÅS com o contributo de Inge Tvedten e Arne Wiig  
Impacto do investimento petrolifero Norueguês nos países de acolhimento, com especial ênfase para Angola. Bergen, 2000, 45 pp. (Price NOK 50 + postage)
- R 2000: 5 JERVE, Alf Morten and Arve Ofstad  
Poverty and development in Tanzania: A discussion note. Bergen, 2000, 34 pp. (Price NOK 50 + postage)
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