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**POLICY BRIEF ON “DEVELOPMENT AND
GOVERNANCE OF THE ENERGY SECTOR”
CPD TASK FORCE REPORT**



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Background

The Policy on *Development and Governance of the Energy Sector* has been identified as one of the sixteen priority strategic issues, on which task forces have been formed to develop *policy briefs*. It is expected that this *policy brief on energy* should reflect the public concerns and expectations so that the new government installed after the Parliamentary elections in October, 2001 will find them acceptable and the recommendations implementable. In developing the policy brief the *task force* members participated actively through their deliberations and the contributions they made with their expertise knowledge and views have been immense. Many distinguished professionals and organizations also volunteered their opinion in developing the energy policy brief. The policy brief thus focused on :

- i. issues of *urgent public concern* with a view to developing concrete, implementable policy agendas within the existing realities of Bangladesh;
- ii. assessment of current *energy scenarios* in Bangladesh ;
- iii. identification of *issues and actions* ; and
- iv. analysis of short – term [upto 5 years] agendas.

The very intent of preparing the policy brief is to try and influence the policy debate regarding the development agenda and subsequent follow-up with the new government. Indeed, the task force has been guided by the principals of *vision, ownership of agenda, political consensus, mobilization of investible fund and manpower development, above all a visionary leadership.*

What however may seem important is to realise that *energy use* in the country has also been undergoing transition from *traditional (non-commercial) fuels* (biomass) to *commercial fuels* (oil, gas and electricity). Notwithstanding, that the traditional fuels provide almost sixty five per cent (65%) of the total energy need of the country, there exists *no institutional or policy support* by the Government to *assess and harness* these resources. At the same time, it is also visible that the present policy planning, institutional strengthening and infrastructure development in case of commercial energy development is also severely constrained. In fact, *good governance* both at the macro-level and at the corporate levels are deficient.

In the past energy development programmes and their management suffered due to :

- i. lack of initiative on systematic survey, exploration and exploitation of energy resources resulting in *imbalanced development* of the energy resources of different zones of the country and of different sub-sectors of the energy sector ;
- ii. *shortage and unreliable supply* of commercial energy ;
- iii. inefficient operations of various energy agencies ;
- iv. irrational energy prices ;
- v. unplanned and unsystematic *use of biomass* fuels that are contributing to *environmental degradation* ;
- vi. inadequate attention given to meet the *total energy needs* of rural areas ; and
- vii. improper attention to manpower training for efficient management of energy sub-sectors, particularly gas sector.

An attempt has been made to highlight the *Energy Security* issues of the people of Bangladesh to support sustainable development. For instance, an insignificant percentage of people advocate immediate export of natural gas without caring to consider the energy need of the future generations on a sustained basis. They argue mainly on two counts : first, Petrobangla is not able to pay for the purchases of gas from the International Oil Companies (IOCs), and second, Bangladesh would not be able to utilize available natural gas in the near future. Even on the proven recoverable reserves of gas, they stretch their imagination to an unreliable figure without substantiating their contentions or proposing any scientific basis for calculations.

Bangladesh currently has one of the lowest *per capita* consumption of commercial energy in South Asia as well as a large unsatisfied demand. Only about 19 percent of the population (12 percent rural) are connected to *electricity grid*, about 4 percent households are supplied with natural gas. The development of this energy

source can have substantial impact on the rate of economic growth of the country. Nevertheless, progress in the energy sector policy reform and implementation necessary to achieve its full potential are lagging. The energy sector remains largely *publicly managed*. Generation, transmission, and distribution of both the power and natural gas sub-sectors are dominated by integrated public sector utilities namely, the Bangladesh Power Development Board (BPDB) for electricity and Petrobangla (Bangladesh Oil, Gas, and Mineral Corporation) for oil and natural gas. Bangladesh Petroleum Corporation (BPC) is charged with the responsibility of import of oil, refining and marketing petroleum products throughout the country. Geological Survey of Bangladesh (GSB) is the principle organization responsible for survey, investigation and research for minerals, and water etc. throughout the country.

The installed electric generating capacity of the country in 2001 is 4005 Megawatts (MW) including the public and private sectors, generators but excluding over 550 MW as captive capacities in various industries and commercial activities. However for general public consumption only around 2850 MW average of electricity is considered to be available for supply through the national daily grid. Overall, the countries generation plants have been unable to meet system demand over the past decade. Power demand, however, is growing rapidly (9 –10 percent annually). A required doubling (bench mark year 2000) of electric generating capability is projected by 2010. Considering this demand scenario, and the prospect of low availability of funds from various donors, the Government has allowed the entry of private sector Independent Power Producers (IPPs) through Private Sector Power Generation Policy in October 1996. Five (5) IPP contracts have been signed, implementation of four has already added 565 MW electricity in a record time in Bangladesh context, and is expected to add another 575 MW by 2003. Thus the total installed capacity of the combined public and private sector would be over 4580 MW by 2003, and about 5500 MW by 2005 (considering retirement of some existing old plants) against a reference peak demand of about 4000 MW and 4600 MW respectively as per Power System Master Plan (PSMP) projection (1995). The PSMP forecasts a 9900 MW demand by 2015, while the Power Policy Statement indicates that, “to meet the projected demand, the generation capacity alone will have to be increased five fold to a ballpark estimate of 15,000 MW. Alongside, the gas sector plan has to be designed and implemented in tandem”.

The saving grace for the country is the indigenous natural gas, whose reserve have not yet been fully and comprehensively established. The current thinking is that around 15 to 16 trillion cubic feet (TCF) of gas reserve may be available out of an estimated Gas-Initially-In-Place (GIIP) from 22 gas fields at 25.80 TCF. During the past 40 years since its first production in 1960, a cumulative consumption is estimated at 3.95 TCF. Consequently, the remaining recoverable reserve may be between 11-12 TCF. Currently, natural gas is not only the most significant source but also the only source of commercial energy available for use in the country. It provides almost 70 percent of the commercial energy needs of Bangladesh. Gas is mostly used to generate electricity (47 percent) and fertilizers (35 percent), the rest 18 percent being used for other industries, commercial and domestic purposes. Non-commercial (biomass) energy source accounts for about 65 per cent of the country’s energy consumption.

Current annual natural gas production, as well as consumption is approximately 365 billion cubic feet (BCF) from 12 gas fields, while production from 3 fields have remained suspended. Seven (7) gas fields are yet to come under production, including two large ones (Bibiyan under IOC) and Chatak under Petrobangla.

Private sector interest and FDI in the gas and in the power sector respectively were visibly dramatic in the 1990s after the GOB divided the country into 23 exploration blocks and offered them to private investors under the PSC, and formulation of private sector power policy respectively.

Sector policy development has been going on at a steady but relatively slow pace, particularly when viewed in light of what the country needs to improve the overall performance of the sector. In the power sector, the Government adopted a *Power Sector Master Plan in 1995*, followed by a comprehensive *National Energy Policy* shortly afterwards. Later in 1996, *Private Sector Power Generation Policy*, and later in 1998 a *Small Power Generation Policy* was formulated. Drafting a proposed *Bangladesh Electricity Reform Act (1999)*, which includes the provision for an independent regulatory commission was accomplished in 1999 but the document is lying with the government unapproved. In addition to the PSCs the government has embarked on other structural reform initiatives in the oil and gas sector. A *Petroleum Policy* was adopted in 1993. In 1996 *power cell* was created. Very recently, a *Hydrocarbon Unit* was established.

It is in this background the Center for Policy Dialogue (CPD) conceived a short-study forming a eight-member task force with a view to identifying:

- i. the *crying needs* in the energy sector and their likely remedial measures;
- ii. the *hard decisions* for the government, expected to be implemented in the first one hundred days and then in the remaining 265 days of the first year; and also
- iii. *prioritizing* the problems and scope for addressing them.

2.0 Scope

Admittedly it was not possible for the task force to address all the issues which may come under the theme. Therefore, the agenda has been kept as broad – based as possible. Accordingly it has collected relevant materials prepared by various forums and organizations and also current policy documents as the point of departure. The task force mainly concerned itself with the Policy Brief of 1991, Power System Master Plan (PSMP), Energy Policy, 1995 (gazetted in 1996), Private Sector Power Generation Policy, 1996, Power Policy Statement of the Government (2000), Fifth Five Year Plan Document (1997 – 2002) [see appendices I to VI] and views of different stakeholders and put them as practical *policy recommendations*, which have been mapped in the issues and actions model. The policy brief selected agendas, which are implementable within a given time frame. The theme has been defined in a neutral fashion in order to avoid any confusion in the orientation about the task force.

3.0 Introduction

Meeting the rapidly rising needs of a growing population and economy requires radical change in the energy sector. In both the power and the natural gas sectors parallel domestic and foreign private participation is essential for achieving the level of investment needed to boost the energy sector entities, while reforming power sector institutions in particular for improving government finances, industrial development, and public well being.

But at least in the past decade the Government did not make sufficient efforts for development of the energy sector. Consequently, Bangladesh economy is in the throes of an *energy crisis*, the result of under investment coupled with *corruptions* and *inefficiencies* that has crippled the power system. Shortage of power supply, at times acute and *unreliable*, has constrained the economic growth. The lost output is, according to some estimates, as high as 1 (one) per cent of the GDP (Ref: Policy Statement on Power Sector Reforms, GOB, January 2000). This is critical because the foregone economic growth could have taken the country beyond the threshold of 6 to 7 per cent growth rate that many policymakers think could make a significant and sustained dent on *poverty*. Nevertheless, for the investors with strong stomachs, Bangladesh utilities offer some worthwhile opportunities. Thanks to some foreign direct investors (FDIs), they have accepted the *challenge* as well as the *incentive package* for private sector participation.

The current energy sector in Bangladesh reflects the *energy-starved* condition of the millions who mostly live in the rural areas. These rural people (almost 80 per cent of the total population of the country) basically survive on fuel wood, animal dungs and solar energy in its natural form. These sources of energy are bracketed under renewable non-*commercial fuels* and are not generally traded in the market places (in the villages).

Nearly 100 million people, or about four-fifth of Bangladeshi population, live in the rural areas with agriculture as their main occupation. Their major energy end-use comprises of cooking and lighting, mostly based on traditional (biomass) fuels. Consequently, for ages, their energy technology base has remained primitive and inefficient. Commercial energy fuels like oil, gas or electricity have only touched their surfaces as a result of low purchasing power of the people and poor infrastructure. Yet, one cannot deny that a positive move towards rural development have taken place due to rural electrification. Continued dependence on biomass fuels has manifested in serious environmental problems apart from affecting the quality of life, especially that of women, who are collectors, processors and user of biomass fuels for cooking. After cooking, lighting is the most important energy end-use in the villages. Availability of lighting has direct links with various aspects of family and social life including education of children, entertainment, and safety of their movement. Flame-based devices fuelled by kerosene or wax candles or biomass meet some lighting needs of the rural households. Electricity as the source of lighting has been promoted only in the past three decades. It has provided it's access to only ten percent rural people.

Therefore, it is necessary to examine the prospects other options for rural Bangladesh. For instance, community biogas plants (biogas is now used through a flame based device) and solar photovoltaic power packs as centralized systems can be introduced and operated at the village level using small distribution system. A number of photovoltaic devices like solar home system (SHS), solar lanterns (SL) can also be used as stand-alone system at the household level and in the public places. These are relatively more expensive than grid electricity. Consequently, financing is necessary which can make its way through the development programmes. Wind power can be another source that has recently witnessed increased popularity in India and China. Turbines of nearly one megawatt capacity are already in the market. SHS : the way forward, may soon become attractive to rural Bangladesh. The main advantage of SPV is in its modularity. The systems conversion efficiency is largely independent of the capacity and the radiation intensity, which makes it possible to install any size from a few watts to megawatts. The lead time for commissioning SPV system is very short, which generally enable the investment risk to be minimised. The cost of operation and maintenance is low. In a decentralized

mode, SPV has very negligible negative environmental impact. Unfortunately, there exists no formal institutional or financial support from the government for development of these sources. It is also unfortunate that whenever traditional energy issues for rural Bangladesh is considered, the usual recommendation from the government is that private sector's participation would be more beneficial. The expectation is that some non-governmental organization (NGO) will shoulder the responsibility of providing energy to the poor masses. This can not be an acceptable proposition in a democratic government. In fact, government intervention is a must towards self-sufficiency of energy in the country.

The country's total per capita energy use barely touched 240 kilogramme of oil equivalent (Kgoe) ¹¹ mark. This figure is the third lowest in South Asia/South East Asia, after Cambodia and Nepal ²¹. Most of it however is non-commercial energy. Commercial energy is available to less than 20 per cent of the total population as electricity ³¹. Around 4 per cent people have access to the only indigenous natural gas. The annual per capita consumption of electricity has been officially estimated at 112 kWh (kilowatt hour) which compares disfavouredly with, for example, India with about 440 kWh ⁴¹.

Yet, it is paradoxical that the current *policy options* in the energy sector mainly concentrate on the development of commercial energy, which in effect supports the privileged minority who mostly live in the urban areas. Ironically also, growth in consumption of commercial energy is being taken as a *yardstick* to measure economic growth, the lions share of which go to service the wealthier citizens of the poor Bangladesh.

Be that as it may, the country has large *unmet demand* in commercial energy, as under:

Electricity : about 5 million customers i.e., about 25 million consumers (out of 130 million people) in the country (assuming on an average 5 members in each family). Thus the access to electricity is only 19 per cent;

Gas : 96 per cent of the total population do not have direct access to indigenous natural gas as cooking fuel ; and

Oil : imported oil (for which the government incurs about US\$ 500 million annually) provide direct access to only 5 per cent rural people as consumers of kerosene for lighting and cooking.

What however may seem important is that energy use in the country is undergoing *transition* from biomes sources to commercial sources. But the policy planning, institutional support and infrastructural development is not taking place commensurate with the need. *Good governance*, both at the macro level and at the corporate levels are deficient. Systematic dissemination of relevant sector information, public hearing and discussion on issues prior to their decisions known as *transparency* is clearly absent in the government decision making process. Cause and effect structure incentive identified as *accountability* is not there, in most cases. At the corporate level (under public sector entities), government actions are expected to be enhanced through, *unbundling*, *corporatization* and *commercialization*. But these issues are faced with severe road blocks. The proposed framework, therefore, aims at :

- i. making a *policy prescription* for commercial energy development;
- ii. outlining the required *institutional change* ;
- iii. listing the *structural modification* and change ;
- iv. discussing about financial, management and *accountability*, which is the crux of the problem.

¹¹ Extrapolated from the World Bank's Development Report for 1999-2000, which indicated a figure of 197 Kgoe for 1996 with an average growth rate of 9 per cent per annum, over 1980-96.

²¹ ADB Fact Finding Mission, 2-16 May, 2000 (Aide-Memoire).

³¹ GOB Power Policy Statement, January, 2000.

⁴¹ ADB's overview of the Power Sector, May, 2000.

3.1. Transforming the Power sector

Accelerated economic growth will place heavy demands on power generation and distribution (with minimum technical losses) in an efficient manner. On current usage patterns each 1 (one) percent growth of GDP requires atleast 2percent rise in power supply, a ratio typical of developing countries at an early stage of industrialization. Thus a GDP growth rate of 6 percent a year would require a corresponding growth in power generation to 12 percent a year. In reality, it has not been possible to achieve power generation growth of this magnitude for fueling the engine of growth in Bangladesh. As with so much else in Bangladesh, the task ahead is formidable particularly because the governance issue is not adhered to in the right perspective.

Reserve Margin is non – existant in the country’s power system, with a quarter of public sector installed capacity out of service, and load shedding is a way of life when plant availability is insufficient to meet peak system demand. The problem is compounded by system losses (mostly power pilferage and theft) that are among the highest in south Asia and by low tariff collection rates. The electric utilities (Bangladesh Power Development Board, DESA, and many of the rural electric co-operatives) incur huge losses – perhaps equivalent to almost a third of annual public investment of the power system and are unable to meet their debt service obligations. The power sector has the dubious distinction of being the largest loss – maker in the economy. Because power losses are incurred primarily in urban power supply, government actions - and inaction – create a substantial antirural and anti – poor bias. The situation looks even grimmer when set against the massive capital requirements of the sector for planned system expansion. It is imperative that the government move quickly to radically change sector performance and to meet the power needs of a growing population and industry.

Already high at 31 to 35 percent in the early 1980s, system losses rose to more than 40 percent in FY 1991 and FY 1992. Compounding the revenue problem collections dropped to about 80 percent of billing in those two years. The upshot was that more than half of all the electricity generated was not being paid for. Some marginal gains were observed later. Seeing no substantial improvements in this deteriorating situation, some donors (the World Bank in particular) suspended new lending to the power sector during the 1990s.

However, in contrast to the dismal performance of BPDB and DESA, the power distribution programme run by the REB has been considerably more successful, though not entirely problem free. As ownership is dispersed among cooperative (PBSs) members, are represented by a board of directors responsible for policy formulation, the system losses incurred by each PBS is absorbed by them. The REB performs a supervisory and regulatory function, helping to maintain technical standards and monitoring effective performance management system linked to employee bonuses and penalties. Consequently, the rural cooperatives generally have a good record, with average system losses of 16 to 17 percent (high because of some transfer of BPDB/DESA areas with high system losses) and collection of about 98 percent of billing. But problems remain. Most of the rural electric cooperatives are financially weak and require government subsidies, at least at the initial phases, even though they are already buying electricity at subsidized tariffs and retailing it at 25 per cent higher than those charged by BPDB and the DESA.

The issue is how the case of the *missing urban watts* can be improved ? The BPDB and DESA, with their poor performance and entrenched unethical practices, let substantial portions of potential *revenue go uncollected*, while the more successful REB/PBSs are prevented from achieving their full potential. Relying on incremental improvements in performance is certain to mean a long and frustrating wait. Only a few unscrupulous employees and non paying customers benefit from maintaining a status quo, while the vast unserved population, honest customers, and the economy’s growth suffer.

Successful reform of power sector institutions within the next five years will field substantial benefits to the government’s finance, to industry, and to the public. The large revenue drain will be arrested, and the institutions will become self sustaining and capable of earning more out the extensive expansion and rural electrification needed to make electricity available to the vast un-served population. Industry will benefit greatly from reliable, round-the-clock power supply. The present captive generation in various

industries (about 550 MW) will no more remain captive; rather can be hooked up with the power grid for optimum use of electricity.

A complementary programme is needed to improve distribution and overall sector performance. The *starting strategy* could be to expand the areas (through decentralized policy frame) similar to the better-performing PBS model rural cooperatives extended to BPDB and DESA. The underlying exercise in rationalizing networks (under BPDB/DESA) can rely on the existing “*excellence centres*” as catalysts to the development of efficient and financially viable distribution organization. In larger distribution centres (Dhaka, Chittagong, Khulna and other major load concentrations) suitable independent corporatized entities need to be set up under the Companies Act and managed on a commercial basis.

The basic steps toward a sector reform programme have already been laid out in the Power Sector Reform Paper’ approved by the government in 1994. Major steps in the reform process aims at:

- restructuring (unbundling) the BPDB along functional lines and establishing independent and corporatized entities for generation, transmission, and distribution activities ;
- corporatizing and commercializing the DESA, giving it managerial and financial autonomy ;
- establishing an independent regulatory authority to oversee the reorganized sector, including the setting of tariffs ;
- erecting an enabling environment for private sector participation in build-own-operate power generation plants ; and
- rationalizing distribution areas to improve the viability of operating units, and introducing private participation in distribution basis.

What really went on during 1994 and mid 1996 was that the government took a relaxed attitude regarding implementation of the reforms and consequently the agreed reformed-linked investments were not coming. In late 1996, separation of transmission from BPDB and corporatization of the same into Power Grid Company of Bangladesh (PGCB) was effected upon. Through formulation of Private Sector Power Generation Policy in October 1996, Independent Power Producers (IPPs) were attracted. Later a portion of DESA distribution (Mirpur area in Dhaka city) was segregated as Dhaka Electric Supply Company (DESCo). Both the companies were formed under the Companies Act, 1994. Then came a halt of the reform actions because of the road blocks created jointly the workers union and the junior management of BPDB (Okyo Parishad).

3.2. Firing Up the Gas sector

Some 70 percent of Bangladesh’s commercial energy comes from natural gas, the country’s single largest energy source. Over the past three decades gas output has increased from 11.5 billion cubic feet (BCF) in 1972 to 365 BCF in 2001 (thirty fold). Recoverable Gas Reserves are estimated at 15.55 trillion cubic feet (TCF) by petrobangla, and in the past 40 years since production started 3.95 TCF gas has been consumed. The remaining gas (about 11.68 TCF) would hopefully be consumed by 2019.

The reality, however, is that gas shortages, especially in meeting demand from the power sector, did cause, for a while in the late 1990s, substantial economic losses, and these will continue to grow unless some *radical actions* are taken. The risk capital required to accelerate development of the sector for exceeds what the government can manage to allocate and draw from external sources. Recognizing that the country lacks and full technology to efficiently explore for and develop its hydrocarbon endowment, the government announced a Petroleum Policy in 1993 for seeking the participation of international oil companies (IOCs) alongside Petrobangla (Bapex) in hydrocarbon exploration. Two successive governments in the 1990s, for some unknown reason,

completely surrendered themselves to the IOCs and opened up all the 23 blocks for them. This has led the country to a path of disaster in the 21st century. The restructuring and corporatization of the public operating companies are expected to contribute substantially to fueling economic growth, but if the activities in the gas sector are withdrawn from them what good corporatization would do to the state owned companies?

Petrobangla experiences enormous system losses of almost 50 percent in its non – bulk retail supply. The overall system loss has remained less than 10 percent, out of that loss is in the retail end of the market, which constitutes about 18 – 20 percent of total gas sales (bulk consumers in power and fertilizer are directly supplied from the main distribution system, account for the rest). Petrobangla needs to develop its operation and maintenance capabilities to catch up with the system expansion ; apparently it also lacks the in-house capacity to adequately plan, design, and supervise the kind of expansion programme the sector really needs. If it did, the gas sector scenario would have been more positive.

Nevertheless, Petrobangla’s financial contribution to the government had increased steadily from Tk. 11 billion in FY 1995, to around Tk. 19 billion in FY 2001, a rare example of a public enterprise in Bangladesh that has been a significant source of revenue for the government. That fact has been less beneficial to Petrobangla and the gas sector; however, Petrobangla pays a supplementary duty and VAT (currently perhaps 55 per cent of gross sales revenue), a 40 per cent corporate tax, and compulsory dividends. These levies have reduced the corporation’s ability to finance investment in the sector.

To overhaul the gas sector the government is following a twin-track strategy of promoting (much too much) private entry in oil and gas exploration under PSC and at the same time making plans for restructuring Petrobangla. It would be horrifying see the financial impacts PSC from only two companies operating now (one off-shore and one-shore) and producing only 300 million cubic feet (MMCF) gas per day. Under the Petroleum Policy 1993, the government significantly liberalized the hydrocarbon policy and the Production Sharing contractual framework as well as the provisions (much beyond what was needed at the instance of a foreign consultant in the mid 1990s), the result of which is that the IOCs have jumped into the project for huge profit.

4.0 Resource Availability

In Bangladesh, more than 65 percent of total energy need of the country is met by renewable energy sources, such as biomass and hydropower. The former energy source is known as non-commercial or traditional energy and the latter is categorized under commercial energy. Depending on their characteristics and quality, only a fraction is used as fuel. In Bangladesh, biomass fuels are obtained from three sources : trees (e.g. wood fuels), field crops (e.g. agriculture residues), and livestock (e.g. animal dung). Land is the ultimate resource base that supports the production of total biomass resources. Bangladesh Energy Planning Project (BEPP) made an approximate estimate of biomass fuels from different type of land for the base year 1981, and there has not been any updating on that study report. As the biomass fuels are consumed near the place of its production, for their planned development, there is an urgent need to *assess the demand and regenerative supply* of different biomass fuels specific to different locations.

On the other hand although presently known primary commercial energy resources of the country include natural gas, coal and peat, only gas in use. In fact, known reserves of commercial energy sources are very modest compared to the development needs of the country. Nevertheless, it is also a fact that the major percentage of people in the country depend on *traditional fuels* for meeting their end-use energy need (lighting and cooking). The *energy balance* thus shows that :

- i. Over three fifth of the country's primary energy supply come from non-commercial sources such as fuel wood, dungs twigs/leaves etc., but not only their energy efficiency is low but also they degrade environment
- ii. Of the total *commercial energy* use in the country (35%), natural gas provides about 24.5%, imported oil 8.5% and hydro-electricity 2%.
- iii. Considerable *misunderstanding* exists in the reserve figure of natural gas, essentially because a comprehensive estimate has not been undertaken as per standard international practice. Petrobangla's assumed gas-initially-in-place (GIIP) for 22 gas fields is 25.80 TCF. From the geological point of view 60 per cent is recoverable i.e. 15.48 TCF. In the past 40 years (since 1960) some 3.95 TCF has been used-up. Thus, remaining recoverable reserve may be estimated at 11.68 TCF. Vested interest persons working in the government and outside, and some IOCs prefer to publicize the 50 to 100 TCF gas availability in Bangladesh. Regrettably, for the past 11 (eleven) years since 1989 estimates of gas remained guesstimates.
- iv. Recent statistical study report (Monte Carlo simulation model) indicate that about 8.4 TCF gas may be available from *undiscovered* geological structures in future (Joint USGS-Petrobangla Report), which may be considered a good guess. However, the figures obtained reflect *resource position, not reserve figures*.
- v. Very insignificant reserve of oil was found (by default) in a gas development well (#7 Haripur) in 1986. Between 1987-94 about 0.65 million barrels of crude oil was produced. The production has been suspended in 1994 on techno-economic consideration.
- vi. Coal was first discovered in the 1950s (Bogra). Subsequently, Jamalganj (1000 meter below the ground level), Barapukuria (Dinajpur) Khalashpur (Pirganj) was identified as major coal deposits. The total reserve of coal in the country is estimated at about 1.5 billion ton including about 300 million ton at Barapukuria. At Barapukuria, underground mining has been initiated (for production of one million ton per year) several years back but production is yet to start.
- vii. Deposits of peat (approximately 173 million tons throughout the country) occur at shallow depths in different low lying areas of Faridpur (150 million tons), Khulna (10 million tons), Sylhet (13 million tons). Production is yet to start because the techno-economic feasibility study is incomplete for the last three decades.
- viii. Solar and Wind resources are potential renewable energy resources that need to be assessed nationwide. The prospect for harnessing solar energy has not been adequately examined. Nuclear energy development is passing through the phases of debates over the last 35 years.

5.0 Energy Situation

A country's level of development is measured in terms of *per capita energy consumption* (approximately 240 kgoe for Bangladesh in 2000) Indeed, there is a positive correlation between per capita energy consumption and per capita GNP. It means that countries having higher per capita GNP also have higher per capita energy consumption and vice versa. According to the World Bank (WB 1999) in 1996 per capita energy consumption and per capita GNP (1998) of Bangladesh were 197 Kilogram of oil equivalent (kgoe) and US\$ 350 respectively. During corresponding periods per capita energy consumption and per capita GNP of Middle Income Countries were reported as approximately 1800 Kgoe and US\$ 2950 respectively. As Low Income Countries in 1996, per capita energy consumption of some other developing countries of the region were reported as: India (476 kgoe), Nepal (320 kgoe), Pakistan 446 kgoe and Sri Lanka (371 kgoe). Quite obviously from the point of view of energy use Bangladesh is one of the least developed countries of the world. Worse still is that there is no firm statistics on demand, supply and generating capability of power and gas in the country.

In Bangladesh, energy resources are neither adequate nor varied. Biomass, natural gas, petroleum products and hydropower are used to meet the demand of different end-use sectors, such as, domestic, commercial, industrial, transport, agriculture and non-energy use. The basic principle of energy availability is to ensure the supply of appropriate sources of energy to meet the demand of different end use sectors. In a particular situation if supply of energy is less than the demand an insecure situation arises. Energy insecurity may also occur due to lack or purchasing power of the people. An imbalance between demand and supply of energy (usually known as energy insecurity) may take place at different levels (household, individual, community, district or division level or even in regional level such as eastern and western region across river Jamuna in Bangladesh). Energy insecurity may take place at a particular time of day (peak hours in electricity), during certain period of the year (electricity in summer months), for some years (as happened in 1997 and 1998 in Bangladesh). Nevertheless, *energy insecurity* is a multidimensional problem.

Various attributes have been contributing to energy crisis (energy insecurity) in Bangladesh, as follows :

- i. political insensitivity to long-term energy planning ;
- ii. irrational national energy pricing policy ;
- iii. lack of good governance ;
- iv. weak institutional capabilities at planning and implementation levels ;
- v. lack of financial capability and technological capability ; and
- vi. lack or management capabilities.

During the 1980s the nation faced a *power crisis* and consequent *load shedding* hurting public life and industrial activities. The so-called system loss crossed 42 per cent mark in the late eighties. Situation however, improved due to enhanced supply through new installed capacity, but the huge system loss remained a pain in the neck of the government. The first five years in the 1990s did not face serious power supply problems due to addition in generation in the late 1980s. But serious non attention on the subject and inadequate development of power and gas during that period (1991-96) led to severe crisis in the second half of the 1990s. Beneath the apparent political turmoils in the mid nineties, and non-availability of fund for rehabilitation of plants, and transmission components, in particular, the demand for power continued to grow and finally in 1997 it outstrip the supply. The nation was plunged into darkness with frequent and prolonged load shedding and even occasional power disruption. Although donors assistance and financing for some important projects were at hand, clear negligence in undertaking gas well development (for production) and inordinate delay in critical high pressure gas pipeline construction, the supply of gas became acute, even uncertain for a long time.

It transpired that the country needed a clearly defined and doable energy policy (although the *National Energy Policy* was formulated in September 1995) to meet the future demand for power and gas, a firm resolve and a sincere endeavour to carry out that policy.

An *excess of bureaucracy*, coupled with a general *failure among politicians* to grasp the realities and principles of administration in the energy sector has contributed to the making of conditions where public sector reforms, among a host of other things, became critically important. The power sector is one vital area where the *need for reforms* has over the years assumed serious and critical dimensions. That is of course obvious. Witnessing that a country struggling to enter the truly developmental process, Bangladesh has a compelling need to provide energy to a population which, for lack of clear *political leadership*, grows increasingly disillusioned with the government.

The state of things in the power sector reveal that even the very conservative estimates put the system loss in the sector anywhere between 30 to 35 per cent. Add to that the sad truth is that hardly more than 65 per cent of the electricity generated in the country is paid for. The degree to which theft and other corrupt practices pervade the power sector has created conditions where the power sector is in danger of falling apart unless *political commitment* towards a resolution of the problem is brought in. The financial aspects of the losses incurred in the utilities sector makes staggering observations. As much as US\$ 100 million are lost annually. Altogether, power outages and the general weaknesses of the power sector lead to some very dangerous consequences : a total of US\$ 1 billion ⁵¹ is lost in terms of industrial output that is simply not there. The case, therefore, for adequate and all encompassing reforms in the power sector can hardly be overemphasized.

And once the facts are taken into account, the picture which emerge is one *bad management* going into the sector over the years and hitting below the belt of the goal of development. Compounding the problems of management has been the existence of powerful *pressure groups* in the sector. The failure of the management and the labour unions to work out a modus operandi towards a smooth operation of a power sector is yet another telling story. The fact that there has been an absence of *incentives* for good performance. To make a bad situation worse, a woeful lack of accountability has characterized the sector. Most important, the power sector, which in the industrial world is privy to autonomy, in Bangladesh has been constrained by its dependence on *bureaucratic control* leading to a terrible arbitrariness in billing and poor collection. In the very road sense, the performance of the power sector leaves little room for hope that improvement can be expected on a sustained basis.

The reform of the power sector necessitated as much by experience as by prevailing global trends, calls for serious attention in Bangladesh. If good, governance is the underlying principle of politics in this country today, a review of conditions in the power sector is only a logical move.

Bangladesh's consumption of natural gas in 1971 was only 46 million cubic feet per day (MMCFD) and 75 barrels of condensate (extracted as liquid from gas as petrol and diesel). 29 exploratory wells were drilled upto 1968 since 1910 resulting in discovery in 8 wells (success ratio 1: 3.6). In the next phase both PPL and Shell were bought out by the Bangladesh government in 1974. Soon a state owned organization Petrobangla was created, who conducted exploration through Soviet and FRG assistance. Later, BAPEX (Bangladesh Petroleum Exploration company) was created as a separate entity, dedicated to conduct exploration of hydrocarbon only. Having no production function the organisation continued to operate as a *poor cousin* of other operating companies.

In 1974 Petroleum Act was enacted and off-shore oil exploration was awarded to multinational oil companies in 1974 through newly formulated Production-Sharing Contract (PSC). In ten years (by 1981) the consumption of gas rose to 139 MMCFD and 186 barrels/day of condensate. 13 exploratory wells were drilled, of which four (4) turned out to have gas (success ratio 1:3). It is during the third phase (1981-90) the major thrust in the gas sector was made, Chittagong was connected with gas network (through a 24" dia gas pipeline between Bakhrabad and Chittagong) and supply was extended to 59 upazilas in 19 districts (about 12 per cent coverage in terms of upazila). 10 exploratory wells were drilled, out of which in five geological structures gas was discovered, while in one oil was found (success ratio 1:1.6) Gas production rose to 490 MMCFD and condensate 920 barrels/day by 1990. By 1995, gas production reached 800 MMCFD (by Petrobangla's own efforts). By 2000, daily gas consumption rose to an

average of 1000 MMCFD (Ref. Petrobanga MIS report). Reportedly the production capability of Petrobanga (including IOCs facilities) is around 1150 MMCFD in the first quarter of 2001.

By 1990 the total estimated gas reserve from 17 gas fields was approximately 21.35 trillion cubic feet (TCF) with a recoverable reserve of 12.41 TCF (Ref. National Energy Report, September, 1995) and with a cumulative production of about 1.98 TCF during 1960-90 (30 years). Recoverable condensate was estimated at 56.70 million barrels (MMBBL) and cumulative production at 3.2 MMBBL.

Production-Sharing Contracts (PSCs) were awarded in five phases, the first in 1974, followed by in 1981, 1987, 1994-95 and 2000-01. The phase during the early to mid 1990s has resulted in discovery of 4 new gas fields including one in the offshore. The addition in reserve is estimated at 4.45 TCF with 14 exploratory wells (success ratio 1:3.5). Currently, combined Petrobanga and IOCs produces a maximum of 1100 MMCFD from 44 wells distributed in 12 producing fields. Production from 3 fields have been suspended. Nevertheless, the progress in gas consumption in the past 30 years has been quite remarkable. Out of 3030 MW of power on one day, about 2400 MW (over 80%) was gas fed; and the current two million tons of urea produced in the country annually is entirely dependent on natural gas. Apart from multiple impact this has had been on the country's economic growth, the saving gas production has brought about in the country's oil imports, without which it would have been almost four times higher, resulting in serious depletion of foreign exchange reserves.

Related to this issue, there is another important factor namely, the country's sovereign right over its own resources. Since all blocks (including gas-prone as well as discovered) are being placed under internationally *enforceable contracts*, one may question whether at the end of the day the country would at all have any control or even say over the disposal of its only valuable resource. There is another clear possibility emerging out of the current policy. It wouldn't require a geologist to comment that all the 23 blocks are not gas rich, yet the government is *giving away* all the *potential blocks* to foreign oil companies through a peculiar dilatory tactics on the advise of the bureaucrats. On the recommendation of the bureaucracy the government was even about to sign on unusual contract in the name of *marginal fields* (Chatak, for example with about 1.9 TCF of gas discovered in 1959 and suspended production on technical grounds in 1969). Earlier 8 (eight) attractive blocks were allotted in the first half of the 1990s. In the past two years (2000-2001) almost all remaining gas prone blocks have been awarded to foreign operators.

6.0 Critical Issues

- i. Energy sector has been afflicted by *shortages* of gas and electricity ;
- ii. Pressure on increasing *demand for infrastructure* in power and gas and also related services and the *government's inability* to finance ;
- iii. *Concessional loan* such as Official Development Assistance (ODA) from multilateral and bilateral donors is less readily available ;
- iv. Access to electricity is less than 20% of the total population, gas availability to household consumers (cooking) is around 4% and kerosene used for lighting is only about 5% ;
- v. *Consumption* of electricity is low, about 112 kWh per capita in 2000 ;
- vi. Foreign private investors (IOCs and IPPs) are showing great interest in *investment* for hydrocarbon exploration and in generation of power ;
- vii. But the problems in energy supply is *more acute* now than ten years before mainly due to:
 - a. *inefficiency* and *corruption* in all aspects of operations (production, transmission, distribution, billing and collection),
 - b. *inadequate* funding for the operation and maintenance of facilities,
 - c. *insufficient* investments in new facilities,
 - d. *low levels* of commercialization and financial discipline,
 - e. *low tariffs*,
 - f. *excessive* central (government) intervention,
 - g. *insufficient* expertise, and

h. *lack of attention* to financial performance of utilities

7.0 Strategic Choice for the Development Strategy

Two *scenarios* can be considered, as follows:

Business as usual	Sector Reform
<ul style="list-style-type: none"> ● Pursue present policies, without addressing the systemic issues in the sector ● By 2005 both power (Haripur Meghnaghat, Barapukuria, Siddirganj) and gas expansion (in western zone) would ease the situation ● Shortage would develop again after 2006 ● About US\$ 2.8 billion would be required to meet modest investment in gas and power in the short-run (upto 2005). ● Notwithstanding the budgetary support, the Power System is not likely to improve substantially. 	<ul style="list-style-type: none"> ● Power sector reform has already started, their momentum must be increased through: <ul style="list-style-type: none"> ● passage of legislation ● Investment needed for development of gas and power sector would be much lower ● At the core of such a strategy would be far-reaching institutional reforms over a 5 year period (not rush) including unbundling of generation and distribution (transmission has already been unbundled and corporatized as PGCB emphasizing distribution in power sub-sector as the key to success. ● In the Gas sector Petrobangla should be corporatized (like BPC) ● In the interim, energy would be used more efficiently, as losses would be reduced, and tariffs adjusted for both gas and power ● Clearly reform is the only sustainable option, otherwise shortage will continue. Systemic issues of inefficiency, corruption, and mismanagement will be addressed through reforms.

8.0 Reform Needs

A. Gas Sector

It may be a *coincidence* that both the major actors in the field of energy i.e., hydro-carbon exploration and electricity entered into this part of the world (Bangladesh) about ninety years back. While the exploration drilling for oil was begun in 1908, the first law on electricity was enacted in 1910. The earlier law dealt with the rights and obligations of those persons who were licensed under the Act to supply electricity. Almost all licensees were private parties, though later on some municipalities also took up electricity distribution. This Act was amended from time to time and is still force in Bangladesh.

On the other hand, after expiry of almost 50 years of exploration efforts under private companies (with no discovery until 1954) in the early 1960s state corporation called Oil and Gas Development Corporation (OGDC) was created to conduct hydrocarbon exploration and development. In 1974, the First Petroleum Act was enacted, and the first Production Sharing Contract (PSC) was also formulated for initiating oil exploration in the offshore (Bay of Bengal). Later, in 1981, 1987 and in 1999s PSCs were signed with the International Oil Companies (IOCs). In June and July 2001 two more PSCs were signed.

Until a few years ago Petrobangla, the state corporation was the sole player in the gas sector. Since 1994, however, after it entered into a new phase of production sharing contracts (first round bidding) with the IOCs and the production of gas from offshore Sangu (geological) structure and Jalalabad started, a new scenario evolved. Petrobangla *supervises* and *monitors* the activities of the companies, acting simultaneously as their *partner*, the sole purchaser of their potential output, and their *regulator*.

Petrobangla's parent organization the Bangladesh Oil, Gas and Mineral Corporation (BOGMC) was established in 1972. Petrobangla was however created under the Petroleum Act, 1974 as a state corporation in charge of oil/gas exploration and production, marketing of gas. In 1977 the functions relating to petroleum liquids were *unbundled* from Petrobangla to the newly established Bangladesh Petroleum Corporation (BPC). BPC soon become a *Holding Corporation* under the companies law and holds the shares of oil marketing companies and the only oil refinery in Bangladesh.

Petrobangla, being a statutory body of the Government, continued to be governed by a 1985 ordinance under the purview of the Ministry of Energy and Mineral Resources. However, Petrobangla is not *active* operationally. Instead, it conducts its activities through eight operating companies, which it controls on behalf of the Government. The operating companies (OCs), some of which originated with the nationalization of foreign oil companies, are now incorporated under the Companies Act as public limited companies. In principle they are governed by their boards of directors. But the board's powers are *usurped* by both Petrobangla and the Ministry of Energy. The board's decisions are subject to ratification by Petrobangla's board, a major decisions (relating to pricing, operating and development budgets, organizational setup and staffing, and the award of contracts exceeding Tk. 10 (ten) crore subject to Government approval. The directors of the OCs are either also director of Petrobangla or Government officials appointed by the MPEMR. The operations of BPC are subject to lesser torture.

Transactions involving foreign oil companies are conducted through Petrobangla's Petroleum Concession Department (PCD), a specialized unit that also acts as the *regulator and administrator* of these transactions. But the department was kept weak and as such could not perform adequately. Moreover, trained and efficient professionals suited for the purpose were not placed in the PCD for a long time, which jeopardized the activities of the IOCs during the 1990s. The Bangladesh Petroleum Exploration Company Ltd. (BAPEX), incorporated in 1989 is charged with the responsibility of various

exploration phases, but Petrobangla has kept the company's financial position extremely vulnerable and it is not allowed to conduct its business as required. Besides, there are gas production and transmission companies, who act as franchised operating companies and hold exclusive right to development, production and transmission of gas respectively. A national transmission company called Gas Transmission Company Ltd. (GTCL), incorporated in 1993, will eventually be responsible for the high-pressure national trunk system. The other three companies, namely, Wes Gas, Barapukuria coal mining and Maddapara hard rock mining has not come into operation as yet.

As a state corporation holding its equity in the OCs on behalf of the state, Petrobalgla is not required to produce consolidated accounts. In fact, it has become customary to assess the financial condition of each of the eight OCs separately. But because of the web of transaction between OCs, this approach does not yield a full and accurate picture of the Petrobangla Groups condition. In a sense, Petrobangla does not maintain its accounts in accordance with Generally Accepted Accounting Principles (GAAP).

The government, through the Ministry of Power, Energy and Mineral Resources (MPEMR), wholly *owns* and *supervises* the exploration for oil and gas as well as production, transmission and marketing of gas; import of crude oil, refining and distribution of POL products; and generation, transmission and distribution of electricity. The exclusive authority for *policy formulation*, *key appointments* (even transfer of officials), *investment decisions*, and above all *regulatory aspects* of the energy sector rests with the MPEMR. The present framework is institutionally *complex*. Its main feature is that all matters – whether policy, operational, or regulatory – are *ultimately decided* by the Government, and the decisions are often delayed unnecessarily, leading to mismanagement, cost and time over run etc.

B. Power Sector

Water and Power Development Authority (WAPDA) was created in 1958. It was bifurcated and Bangladesh Power Development Board (BPDB) was formed in 1972 and the entire activities relating to generation, transmission and distribution was integrated into the state controlled Board – BPDB. However, the energy sector witnessed that the electricity supply's *change of hands* and the milestones largely unfolded in many dimensions – in the direction of control (ownership) of generation facilities from the private entrepreneurs to the Government in the late 1950s – a vertically integrated monopoly until early 1990 – and then a gradual but slow *unbundling* of the operation to evolving into a new partnership between the public and the private sector in the late 1990s.

As stated above, Bangladesh had integrated operation in the electricity sector. The same entity BPDB was entrusted with generation (100%) transmission (100%) and distribution (36%). But efficiency of the integrated monopoly structure, has been increasingly questioned, more by the donor agencies particularly by the World Bank. Indeed, a reliable power supply is essential for economic development and growth. The power sub-sector, beset by many problems, hampers the country's economy.

The government, through the MPEMR, bears overall responsibility for the power sector institutions, with exclusive control of:

- i. policy formulation
- ii. key appointments, and
- iii. investment decisions

Outside government structure there is no regulatory mechanisms for sector operations. The small office of the *Electrical Inspector* performs some functions under Electricity Act, 1910, but these are limited to safety measures. But the operation of activities such as the recently introduced Independent Power Producers (IPPs) are kept within the purview of BPDB. Through the active and full time assistance of international consultants / funded and provided by the World Bank the Power Cell produced a *belated* sector reform prescription in 1998, similar to the one approved earlier by the government in 1994. The main operating entities in the sub-sector are :

- i. The BPDB, until recently the sole public sector generator. The organization was also responsible for transmission and distribution (except for Dhaka and most of the rural areas)
- ii. Consumer-owned rural cooperative – Palli Buddut Samities (PBSs) under the banner of REB have the mandate to electrify rural areas.
- iii. The Dhaka Electricity Supply Authority (DESA), BPDB, DESA and REB fall under the purview of the MPEMR.

The government established two new institutions in late 1996 under the Companies Act: the Power Grid company of Bangladesh (PGCB) and the Dhaka Electric Supply Company (DESCO). Transmission activities are being gradually transferred to PGCB and DESCO has taken over some distribution activities in metropolitan Dhaka (Mirpur area). On the other hand, 67 PBSs (now) function under the supervisory guidance of REB. The board of directors of each PBS is elected by the member consumers and is responsible for policy formulation. The GM, who acts as the chief executive and operational head, is appointed by the board in consultation with REB. The staff are hired under *employment contracts*, are not *unionized*, and are not covered by the service rules and condition applying to public sector employees. Thus PBSs can recruit, discipline, and terminate staff according to normal business practice.

In the distribution activities, which is the weakest component in the power sub-sector, BPDB have been experimenting with contracting out (since 1996) functions to improve performance in some selected areas, which has shown positive signs.

Although no clear prescription has been given, the BPDB acts as a “single window” for solicitation and evaluation of proposals (international tenders known as Request for Proposal) on the basis of competitive bidding. Initially, because of the Power Cell’s undue interference due to MPEMR’s indulgence there was some confusion about their role in execution of IPP projects, which has been finally removed by the Ministry in 1998. With the easement of situation regarding the execution of IPP projects by the BPDB, negotiations were held, PPA’s were signed and implementation private sector power projects are now being handled by the BPDB and REB respectively.

The conventional, idealized approach to setting tariffs for grid electricity (in some developing countries) is based on an estimation of the long-run-marginal cost (LRMC) of service for different consumer classes, adjusted, for social reasons, and also allowing cross-subsidization among classes and permitting full cost of recovery and financial viability for integrated monopolies. The LRMC concept has historically been kept as a *reference point* in Bangladesh, but never fully applied for practical difficulties.

BPDB’s financial management systems are *rudimentary*. Although annual reports and statements of accounts are produced regularly, they do not comply fully with GAAS. BPDB is heavily subsidized, and if not for frequent Government bailouts, it would probably become financially unviable with about 24,500 employees most of whom desire to work in the highly controversial distribution component. It’s yearly losses have led to huge accumulated deficit. Collections average only around 80% of billings. Accounts receivable are growing by about US\$100 million a year, and no apparent action is being taken to reverse the deteriorating trend. The net result of cascading inefficiency – from inefficient generation to high system and non-technical losses - lead to poor collections. As a result of its *poor financial health*, BPDB investments in its various components have been inadequate. Historically, BPDB has contributed very little of its own resources towards investment as internal cash generation is not sufficient. It is expected that by 2005, when the first and second stages of IPP programme would be accomplished, BPDB/Government would be able to translate the potential benefits into economic gains *mainly* by addressing the distribution issues in a systematic manner. Besides meeting large investment requirements, BPDB would have to increase the efficiency of billing and performance.

DESA’s *financial health* is even worse with over 30% of the electricity is unaccounted for. The high level of losses, costing DESA about US\$ 50-60 million a year in foregone income, is largely due to illegal connections, underreporting of consumption, and pilferage and outright theft. The balance sheet of DESA shows that for all practical purposes it is insolvent; it does not have adequate working capital

and has lost all its equity. DESA's deteriorating financial performance has been particularly detrimental to BPDB, its main creditor. DESA's cumulative debt to BPDB is reportedly about US\$ 700 million (until March 2001)

Today with about 2.9 million consumers (about 58 per cent of total customers under REB/PBS) out of total customers of around 5 (five) million in the country, there is enough evidence that rural electrification programme has had a positive impact. Compared with their counterparts in Dhaka or elsewhere in the country under BPDB/DESA, rural customers receive *less subsidy, pay their bills promptly*, and engage in far less pilferage. They also generally seem to receive the better distribution service and have a greater say in the distributor's operations. However, the rural electrification programme is not without its problems, created in part by:

- i. the overall malaise in the energy sector,
- ii. large investment requirements and poor returns,
- iii. financial difficulties in many PBSs, particularly in the initial years,
- iv. power shortage, and
- v. issues related to the takeover of secondary areas previously supplied by BPDB/DESA.

Expanding rural access to modern energy sources is critical to raising the productive potential of rural people. Access to electricity reduces the cost of energy services.

Thus the inability of the power sector to perform to the standards of efficient utilities stems from the inherent disadvantages of the Governments intervention as *owner, operator, and regulator*. Although the process of corporatization has begun in the power sector since 1996 and some institutions under the companies law have been formed, their activities are not governed by strict and transparent commercial relationships. The poor operational performances has led to a bleak financial situation, with the sector institutions unable to generate the investment finance needed to meet growing demand.

Above all, a Working Committee including representation of professionals in 1993 examined the need to reform. The committee deliberations led to a recommendation, "Power Sector Reforms in Bangladesh", which the cabinet of Ministers endorsed in principle in September 1994.

9.0 Energy Development Options

Energy *development options* in Bangladesh are *very limited*, because:

- The country is *not blessed* with adequate and varied energy resources, both commercial and non-commercial services
- *Over dependence* on biomass fuels (fuel wood, dung etc) has led to environmental pollution
- Geologically *most potential* areas have been explored yet the country's indigenous commercial energy *resource base* is poor (coal mining is yet to start)
- Renewable energy sources like solar and wind power are yet to become *viable option* or even supplement substantially
- The hydro-electric capacity is very *limited*
- The country do not have *large reserve* of natural gas, which is the only commercial energy source available now
- The annual expenditure on oil import (that rose from US \$ 25 million in 1973 to US \$ 500 million in 2000) *overshadows* the overall energy development in the country.

10.0 Short-term Measures

Within the next five to six years all the issues identified in the energy sector cannot be pursued. Therefore, areas deserving priority attention in the short-term have been listed below :

A. Power Sector

i. Alleviating Power Shortages

- Besides under construction combined cycle power plants at Haripur (360 MW) and Meghnaghat (450 MW) through the private sector and 210 MW steam turbine at Siddirganj (under construction), no new power plant should be built in the eastern zone. With the addition of another 100 MW GT, the Banghabari (71 MW) plant may be turned into a (250 MW) combined cycle station. In the western zone atleast 200 MW gas turbines (say 50 MW each at Bogra, Rangpur, Dinajpur and Khulna area) and a large 250 MW combined cycle plant may be considered near Ishurdi, preferably under public sector. The 300 MW first coal fired plant's implementation be carefully pursued.
- National Load Dispatch Centre (NLDC) should be built at the quickest possible time
- All 230/132 kV transmission lines must be handed over to PGCB at Bat the earliest

- Ashuganj power station, Haripur (99 MW), Ghorasal and Raozan power stations be corporatized under the companies law, 1994
- Either DESA itself be corporatized or DESCO type 2 to 3 companies be created to share the distribution of power in Dhaka
- PBS model may be considered for rejuvenating the distribution component under the BPDB both in the urban and rural areas
- Aggressive loss-reduction programme, better load management be vigorously pursued

ii. Limiting Contingent Liabilities

- For all future IPP projects, sovereign guarantee clause be withdrawn (IA be merged with PPA)
- Given the contingent liabilities already in place in the gas and power sectors, it may be prudent to:
 - Pursue policies that foster better financial performance;
 - Develop institutional frameworks for monitoring and disclosing contingent liabilities, and
 - Build the institutional capacities to moderate these risks

iii. Restructuring Institutions

Modest measures have been initiated to unbundle the power sector as a pre-condition for a competitive market. Restructuring effort be accelerated and:

- all transmission lines be handed over to PGCB and all possible assistance be accorded to fully operationalize the company by 2002
- DESA and BPDB distribution activities be corporatized soonest (preferably using PBS model)

iv. Reform Actions

For *reform actions* to succeed, awareness level of the main stakeholders, notably the workers' union, be improved and the difference between the 'privatization' and 'corporatization' be explained through proper advocacies, however citing the example of PGCB and the benefits to individual employee. The government should also formulate labour adjustment programme early on to win support of labourer and protect workers interest. This can be done by:

- informing the workers and unions of the reform process
- ensuring that the workers gain from corporatization (say through share ownership schemes etc.)
- softening the impact of retrenchment through such options as early retirement incentives and also providing support through retraining and redeployment assistance.

B. Gas Sector

V. *Natural Gas accounts for about 72% of commercial energy use in Bangladesh (excluding imported petroleum). A breakdown of demand shows that gas consumption grew rapidly in 1985-97, with an annual growth averaging 9% per annum. The average growth in demand showed down to only 2% in 1995-97 not because of a drop in demand, but because of shortage in supply routing from insufficient investments in the sector. The shortage has been estimated at 15 million cubic feet per day (MMCFD) in 1996-97 and 20 MMCFD in 1997-98, the highest consumption in 1997 was 670 MMCFD. In 2000, the per day demand has grown to 1000 MMCFD and the trend is increasing. However, the gas shortage have been caused by several factors, such as:*

- reservoir management practice have been inadequate
- gas wells have been overproducing, ignoring the reservoir characteristics and petroleum industry practice (Bakhrabad structure is an example)

- surface facilities are poorly maintained
- investments in drilling development wells have been inadequate
- insufficient gas treatment facilities
- pipeline transport capacity have been inadequate
- compressor-booster facilities have not been considered over long distance transmission lines when sustained load on gas pressure encountered.

VI. The future demand supply balance will depend on the ability of the government/Petrobangla to mobilize resources needed to develop the gas sector, be it public or private sector investment. Three policy scenarios, as shown below, may be examined and the one offering optimum benefit be considered for implementation:

Scenario I	Scenario II	Scenario III
<ul style="list-style-type: none"> • Business as usual • No reforms • (shortage reappears in 2006) 	<ul style="list-style-type: none"> • No reforms • Government resources be harnessed • (additional investment will enable increased production capacity – no shortfall beyond 2006) 	<ul style="list-style-type: none"> • Reforms (in real sense) undertaken • Prices are adjusted • Private sector encouraged • No shortfall beyond 2006

- vii. Petrobangla/Government's recent *dubious policy* on PSC, and reducing BAPEX to a rubber stamp indicate a clear disincentive for future exploration effort by own institution.
- viii. *Institutional aspect* of Petrobangla and the subsidiaries (8 companies formed under companies law, 1994) remains unclear. Petrobangla has not yet been corporatized although it behaves like a national oil and gas holding entity. In fact, the Ministry of Energy and Mineral Resources controls and supervises the activities of Petrobangla as if it is a department of the government.
- ix. *Transaction* involving foreign oil companies (in regard to PSC) are conducted by Petrobangla through Petroleum Concession Cell (PCD), a specialized unit, understaffed and poorly managed now.
- x. Petrobangla's *financial condition* is deteriorating continuously due to growing production of IOCs, the government's gas pricing, taxation policies and investment levels. Under the existing practice Petrobangla buys gas from IOCs at a higher price and sells to over 80% of the total consumer (power and fertilizer) at a lower price. Petrobangla pays the state taxes due from the IOCs. Given the tax regime, the Petrobangla group will continue to incur heavy losses under the present framework until the IOCs have recovered their cost (which they *gold plate* during the exploration phase).

11. Priority Issues

The list of issues are given below:

- i. **Institutional Issues.**
- ii. **Power Gas Sector Issues**
- iii. **Sector Issues**

11.1 Institution Issues

- 11.1.1. Redefining The Government's Role
- 11.1.2. Increased Institutional Capacity Building
- 11.1.3. Autonomy, Accountability And Transparency
- 11.1.4. Energy Regulatory Commission (ERC)
- 11.1.1. Redefining the Government's Role

11.1.1.1. For institutions under the MPEMR to function effectively, there is a need to separate *polymaking*, *regulation* and *operations* because the three functions entail different level of responsibility and accountability. At present the Ministry of Energy acts as the *owner*, *operator* and *regulator* of all functions carried out by the organizations administratively placed under them, which deserves changes and amendments in future.

11.1.1.2. Polymaking is clearly a government function because in a democratic system the government is accountable to Parliament. But the Ministry in the name of *supervision* and *monitoring* extends its role much beyond their jurisdiction, which creates undue tension between the government and the autonomous bodies like BPDB, DESA and Petrobangla.

11.1.1.3. Regulation of all activities now conducted by the MPEMR, while experience in other countries shows that it is better to leave the job to a specialized entity operating independent of the industry, in accordance with policy guidelines elaborated by the government. As such operations are best left to the management of corporate entities accountable to their Board of Directors, and the shareholders.

11.1.1.4. BPDB, DESA, REB and PETROBANGLA fall under the (existing) purview of the MPEMR. As a result, all major decisions relating to :

- i. development budget
- ii. organizational change
- iii. senior appointments
- iv. contract award over specific limits, and
- v. tariffs etc., require the Ministry's approval.

Thus, the inability of the energy sector to perform to the standards of efficient utilities stems from the inherent disadvantages of the Government's intervention as *owner* and *regulator*. Although the process of corporatization has begun since 1996, and some new organizations have been created under the companies law, their activities are not yet fully governed by strict and transparent commercial relationships.

11.1.1.5. The poor operational performances of the power and gas sector entities has led to a bleak financial situation, with the sector institutions unable to generate the investment needed to meet the growing demand.

Action 1: Through implementation of reform measures a *level playing field* for both *public* and *private* sector be created so that new investments are attracted for the power sector in particular.

Action 2: In the operational areas adequate incentives be accorded to the employees of the public sector through corporatization so that competition be encouraged both the sectors.

Action 3: The Ministry should concentrate more on policy and investment issues. The proposed Regulatory commission be formed at the earliest.

11.1.2. Increased Institutional Capacity Building

11.1.3.1 *Institutional capacity building* is critical to the success of initiatives in the energy sector of Bangladesh. An important requirement for any reform of the energy sector is that key decision makers clearly understand the modern concepts of the sector reform and their relevance to economic growth. Moreover, professionals involved in regulatory reform activities within the Government must be exposed to the best practices adopted in comparable economics as well as developed nations. In addition, professionals and technicians in the electricity and natural gas sectors need to update their knowledge base and learn about modern technological advances in all aspects of operation (production, transmission and distribution). This will be important in improving their understanding of the relevance of unbundling utilities, and, ultimately will assist Bangladesh in this process for gas and power sectors, in the short, medium and long term.

11.1.3.2 Improving the *enabling environment* involves sector reform. In the energy sector, this entails unbundling the integrated utilities, restructuring their components, and establishing an independent and technically competent regulatory body. Unbundling has been initiated in a modest way. The PGCB has been created and a small portion of the transmission system has already been transferred to it. BPDB and DESA have begun to transfer small pockets of their rural electric networks to REB. The scale is similar in gas transmission. GTCL is operating, but has not been given operational authority for any major gas transmission operations and is still functioning as a subsidiary to Petrobangla (while Petrobangla itself is not a holding company). The restructuring process has begun and the establishment of a more independent regulatory body is being considered (for both gas and power sector), but the pace is slow.

11.1.3.4 Increasing *public support* for developments in the energy sector is critical. The energy sector is essential for macro-economic growth. Private sector interest and, concurrently, FDI in the natural gas sector increased dramatically in the 1990s when the country was divided into 23 exploration blocks. This exploration, under PSC has led to a number of successful, and apparently large, discoveries (Bibiyana) in the on-shore and in the off shore (Sangu), triggering optimism about the possibility of large gas reserves. To build on this momentum, it is generally argued that Bangladesh needs to implement a more aggressive and attractive development agenda in order to maintain the flow of FDI.

Action 1 : The strategic objective of improving performance in Bangladesh's energy sector must be pursued, keeping in mind that they are highly integrated and mutually reinforcing.

Action 2 : The reform measures agreed upon in 1994, must be activated and implemented as agreed earlier by the government.

Action 3 : Some exploration blocks should be set aside for Bapex undertaking.

11.1.3 Autonomy, Accountability And Transparency

11.1.3.1. As stated earlier, the Government through the Ministry of Power, Energy and Mineral Resources (MPEMR), bears overall responsibility for the energy sector institutions, with exclusive control of policy formulation, key appointments. Outside the government structure, there is no regulatory mechanisms for sector operations in Bangladesh. The miniscule office of the Electric Inspector performs some insignificant technical functions under Electricity Act, 1910 (partly amended),

but these are limited to safety measures and the control of activities outside those of the government operating entities.

11.1.3.2. Since 1996 the Ministry is being assisted by an outfit called the Power Cell created to advance sector reforms and assist in tariff formulation in the power sector. This set-up, as a development project, has remained a World Bank consultant driven unit. Therefore, whatever work has been performed and is being carried out through the Power cell has been looked at with an eye of suspicion by the major utilities and more importantly did not reflect the owner's views. The reform proposal, tariff prescription (on LRMC basis) and regulatory frameworks prepared by foreign consultants seriously lacked the views and opinions of BPDB/DESA. Yet, the government has created a similar unit called Hydrocarbon Unit to act as a technical arm of the MPEMR and conduct policy business in the oil and gas sector with the assistance of some foreign consultants.

11.1.3.3. The main operating entities in the sector are:

- The MPEMR is also the *owner, controller, supervisor* of all organizations under the Ministry.
- The BPDB, until recently, the sole public generator, has also been responsible for transmission and distribution (except for DESA area and most of the rural areas) for generation and transmission planning.
- Consumer owned rural cooperatives-Palli Biddut Samities (PBS) mandate is to reach electricity to rural areas, under the direction of REB.
- The DESA supplies electricity to greater Dhaka (gradually being unloaded to REB/PBS)
- Petrobangla acts as a regulator, sole buyer of gas from the IOCs. It supervises and monitors the PSCs implemented by the IOCs.
- Bangladesh Petroleum Corporation (BPC), as a Holding corporation, acts as a regulator of the only oil refinery and three marketing companies. These operating companies as well as the BPC has been corporatized and is functioning well.

11.1.3.4. BPDB distributes the electricity it generates directly to retail and bulk consumers, which accounts for almost 34 per cent of its sales, and REB, is expected to account for about 24 per cent (with the transfer of about 12 per cent from BPDB/DESA). DESA would continue to provide electricity to Dhaka area, which would be reduced to about 42 per cent of the total generation in the country. BPDB employs a staff of about 25,000 and is run by a highly *insulated board*. DESA has a similar management structure and a staff of about 5000. The 67 PBSs are each responsible for supplying electricity in their designated areas. The board of director of each PBS is elected by the member consumers and is responsible for policy formulations at the behest of REB. The REB is managed by a board, and is responsible for planning all rural electrification, including establishing new PBSs, indentifying areas to be served, constructing the new networks, which are transferred to the PBSs against a loan. REB then provides financial and engineering services for the rural electrification programme and supervises and regulates the operations of the PBSs.

Action 1: Modest measures have been initiated to *unbundle* the power sector as a pre-condition for a competitive market. Restructuring effort be accelerated and,

- i. generation and distribution of BPDB be *unbundled*.
- ii. all transmission lines be *handed over* to the corporatized PGCB and all possible assistance be accorded to the organization to fully operationalize the company by 2002.
- iii. DESA and BPDB distribution activities be *corporatized* soonest, preferably using PBS model; and
- iiii. generation activities under BPDB be corporatized.

Action 2: For reform actions to succeed, awareness level of the main stakeholders, notably the workers union, be improved and the difference between the privatization and corporatization be

explained through proper advocacies, however citing the example of PGCB and the benefits to individual employees. (PGCB with modest *wheeling charge* and very limited operation has entered into the domain of profit in about four years). The reform action can be better implemented faster by :

- i. informing the workers unions of the benefit of reform process;
- ii. ensuring that the workers gain from corporatization;
- iii. softening the impact of retrenchment through such options as early retirement incentives and also providing support through retraining and redeployment assistance.

Action 3: For institutions to *function* effectively, there is a need to *separate* policymaking, regulation, and operations because the three functions entail different levels of responsibility and accountability. *Policy making* is clearly a government function because it is accountable to Parliament. *Regulation* is best left to a specialized entity operating independent of the industry, in accordance with policy guidelines elaborated by the government. *Operations* are best left to the management of the corporate entities (companies) accountable to the Board of Directors, and the shareholders.

Action 4: The role of MPEMR be redefined in pursuance to Action 3, stated above.

11.1.4 Energy Regulatory Commission (ERC)

11.1.4.1. The existing Petroleum Act, 1974 Electricity Act, 1910 respectively provide for a role of the government as owner, operator and regulator. The guidelines with respect to sector entities performance standards and service codes are at times vague. This is particularly true in case of electricity more so when private sector operation has come into reality. The regulatory tasks may include, among others, the following :

- *framing of rules* and codes of practice for operation and maintenance ;
- establishing *performance standards* and uniform system of accounting;
- approving *tariff* and *regulatory procedures* for enforcing bill collection from both the public and private sector ;
- ensuring enforcement of *industry standards*, public safety, as well as demand management ;
- issuing exclusive *service franchises* to the distribution companies, either public or private, and license to private generators ; and
- *arbitrating* and conducting inter-ministerial coordination regarding BPDB, REB, and DESA and other affiliated organs or the power sector and the private sector operators (equally applicable in case of gas sector).

11.1.4.2. It is important to emphasize that regulators are entrusted not with policy formulation but with the application of laws, rules and regulation that set out its mandate. A regulator usually issues and enforces licenses and concessions, sets prices when there is no competition, monitors financial viability of operators, sets service standard and monitors compliance, and provides information and advice to the ministry.

11.1.4.3. A related issue is the degree or discretion in the regulatory system.

Action 1 : To be effective, a regulator must have a degree of independence.

Action 2 : The regulator be provided with a distinct *legal mandate*, free of ministerial control. They may be appointed for fixed terms and be protected from arbitrary removal.

Action 3 : Regulatory Commission must be made *accountable* to ensure that they do not stray from their mandate, engage in corrupt practices, or become grossly inefficient.

Action 4 : Striking the *proper balance* between independence and accountability is difficult but adoption of following measures would be useful :

- mandating rigorous transparency including open decision making and publication of the decisions and their rationale
- prohibiting conflict of interest
- providing effective arrangement for appealing the commissions decision
- providing for scrutinizing or the commission's budget
- subjecting regulator's conduct and efficiency to scrutiny by by external auditors or other public watchdogs.

11.2. Power Sector Issues

11.2.1. Governance And Management

11.2.2. Shortages in Generation, Transmission and Distribution

11.2.3. Losses and Inefficiencies

11.2.4. Inadequate Investment and Poor Power System

11.2.5. Operational Constraints

11.2.6 Demand-Side Management

11.2.7. Insufficient coverage under Rural Electrification

11.2.8. Distortions in Tariff Setting

11.2.9. Sub-Regional Energy Cooperation Initiatives

11.2.10. Independent Power Producers (IPPs)

11.2.11. Reform Measures

11.2.2. In the electricity sub-sector, several concrete *policy steps* have been taken, albeit slowly :

- Through the creation of Rural Electrification Board, unbundling of the integrated BPDB took place for the first time in 1977;
- In 1990, the initial step was taken to formally unbundle a part of BPDB's distribution through the creation of the Dhaka Electric Supply Authority (DESA) as a separate distribution authority for Dhaka in 1991 recognizing that Dhaka alone accounts for over 50 percent or electricity demand
- The Power Grid Company of Bangladesh (PGCB) was created in 1996 and incorporated under the companies Act or 1994. Although a public limited company, this new structure gives the PGCB much grater control to provide incentives and manage its affairs in a company rather than a government entity; and
- Dhaka Electric Supply Company (DESCo) was also created in late 1996 and incorporated under the companies Act, like PGCB. DESCo took control or distribution assets at Mirpur area of Dhaka in 1998. It is gradually overcoming the initial teething problem. In about less than four years it has reduced the system loss from 42 percent to around 30 per cent.

Action 1 : Seperate policy, regulatory, and commercial functions

Action 2 : Decide the optimal number of generation companies and how these should be grouped. Corporatize them in phase

Action 3 : Corporatize Distribution Component of BPDB

Action 4 : Formulate Rules for Power Dispatch

11.2.2. Shortages in Generation, Transmission and Distribution

11.2.2.1. Bangladesh's economic development has been held back by energy shortages for much of the past decade. The scale of shortages has increased as demand continues to outstrip supply, and power cuts are long and frequent. In the fiscal year to June 1998 the main electricity producer, Bangladesh Power Development Board (BPDB), provided uninterrupted supply on only 55 days. Power plants often lacked enough gas to operate at full load and most of the time upto 25 per cent of peak electricity demand remains unserved. Gas users are accustomed to sharp falls in pressure during peak hours, and gas shortages in fiscal year 1997 was consequent shortages of electric supply^{6]}, at times very acute and unreliable, has constrained economic growth. Demand for access to power which is one of the most popular concerns in the rural area, indicates its overall benefits. The initial uses of electricity for basic *lighting, irrigation* and *clean water* make such vast differences for health, education and work that even people at the margins of survival are willing to spend a significant part of their income on electricity. However, the *connectivity* of electricity in all areas in a country such as Bangladesh with the national electric grid system at times becomes *cost prohibitive* or poses severe technical difficulties. Therefore, alternative sources of electricity may need to be supplied to isolated rural homes and/or to very remote areas. However, the issue of availability must also coincide with the *affordability*.

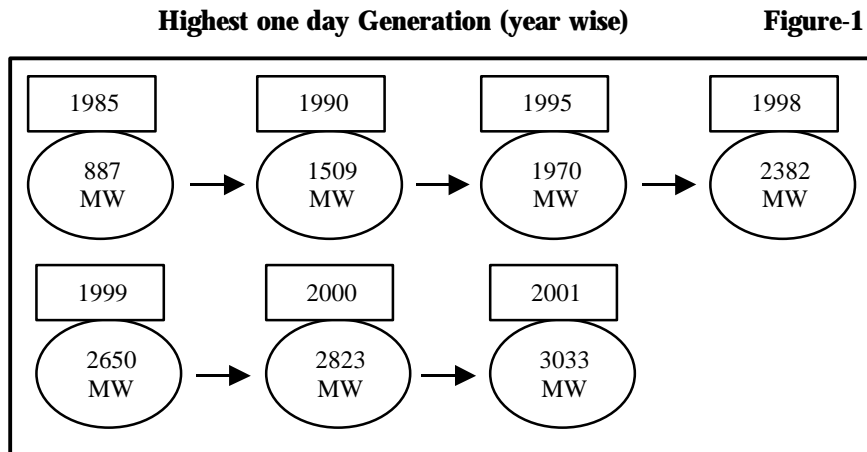
6] During FY 1999, load shedding ranging from 16 to 700 MW, for a total duration of about 1600 hours

11.2.2.2. Despite increase in generation over the years, the development of transmission lines fell far short of demand. The Power System in Bangladesh is characterized by sharp differences between the eastern side, where natural gas is available, and the less developed western side which depends on imported liquid fuels. The share of power plants located on the two sides are approximately 81 per cent and 19 per cent respectively between the east and the west. However, the two sides are linked by a 230 kV *East West Interconnector* built in 1982 that transports *surplus power* from east to the west zone. A second interconnection through a 132 kV double circuit line has been completed in 1998 aligned along the *Bangabondhu Bridge*. The bridge also provides a 30" dia natural gas pipeline. This will enhance more balanced generation of electricity in the country in future and substantially reduce large high voltage transmission losses.

The transmission system consists of high voltage 230 kV and 132 kV grid lines covering the main load centres in the country, however the integrated transmission and the distribution networks are inadequate. The *system control centre* is inefficient, inadequate and is based on low technology for a system of the size and complexity of the Bangladesh's network. Erected in the 1980s LDC at Siddhirganj cannot cope even now, which will aggravate when IPP generating units, particularly Haripur (360 MW) and Meghnaghat (450 MW), Barapukuria 250 MW and Baghabari 250 MW etc. will come into full operation by 2005.

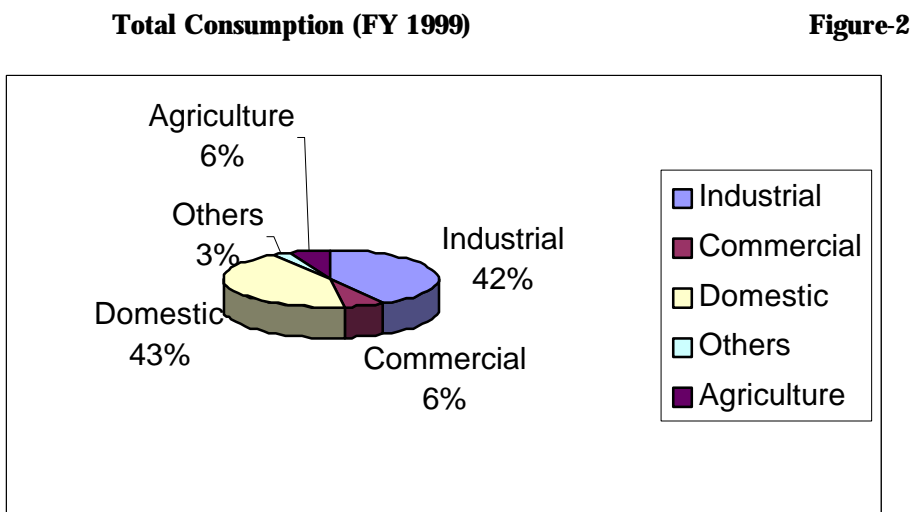
11.2.2.4. The inability of the generation plants to meet the country's *suppressed demand* has been a persistent issue over the past decade. In 1999, a maximum generation of 2650 MW was achieved in October 1999, which met the peak demand of one day or one week, but this did not continue on a sustained basis. In the summer of 2000 the average demand for a sustained period grew to about 2800 MW, which could have turned the supply-demand scenario more precarious if the *crisis management* programme in generation through the Independent Power Producers (IPP) under the Private Sector Power Policy, October, 1996 was not materialised within a record time, some critical power plants were not rehabilitated and evacuation facilities (transmission line) from Raozan (Chittagong) generation was not implemented. Another very important decision was to locate two IPP—plants in the Western Zone (Khulna and Baghabari) instead of installing them all in the eastern zone or the river Jamuna. Due to continued effort in the IPPs, the government was able to generate more power in the country in July 2001, yet the power shortages and load-shedding continued. The installed capacity increased to 4005 MW in June 2001 from 2908 MW in 1996 (72.60 per cent increase in about five years). In 2000 the generation in the Eastern and Western Zone was 15,630 and 648 GWh respectively. Through the interconnection 2482 GWh was transferred to serve the need of the Western Zone.

11.2.2.5 The *generation capability* increased from 2105 MW in 1996 to 3033 MW in 2001, (about 69 per cent increase in the same period). Yet the demand-supply gap remained precarious. The supply shortfall, since early 1990s, increased substantially during FY 1997 to 1999, when maximum unserved demand reached the highest ever level of 700 MW. Three of the BPDB's main base-load plant complexes (Ghorasal, Ashuganj and Raozan's combined capacity of about 2090 MW or about 62 per cent of the total public sector installed capacity) have been affected at different times by gas shortages. Besides low plant availability and capacity constraints, the generation system also faces operating efficiency problems. The bulk of the system base-load plant generation thus remains unpredictable. Figure-1 below shows highest one day generation :

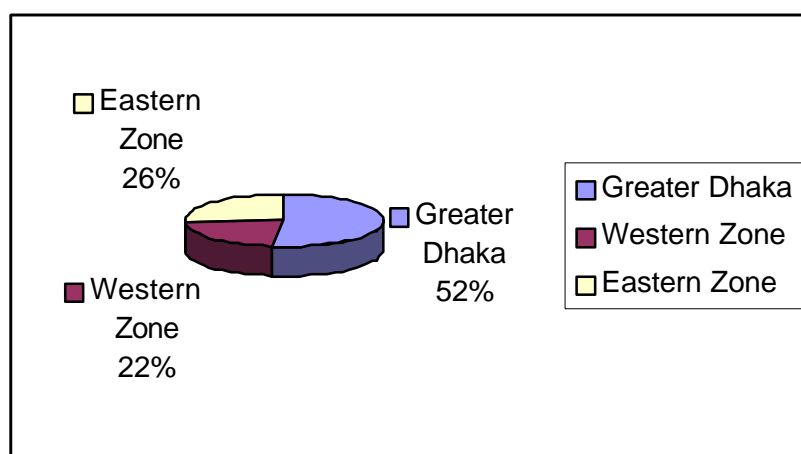


11.2.2.6. Furthermore, because of varied sources of supply, the production systems of the BPDB generators tend to be different, which aggravates coordination problems. The *Relay Co-ordination System* is one of the weakest links in the high voltage transmission area.

11.2.2.7. Bangladesh's electricity *distribution systems* are characterized by a substantial lack of investment, particularly in areas of growing load concentration. Existing networks are unable to meet the growing load demand. The consumption of electricity has been increasing at an average annual rate of 8.5 per cent in the past decade. Growth has been particularly rapid in the residential sector (14 per cent), less so in the industrial and commercial sectors. Figure-2 shows consumption of electricity by various sectors :



The consumption of electricity is, however, *highly skewed* geographically. The greater Dhaka accounted for about 52 per cent of the electricity sales, while the entire region west of the river Jamuna accounts for only 22 percent and the eastern zone having 26 percent of total sales.



11.2.2.8 The distribution system continues to be the *weakest link* which also affects the quality of supply to the consumers. However, any attempt to improve the distribution remains constrained by lack of availability of funds from external sources as well as insufficient inflow of private investment into this area. This gap in financing the upgradation of the distribution system is severely affecting the quality of supply to consumers. Although the existing distribution systems have grown from a small disjointed networks, the Rural Electrification Board (REB)/Palli Biddut Samities (PBS) distribution network remains a *distinct departure* from the BPDB/DESA system, because of the flexibility and advantages enjoyed by the USAID influenced model of the REB/PBS. Historically, distribution expansion under BPDB and DESA has been carried out on an *ad hoc* basis, to meet the immediate demands of the system. The typical Eastern and Western distribution projects of BPDB, for example, reflect the dictates of political expediency more than as a response to the technical and other genuine constraints of the system. The ad hoc network expansion along with the improper size and location of distribution transformers, resulted in frequent failures of distribution lines which disrupted the supply of electricity. Again the share of low-tension (LT) lines in the distribution network has been increasingly going up due to the *disproportionate expansion* of the rural electrification network. In fact, because of the availability of fund from external sources (at a much lower interest rate than the standard interest rate offered by the government to BPDB/DESA), the REB expansion continues unabated without taking much account of the overall supply of electricity from the mother organization i.e. BPDB.

Action 1: Serious effort must be made to reduce the existing imbalance in generation between the two zones (East and West). In the next 5-years, more power plants be installed on a priority basis, in a decentralized manner (in Khulna, Bogra, Baghabari, Rangpur, Dinajpur and Rajshahi), in the Western Zone. All new projects approved at the *flag end* of the past political government should be reviewed and some of them be relocated to places across the river Jamuna in the proportion 80:20 for the West Zone. Sites and infrastructure for construction of power plants are available in all the proposed sites. Majority of the new plants be preferably *combined cycle* as gas and other facilities are available.

Action 2: A new 230 kV transmission line be built in the Western Zone (between Khulna and Dinajpur via Ishwardi) on a priority basis so that all new and old plants are connected under the proposed grid-line.

Action 3: To fully operationalize the Power Grid Company of Bangladesh (PGCB) all existing transmission lines under BPDB and DESA be handed over to PGCB.

Action 4: The Power System Master Plan (PSMP) should be *reviewed and updated*, commensurate with the Policy Statement 2000 of the Government.

PSMP Reference Forecast

Table-1

Year	Max. Deman (MW)	Gross Energy Generation (GWh)
------	-----------------	-------------------------------

2000	3,149	16,500
2005	4,597	24,000
2010	6,779	35,000
2015	9,906	52,000
2020*	15,000	-

Source: BPDB, 1995

* Power Policy Statement of GOB, 2000

Action 5: The present thinking of the government is to allow the IPPs to generate a total of 1750 MW by 2005. The existing ratio is 77:23 for the government. If the generation capacity of the IPPs increase to 1750 MW by 2005, the most likely scenario would be that the ratio will become about 38 per cent for the IPPs, which must not be allowed to happen. The planned addition of 1065 MW (including 450 MW at Meghnaghat and additional 125 MW at Haripur (to turn the plant into combined cycle) must be reviewed on a priority basis. The ratio between the Government and the IPP units must not cross 70:30 at the most by 2005. Thereafter, in the next five years the ratio must go down to 75:25.

Action 6: The process of *corporatization* of the major generation units (such as Ashuganj, Ghorasal and Raozan) should be implemented in phases so as to bring in competition among different generating units.

Action 7: The process of *decentralization* and corporatization of distribution activities under BPDB and DESA be expedited. Among others, the REB cooperative model (PBS) may also be examined for adoption under BPDB and DESA. However, corporatization is a must.

Action 8: The construction of the National *Load Dispatch Centre* (NLDC) be expedited to effectively and efficiently allow the *economic dispatch* particularly, after the major IPPs are commissioned.

Action 9: The *Relay Coordination* system between the generating units and the high tension transmission lines be thoroughly examined, and improvements effected upon.

Action 10: A clear *retirement plan* for old, outmoded and very inefficient plants be prepared and accordingly plants be retired.

Action 11: Compulsory provision of Reserve Margin to the tune of about 15 per cent must be ensured by 2005.

11.2.3. Losses and Inefficiencies

11.2.3.1. High system losses have been serious and continuing problem for BPDB and DESA in particular. During 1986 to 1992 total system loss varied between 42.52 and 34.01 percent. An emergency plan was undertaken and the loss was reduced to 35 per cent in FY 1996.

System Loss prior to Creation of DESA

Table-2

Year	% of Gross Generation (Gross)	% of Net Generation (Net)
1986-87	37.62	32.51
1987-88	42.23	36.20
1988-89	34.01	28.42
1989-90	39.14	33.59
1990-91	41.11	35.62

System Loss after creation of DESA

Table-3

Year	PDB	DESA	REB	National	
				Gross (Incl. Stn. use)	Net (Excl. Stn. use)

1991-92	32.30	35.24	16.19	42.52	36.89
1994-95	22.54	32.01	15.12	35.83	29.91
1996-97	20.33	27.67	17.13	34.04	28.85

As percentage of gross generation, the average plant auxiliary consumption levels in BPDB's power stations increased gradually from 4.3 percent in 1981 to 5.5 per cent in 1996. However, auxiliary consumption is not only station use but also use in offices and residential colonies of the power station staff. Transmission and distribution losses alone, on the other hand, increased from 30.7 per cent to as high as 36.9 per cent in FY 1992 and dropped to 32.1 per cent in 1993. Overall losses in percentage of generation, excluding station use, was about 16.96 per cent and including station use was 21.60 per cent in FY 1996 in BPDB, excluding DESA and REB. It has been observed that the overall system loss, both in gross and net terms, has increased after creation of DESA as may be seen from Table-2 and 3. DESA's system loss, which consumes more than 50 per cent of the total amount generated, distorts the system loss scenario of the country. On the other hand REB's system loss of 17.13 per cent (for consumption of 12 per cent of total generation) on distribution alone cannot be taken as an encouraging number. By end 1990s the system loss of BPDB came down to 25 per cent and DESA's system loss is over 30 per cent while REB's loss fluctuated between 15.5 to 17.5 per cent.

11.2.3.2. Technical losses in the distribution system are high due to, in part, to inadequate investment in distribution facilities in relation to investment in generation and transmission. Investment in the former had not kept pace with rapidly increasing demand, resulting in overloading of distribution network. Losses in BPDB's transmission varies between 4.5 to 5 per cent (230 kV and 132 kV lines), while in DESA the transmission losses are much higher (132 kV transmission line). REB purchases electricity from BPDB/DESA at 33 kV lines.

11.2.3.3. The non-technical losses are essentially theft and pilferage.

Action 1: DESA's *system loss* of over 30 per cent distorts the national loss scenario which must be reduced substantially particularly the non-technical losses.

Action 2: The *export-import* figure between the PDB and the DESA must be reconciled. For instance when BPDB exports through its Load-dispatch Centre (LDC) at Siddirganj 1000 MW, DESA receives only 900 MW at their Hatirpool receiving point. In the process 100 MW is not accounted for.

Action 3: The rest of DESA's distribution component should be corporatized (like DESCO). DESCO's teething problem has gradually been reduced, although it had some set back in the late 1990s and in early 2000.

Action 4: Both BPDB and DESA distribution system should be computerized, billing and collection procedures be improved. BPDB's distribution should be decentralized and corporatized at the earliest.

Action 5: Adequate, proper upkeep and routine maintenance and distribution facilities must be ensured.

11.2.4. Inadequate Investment and Poor Power System

11.2.4.1. Financing problems have consistently plagued Bangladesh's power infrastructure development. Public investments and state ownership had been the traditional means to meet power needs in this country. The gradual expansion in power capacity was related to ambitious *social goals*, particularly relating to rural electrification and low cost electricity supply to common people as well as to meet development goals which needed cheap and adequate power supply. State controlled organizations such as BPDB continued to receive soft loans or bilateral suppliers credits for generation of new capacity from various multilateral and bilateral donors. Such aid was suspended since early 1990 largely on account of the failure of the PDB to carry out its commitments to reform the power sector (also failed to reduce the system loss, theft and pilferage). This suspension of donor financing for power

generation, during the 1990s compounded the crisis of efficiency in the power sector, which had been germinating since the 1980s.

11.2.4.2. According to the Power System Master Plan (PSMP), 1995, an investment requirement of US\$ 6.6 billion has been envisaged for the period upto 2010. This is a huge investment indeed. The government realises that such a large investment during the decade, far exceed the capability of the public sector even if it is heavily supplemented by the external assistance. The two major multilateral donor, provided around US \$ 1.5 billion since the beginning of Bangladesh, 80 per cent of which was allocated to BPDB. Kfw, OECF, Russian Federation (former Soviet Russia), Peoples Republic of China, USAID, IDB, SFD, SIDA etc. provided soft loans, grants and technical assistance. But the World Bank appear to have had taken a non-appreciative approach towards financing the power sector during the 1990s and they now much prefer to provide advices and their selected consultants rather than funds. One of their offer in the late 1990s for US\$ 600 million loan in 10 years under the Adaptable Programme Loan (APL) was not acceptable to the Government for its peculiar conditionalities. ADB'S current financing programme mostly aims at improving the distribution component. It appears that the combined effort of donor's may provide some 1.5 to 2 billion US dollars in the next 10 years. Much of the balance would have to come from private investment and from internal cash generation of the utilities/government.

11.2.4.3. The Power sector in Bangladesh is facing the pressure of increasing demand for infrastructure and related services and the government's financial capacity to meet this has correspondingly, weakened. Concessional loan from bilateral donors is lees readily available today but is now being diverted from investments in particular sectors of the infrastructure to other sectors of the economy. Thus the claims on official development assistance (ODA) for infrastructure finance have become much more competitive than in the previous decades.

11.2.4.4. Access to electricity coverage in the country, which is one of the lowest in the world, today stands at less than 20 per cent ⁶⁾ of the total population. Consumption of power is also low, only about 112 kWh per capita per annum in 2000. Compared to India's per capita consumption of around 360 kWh, some donor's view is that the figure on per capita use in Bangladesh is barely 100 kWh,⁷⁾ which reflects a very low level of economic development ⁸⁾ This has lead to shortage of electric supply, at times very acute and unreliable, and has constrained economic growth. Demand for access to power, which is one of the most popular concerns in the rural area, indicates its overall benefits.

6) Power Policy statement of the Government in January, 2000
7) Asian Development Bank, RPP: BAN 28025, November, 1999
8) Electric Utilities Data Book, ADB, 1997.

11.2.4.5. On going public sector projects (such as Siddirganj 210 MW project) are needed to be accomplished, but future public sector investment appear to be very limited. Even if funds are available, most new generation should be located in the western zone for balancing the overall generation situation.

Action 1: To enhance the potential demand to about 4600 MW (24,000 GWh) by 2005, an increase of about 7000 GWh, and commensurate transmission/distribution would require an investment of about US \$ 2.0 to 2.8 billion. At the same time IPPs participation should be limited to another 550 MW (assuming an installed capacity of about 1150 MW by IPP until 2003). Additional funds must be found from the public sector/government.

Action 2: REB/PBSs be encouraged to gradually plan for installing more small generating units (10-12 MW in each PBS) through the IPPs, for which the payment of bills would be in taka. The idea is to make REB/PBSs self sufficient in generation and distribution. That way about 600-700 MW new generating capacity will be built by 2006, which will reduce the burden of BPDB.

Action 3: There is a large backlog of investment in the power sector, and investment needs are substantial. To achieve the target of move than US\$ 400 million a year would require significant improvement in the sector's implementation capacity. In the absence or a credible sector reform programme, fund expected from foreign donors is unlikely to materialize. Second, the current plans

include several projects where economic viability has not been established adequately. Keeping the present financial situation of BPDB, some of the *proposed* generating plants should be relocated to the western zone.

Action 4: The biggest difference in the scenarios would show up in their financial impact, mainly due to *reform* measure as under :

**Comparison of Financial Impact on Scenarios
(in US\$ billion)** **Table 4**

Funding	Scenario (I)	Scenario (II)	Scenario (III)
	Suppliers Credit etc. (No reforms)	GOB/Multilateral Loan (No reforms)	Private/IPP (Reforms)
Power Sector Entities	2.8*	2.5**	2.0***

Source: Energy Sector Note, the World Bank, 1998

- * Under scenario-1, despite the injection of nearly 2.5 billion US \$ to the sector, power shortages will hurt the economy more than they do at present, except for the period 2003-04, if no sector reform is encouraged. Economic growth will be constrained and the balance of payments will deteriorate due to the additional imports of private generators.
- ** Under Scenario-2, the demands on the Government budget will be unsustainable because private investments and multilateral lending will dry up in the absence of sector reforms.
- *** Under scenario-3, the situation is expected to improve, for it would relieve the government of the burden of the electricity sector losses due to implementation of reform measures. This will attract further FDI in generation.

Action 5: The PBSs are financed by REB, which in turn receives subsidized loans from the Government (3 per interest rate as against normal on-lending interest rate of 9-10 per cent to BPDB/DESA). This policy should continue, even expand for the better interest of rural electrification.

Action 6: For the next five years, 80 per cent of the total investment in generation should be in the western zone as natural gas has already reached there. This will also assist balancing the generation gap between the two zones.

Action 7: Only IPPs on which negotiation have been concluded and PPA/IA initialed may come into operation. Some new generation projects such as Barapukuria 250 MW(CT), Baghabari (additional) 180 MW(CC), Haripur 109 MW(CC) under the public sector may be implemented in the next five years upto FY 2005. Transmission and distribution investments may continue, but at a reduce level. Instead of a second (450 MW) combined cycle plant (IPP) at Meghnaghat, the location may be shifted to the western zone.

11.2.5 Operational Constraints

11.2.5.1. *Generation shortfall and load shedding* continues to hurt the sector. Present installed capacity is 4005 MW (including the IPP generation of 685 MW upto June 2001). The actual *combined generating capability* (average) of BPDB/IPP is only around 2850 MW in 2001 although one day highest generation of 3033 MW has been achieved in July, 2001 (Ref: Fig 1).

11.2.5.2. Due to delay in maintenance etc., and in many cases lack of rehabilitation and maintenance and derating of some old generating plants, the available generation (from BPDB Plants) is much lower than nameplate capacity (3320 MW) i.e. only around 2350 MW (about 70%). Consequently, there is a

continued generation shortfall. During 1996, for instance, load shedding range was between 20 to 674 MW. In FY 1997 highest one day load shedding was 700 MW.

11.2.5.3. The distribution of the load-shedding is not even throughout the country, rather the major brunt is borne by the rural people. Erratic power supply has tended to increase the unwillingness of some customers to pay bills, which in turn aggravate the already shortages of fund for maintenance, worsening the situation.

11.2.5.4. Transmission lines are necessary for transferring electricity from the power plants to the load centres and various consuming points. The reliability and feasibility of transmission system (lines and substation) is very important for ensuring uninterrupted power supply. Unfortunately, adequate transmission links are not available throughout the country.

Action 1: *Load management* must be ensured.

Action 2: *System loss*, particularly *non-technical loss*, must be reduced substantially.

Action 3: For upkeep and *maintenance* of old plants and transmission lines, BPDB must improve its revenue collection and allocate funds. Government also should provide budget allocations for the same purpose.

Action 4: To ensure *economic dispatch*, as a standard practice in the power system, the proposed National Load Dispatch Centre (NLDC) should be constructed on a priority basis (funds are likely to come from Japanese assistance after a long delay of six years by the World Bank).

11.2.6. Demand – Side Management

11.2.6.1. The characteristic of demand of electricity in Bangladesh is such that evening peak is very sharp and for several hours the demand goes as high as 20 per cent in some seasons of the year. In order to improve the performance of the system, reduce investment and rationalize the energy use, there is a need to undertake some measures for *load management* and conservation of energy. These are known as *Demand Side Management* (DSM), which is an established and effective tool. Even electricity surplus nation like USA follow these practices, but in Bangladesh it is not. The ultimate objective is to ensure optimum use of generation by load shifting, peak shaving and valley filling or the load curve.

Action 1 : Use of power factor improvements in plants are to be made mandatory for all consumers in both low (LT) high tension (HT) industries, bulk commercial consumers and irrigation pumps.

Action 2 : High efficiency appliances like fluorescent lamps with efficient ballast, electronic regulators for fans and high efficiency electric motors should be used.

Action 3 : Replacement of existing appliances with more efficient ones shall have to be encouraged.

11.2.7. Insufficient coverage under Rural Electrification

11.2.7.1. Only about 13.6 percent (in 2.9 million households) of the total rural population of Bangladesh has access to electricity. While the benefits of rural electrification have been demonstrated (higher income, improved status for women and children, better irrigation system), the challenge remains formidable.

11.2.7.2. At the current electrification rate (200,000 new connections a year), a population growth of 1.5 per cent, a 50 per cent access would be difficult to achieve. Even if the rate of electrification were

doubled to 400,000 a year, only half of the population will have access to electricity by 2020 (this contradicts the forecast of Power Policy Statement, 2000).

Action 1: Improving the financial viability of PBSs.

Action 2: Attaining higher loads is critical to the success of the rural electrification programme. The coordination of rural development efforts should be improved by developing link with local government and rural development organizations. This would result in a higher electricity offtake.

Action 3: Future investment in rural electrification should be on economic consideration, and not on emotion.

Action 4: There is a general lack of matching growth in generation and transmission in the country. Keeping that in mind future electrification be undertaken.

Action 5: REB should aim at self sufficiency in generation in the context of the present effort of installing 10-12 MW generating capacity (local IPPs) in each PBS.

Action 6: Non-grid isolated generation may concentrate on Small Solar Systems (SHS), PV cells, Wind Power etc.

11.2.8. Distortions in Tariff Setting

11.2.8.1. At present, tariffs are inadequate related to economic and financial criteria. BPDB is financially burdened with the cost of providing subsidized electricity supply to DESA and REB, and also to higher income group customers.

11.2.8.2. Gas and Power Tariff is not priced at a level equivalent to Long Run Marginal Cost (LRMC), rather the present tariff is much lower. LRMC is the cost of meeting an increase in consumption, sustained indefinitely into the future, when needed capacity adjustments are possible. Between 1994 and December 1998, there was no tariff adjustment in case of gas, but tariff was increased by 15 percent in several installment between September 1996 to 2000. On the other hand, the subsidy benefits the four percent Bangladeshis with higher income, who have access to domestic natural gas.

11.2.8.3. To support development of a viable and self-sustaining power industry in Bangladesh, needs to be rationalized, which can be achieved by having a regulatory body with clear terms of reference. This regulatory body will set tariffs in accordance with explicit economic and financial criteria.

Action 1 : In case of domestic power tariff, two main measures are warranted as :

- i. reducing the first block in the domestic from 300 kwh to 100 kwh, which would support the low income groups; and
- ii. providing small rebates for prompt payments, or introducing pre-payment meters (when introduced adequately) for the larger residential and commercial customers.

Action 2: High voltage customers should be subject to time – of – day metering and tariffs. This will reduce the additional costs imposed on the systems during peak hours, help flatter the demand, and thus reduce load – shedding. Because of the lack of sufficient generating capacity, demand –side management should be introduced, particularly for large industries. It is worth mentioning that since late 1996, electricity supply for irrigation has been re-scheduled to a new timing (11 pm to 6 am), which has provided flexibility and demand side management.

11.2.9. Sub-Regional Energy Cooperation Initiatives

11.2.9.1 Apart from internal economic policy issues, lack of regional cooperation is also an important reason for the low performance in energy in Bangladesh. While in general regional cooperation efforts have to date been somewhat weak in South Asia, the bilateral cooperation efforts between India-Nepal and India-Bhutan have progressed well. However, the need for *sub-regional cooperation* (between India-Bangladesh-Nepal-Bhutan) be recognized and activated. Against the background of such cooperation initiatives the following actions are needed :

- Action 1 :** Assess the need and rationale for cooperation in the sub-regional countries in the light of the experience of the East and South Asian countries and global trend towards regional power grid systems ;
- Action 2 :** Review and assess the existing energy profiles of each of the four (4) countries. This would include the current and future demand for energy;
- Action 3 :** Examine the possibilities of sub-regional cooperation among the countries in GBM Basin focusing largely on the benefits or linking the infrastructure network, including cost-benefit or a sub-regional power grid.

11.2.10. Independent Power Producers (IPPs)

11.2.11. Inadequate Human Resources Development

11.2.12. Corruptions in the Power System

11.3. Gas Sector Issues

- 11.3.1. Governance And Management
- 11.3.2. Institutional Aspects
- 11.3.3. Legal and Regulatory Commission
- 11.3.4. Financial Management
- 11.3.5. Gas Reserves and Supply-Demand Balance
- 11.3.6. Private Sector Operation
- 11.3.7. The Gas Market
- 11.3.8. Inadequacies in Production and Transmission
- 11.3.9. Losses and Inefficiencies
- 11.3.10. Inadequate Investment
- 11.3.11. Reserve Estimation and Depletion Policy
- 11.3.12. Petrobangla's Role vis-a-vis PSC

11.3.1. Governance And Management

11.3.1.1. For institutions in the gas sector to function effectively, there is a need to separate policymaking, regulation, and operations—because the three functions entail different levels of responsibility and accountability. Policymaking is best left to the government accountable to parliament and to voters. Regulation is best left to a specialized entity operating independent of the industry, in accordance with the policy guidelines provided by the government. Operations are best left to the management of companies accountable to the board of directors, and shareholders.

11.3.1.2. A *Petroleum Policy* was approved by the cabinet on 18 July, 1993. The basic objectives underlying the policy includes, but not limited to :

- undertaking *systematic survey* exploration and exploitation of petroleum resources and ensure their national use for sustainable development of the country ;
- adopting *uniform policy* instrument for both public and private sector enterprises;
- considering development of gas fields through private sector, as part of Government's *corporatization policy* ; and

- *replacing* oil import by gas as far as possible and to augment energy supply by other undeveloped commercial energy sources such as coal, coal bed methane, peat as well as LPG etc.

Action 1 : For undertaking systematic and optimum exploration for oil and gas, BAPEX should also be engaged alongside the IOCs, not only as *carried partners* but in *independent operations*

11.3.2. Institutional Aspects

11.3.2.1. Petrobangla is the sole player in the Bangladesh gas sector. The organization entered into its first production sharing contracts (PSCs) for the offshore blocks (six) with foreign oil companies in 1974. The second contract (on-shore) was in 1981, followed by another one in 1987. All previous contracts were terminated in 1978, 1984 and 1990 respectively. The mid to late 1990s witnessed opening up more blocks for the IOCs in several phases. *Petrobangla* acts simultaneously as the partner of IOC, the sole *purchaser* of their potential output, and their *regulator*.

11.3.2.2. Petrobangla is a statutory body of the Government, governed by a 1985 ordinance and operating under the purview of the Ministry of Energy. It is governed by a 7-member board appointed by the Government. The Operating Companies are all corporatized under the Companies Act, while the mother organization (Petrobangla) is not. Transactions involving foreign oil companies are conducted through Petrobangla's Petroleum Concession Division (PCD). Apparently, the present framework is institutionally complex. Its main feature is that all matters-whether policy, operational, or regulatory-are ultimately decided by the Government (as desired by the Ministry of Energy). The decisions are often delayed, and it remains unclear whether they are guided by commercial or other considerations. It employs some 8,000 staff, including about 600 at Petrobangla proper.

11.3.2.3. Its operations are divided among the operating companies as follows :

- i. *Exploration and drilling* through the Bangladesh Petroleum Exploration Company Ltd. (BAPEX), incorporated in 1989 and also through the IOCs under PSC. Bapex's only source of operating revenue is 4 percent service charge levied on gas production, which is highly inadequate. Bapex has about 1200 employees, professionally qualified and experienced over the years.
- ii. *Gas development and production.* Bangladesh Gas Fields Company Ltd. (BGFCL) incorporated in 1956, Sylhet Gas Fields Ltd. (SGFL) established in 1972 are the two units incorporated under Companies law.
- iii. *Transmission, distribution and marketing.* Three franchised operating companies (Titans, Bakhrabad and Jalalabad gas companies) distribute and market natural gas.
- iv. *National transmission system* represented by the Gas Transmission Company Ltd. (GTCL), incorporated in 1993, will eventually be responsible for high-pressure national trunk system.
- v. *Natural gas liquids and liquefied Petroleum gas.* Rupantarita Prakritik Gas Company Ltd. (RPGCL) established in 1991, transports and fractionates natural gas liquids and distributes compressed natural gas (CNG).

11.3.3. Legal And Regulatory Commission

11.3.3.1. Petrobangla do not operate as a Holding Corporation created under the Companies Act. Only the operating companies (OCs) under Petrobangla are subject to the Companies Act.

11.3.3.2. The policymaking unit (for oil and gas exploration) at the Government level is expected to be the Hydrocarbon unit (HCU), planned to be guided and operated by foreign consultants like the Power Cell in the Power Sector. Integration of local experts would help develop the unit, which later may be merged with the proposed Regulatory Commission.

11.3.3.3. Petrobangla acts as a regulator of the upstream (through its Petroleum Concession Division or popularly known as PCD). Petrobangla is the sole buyer of gas from the International Oil Companies (IOCs) operating under the Production Sharing Contract (PSC) policy of the government. It has a monopoly over the transport and distribution of natural gas. In addition, it is also a (carried) partner (Bapex) of the IOCs under PSCs. The allegation that conflicts inherent in combining all these functions are not conducive to the healthy development of the industry does not stand out logically. This issue has cropped up recently (in the 1990s although PSCs were initiated in 1974 and subsequently contracts were also signed in 1981 and 1987).

In fact, reportedly the IOCs are taking undue advantages in the operation of PSCs due to lack of proper supervision and monitoring of contracts by Petrobangla.

11.3.3.4. Joint Review Committee (JRC) of Petrobangla is very poorly structured and generally appear to be non effective from the point of view of taking care about national interest.

Action 1: Petrobangla should be corporatized (as Holding Corporation) under the Companies Law (like the Bangladesh Petroleum Corporation).

Action 2: A separate Energy Regulatory Commission (ERC) be created and the activities envisaged under the Hydrocarbon unit be transferred to the commission.

Action 3: Joint Review Committees should be adequately strengthened by good quality professionals.

Action 4: Sector reform strategy be firmed up and pursued vigorously.

Action 5 : conduct advocacy and inform international legal practices governing gas sector production, transportation, and distribution

Action 6 : emphasize the separation of policy, regulatory and commercial functions

Action 7 : development of implementing rules and regulations for the hydrocarbon sector reform law etc.

11.3.4. Financial Management

11.3.4.1. Petrobangla operates through 8 (eight) operating companies (OCs) which transact with each other under a complex system of internal transfer price. Some OCs are profitable, other aren't—so consolidated accounts are required to assess the condition of the gas sub-sector.

11.3.4.2. In recent years the Petrobangla Group has been profitable, though modestly, earning a return on equity of 6-7 per cent.

11.3.4.3. Tariffs have not been adjusted for the last six years, and the apparent decline is due solely to the depreciation of the take in relation to the US dollar.

11.3.4.4. Gas production had declined in the late 1990s, mostly due to Bakhrabad gas field, a large producer now in declining phase resulting in collection of lesser revenue in some years.

11.3.4.5. About 65 per cent of the gross revenue of Petrobangla Group is paid to the state in taxes and compulsory dividends—making effective price received for gas at a very low rate (compared to international standard).

11.3.4.6. As a result of low margins, the Petrobangla Group has not been investing enough in exploration, development and pipelines, or distribution. Nor have the expenditures on operation and maintenance been adequate for upkeep of the gas system.

11.3.4.7. In the coming years the financial performance of Petrobangla will be heavily affected by the enhanced production from IOCs and the fiscal policies that the Government applies to gas. Petrobangla now buys gas from the IOCs at a price linked to the international price of fuel oil—and receives the government’s share, as the state is the owner of natural resources under Petroleum Act, 1974. Against that, Petrobangla has to pay taxes on behalf of the operator and excise duties on the gas sold. The financial projections indicate that Petrobangla will incur increasing deficits, leading to negative cash flow of more than US \$ 120 million in 2001.

Action 1: Tariff increase may be reviewed.

Action 2: Out of the gross revenue paid to the government, about 10 per cent may be set aside for Bapex to conduct exploration and drilling.

Action 3: Gas-cess (a percentage of gas price per unit) may be re-introduced to collect funds for exploration by Bapex.

Action 4: Separation of policy formulation from operations and regulation.

Action 5: Convert Bapex into a full-fledged exploration and production company (E & P company), in line with industry practice and in a framework comparable to that of the PSCs.

Action 6: Transfer the transmission assets of Petrobangla’s operating companies involved in transmission activities to GTCL, and convert the remainder to gas distribution utilities operating on a commercial and regulated basis.

Action 7: Introduce pricing policies to attract upstream investments that provide a fair return to the owners or the gas infrastructure (pipelines).

Action 8: Introduce a financial action plan aimed at ensuring the financial viability separately of the upstream activities, the transport, and the distribution of gas.

11.3.5. Gas Reserves And Supply-Demand Balance

11.3.5.1 Although considerable anomaly exists in the reserve estimate, Gas-Initially -In-Place (GIIP) from 22 gas fields is assumed at 25.80 trillion cubic (TCF). From geological point of view approximately 60 per cent is recoverable from GIIP figure. The recoverable reserve is estimated as 15.48 TCF. In the past 40 years since first production in 1960, about 3.95 TCF of gas has been consumed. Therefore, remaining recoverable of gas may be around 11.68 TCF. In the recent months Petrobangla and an IOC (UNOCAL) has reviewed the reserve figure separately. According to UNOCAL it is 16.1 TCF, while Petrobangla stated that it is 15.1 TCF.

11.3.5.2. Recent Statistical report, a joint study by USGS-Petrobangla indicate a 8.4 TCF *gas resource* from *undiscovered* geological structures (at 95 per cent confidence level). But this *gas resource* figure (uncertain) is different from *gas reserve* figure (certain). Consequently, the resource position would need to be firmed up through further investment in exploration, appraisal and evaluation to obtain a reserve figure in future.

11.3.5.3. Natural gas accounts for about 70 per cent of commercial energy use in Bangladesh. This share, although large by international standards, do not reflect the abundance of gas reserves as unsolicited speculation floats in Bangladesh. Gas consumption grew rapidly, with annual growth rate of 9 per cent. The gas market is dominated by the power and fertilizer sectors, which accounts for 45 per cent and 32 per cent of demand in 2000-01.

11.3.5.4. The *gas shortages* have been caused by several factors. Reservoir management practices have been inadequate; gas wells have been overproducing, with little consideration of the reservoir characteristics and the petroleum industry practice of producing on a well’s “maximum efficient rate”.

11.3.5.5. Investments in the *drilling of development wells* have been inefficient (Petrobangla waited for over three years to conduct 11 development well drilling when funds from donor’s were already available). Surface facilities are poorly maintained and appear to possess insufficient gas treatment capacity. And pipeline transport capacity is inadequate.

11.3.5.6. No proper *comprehensive reserve estimate* exercise has been conducted by Petrobangla as per international Petroleum field practices since 1989. Even one IOC (Cairn/Shell) have started production of offshore Sangu field without carrying out a reserve study.

11.3.5.7. The future supply demand balance for gas will depend on the ability of Bangladesh to mobilize the resources needed to develop the gas sector, whether from the public or the private sector.

Action 1: A Comprehensive Gas Reserve Estimate through internationally reputed independent specialized company must be commenced at the earliest.

Action 2: Reservoir Management practice have to be introduced as per international gas field practice.

Action 3: The joint gas resource study (USGS-Petrobangla) of undiscovered (geologic) structures be examined with a view to delineating the drilling spots and investment needed to conduct exploration in the coming years so that reserve estimate of gas in the country be undertaken.

11.3.6. Private Sector Operation.

11.3.6.1. The Government announced a new petroleum policy in 1993 with incentives for private investment, which was well received by foreign companies. By 1996 six (6) PSCs were signed, with four(4) operation for eight(8) blocks including one offshore block. The second offering made in July 1997 also drew favorable response. So far (until June, 2001) four contracts have created suspicion about the implementation schedule.

Action 1: The most recent PSCs signed *in a rush* should be reviewed with an open mind.

Action 2: Relationships between the IOCs and the JRCs be strengthened.

11.3.7. The Gas Market

11.3.7.1. Natural gas prices in Bangladesh have traditionally been fixed by the Government and were last adjusted in December 1998.

11.3.7.2. About two-thirds of the country's load of natural gas has a pronounced difference between peak and off-peak demand. Such variations impose a significant cost on the supply system, as production facilities and pipeline network need to be sized and equipped to supply gas at peak.

11.3.7.3. Petrobangla is charged an *exercise duty* that accounts for about 58 percent of its gross revenue; with other taxes (income tax, compulsory dividends, and so on), the fiscal take increases to 65 percent of Petrobangla's revenue.

11.3.7.4. For Pectrobangla the difference between the *economic cost* of natural gas and tariffs meant a loss of about US\$ 110 million in 1997 in the form of direct subsidies to the power, residential, and fertilizer sectors.

11.3.7.5. A relatively complex system of administered internal transfer prices is in place in the Petrobangla group, but for all practical purposes the single buyer *model* applies. There is on allegation that single-buyer model is not efficient because it looks competition.

11.3.7.6. The *upstream* segment of the natural gas industry in Bangladesh is governed by the Petroleum Act 1974, which gives the government the exclusive right to explore, produce, and market hydrocarbon (oil and gas). In the *down stream* gas sector there is no regulatory framework, as the transmission service is integrated in the operating companies bundled price and GTCL's tariff is expected to be set by the Government.

Action 1: Gas Tariff may need to be reviewed.

Action 2: The issue of introducing a separate regulatory regime may be examined.

11.3.8. Inadequacies in Production And Transmission

- production
- transmission network, expansion in the Western zone
- distribution network (remote and isolated areas -policy)
- Options/LPG.

11.3.9. Losses And Inefficiencies

- Titas loss (minus bulk customers) over 50%
- loss figures are not discussed/disclosed
- pressure drop in transmission and distribution network
- the need for installing compressor-booster for smooth supply through long distance transmission lines.

11.3.10. Inadequate Investment

- Government's own vis-a-vis PSC
- in reservoir management

11.3.11. Reserve Estimates and Depletion Policy

11.3.12. Petrobangla's Role vis-a-vis PSC

- lack of level playing field for BAPEX

Chapter-VII

12.0 Developing the Energy Sector

- I. Bangladesh has a large *unmet* need for commercial energy. Against the backdrop of pent-up demand, lost growth, and social inequity, some recent developments may brighten a somber picture. In the hydro-carbon sector even with 11.68 TCF recoverable reserves of natural gas, if the exploitation is well managed, it can fuel the country's commercial energy needs in an *ecologically benign* manner and act as an engine for rapid economic growth until about 2020. In keeping with global trends in the 1990s, Bangladesh has opted for private sector IOCs participation in the development of the energy sector. In the power sector, several initiatives in the past (1990s) have elicited considerable private sector (IPPs) interest in electricity generation. All these are encouraging news for the country, for few BPDB plants can produce electricity at less than US¢ 3 per kwh. Private sector combined cycle plants have signed contracts with BPDB to supply electricity at US¢ 2.97/kwh from 450 MW Meghnaghat plant (by 2003) and US¢ 2.73/kwh from Haripur plant (by 2001). Clearly this is an excellent opportunity to expand electricity supply, but future IPP investments must be encouraged with due precaution.
- II. Three *contrasting scenarios* for development of the energy sector is stated below, as illustration, assumes:

Scenario 1: Business as usual:

- Inadequate investments in both power and gas
- Declining energy prices in real terms
- No improvements on the operational efficiency of the energy supply companies
- No institutional reform
- Continuing funding constraints
- **Scenario 2: Improved Energy supply at Government's Expense.** But,
- energy prices decline in real terms ;
- no improvements occur in the operational efficiency of the supply companies ;
- no institutional reforms take place ; and
- no funding constraints

Scenario 3: Improved Energy supply through Sector Reforms :

- Investments in gas and power sectors consisted with demand needs
- Energy prices rise in real terms
- The operational efficiency of the energy supply companies greatly improve
- Far reaching institutional reforms

13.0 Action Plans

Energy issues of late has assumed the character that is *unpredictable* and *risky*. There seems to be no firm statistics on demand, supply and generation capacity of electricity. The number on proven *recoverable reserve* of natural gas has recently become anybody's guess particularly because of the undue involvement of unskilled and non-professionals. The state enterprise Petrobangla's management has been dealing with the subject rather carelessly which is evident from their total non-response on following the internationally accepted oil field practice on *reserve estimation* and certification through specialized organizations since 1989. Instead, the influence of bureaucracy in general and undue dictates even on professional matters of the Ministry of Energy and Mineral Resources in particular has made the organizations to act as departments of the Government. In the power sector, the inter-sectoral relationship between the statutory boards (BPDB, DESA) and the Ministry has deteriorated substantially to the extent of unnecessary interference by the MEMR in almost all matters which deserves to be rectified.

In a situation like this the sector has been afflicted by shortages of gas and electricity (in particular). The cumulative cost of non-supply of electricity alone is to the tune of US\$ 1 (one) billion, while the losses amounts to US\$ 100-150 million annually between the sector entities (including REB). In the gas sector, Petrobangla buys almost 300 MMCF gas every day from the IOCs at a higher cost, while it sells to its customers at a lower unit price. This is mainly because the government was trapped into a *gas pricing formula* for purchase gas (under the PSC) under the influence of IOCs due to either ignorance of the bureaucrats or their connivance with the IOCs. In any case, the nation is faced with a severe power crisis and consequent load-shedding hurting public life and industrial activities. Yet the people are lulled into blissful ignorance of the true state of affairs in the energy sector by the bureaucratic tangle and lately by a naïve political boss in the MEMR.

The country has an Energy Policy (1995), which is only five years old, but lack of a firm resolve and sincere endeavors to carry out that policy is simply outrageous. It is also unfortunate, but the fact is that if one looks closely into the various aspects of the energy sector one would find that there is in fact no forward looking implementation schedule rather ad hoc measures and tentative suggestions which did not help remedy the situation. The crisis deepened and the country has been put into the abyss. Had these been positive, the nation would not have plunged into such a *power crisis* only within such a short time after the electricity generation capacity has increased to about two fold in a decade. That only indicates that the policy planners have failed to realize how the demand for power would grow from year to year and over a period of ten years and also failed to take measures to meet the increase in demand.

As stated earlier the most obvious forms of energy are electricity (secondary) and gas (primary) in Bangladesh, but they meet only an insignificant part of the nations energy needs. The bulk of the energy needs are met from biomass etc., mostly in the rural areas where almost 80 per cent people live. At the national level planning non-renewable energy sources like the solar or wind power has remained like orphans, only some private entrepreneurs are hesitatingly promoting these sources in remote and isolated areas, if that appears commercially beneficial. For the last several decades the politicians have been toying with the idea of nuclear power. Ruppur has become mirage – a dream unfulfilled. But disasters at Three Miles island (Harrisburg, Pennsylvania, USA) and at Chernobyl (in Ukraine) has given enough clue to think many times over before the nation seriously considers nuclear power generation in Bangladesh. The bottom line is that the country has very limited options in the energy sector. So far adequate reserves of natural gas have been proved, but for lack of investment in development the supply is severely constrained. In the recent years, through the Petroleum Act, 1974 the government provided liberal incentive packages for hydrocarbon exploration to the IOCs under the production-sharing contracts, while the IPPs have entered the power sector through the Private Sector Power Generation Policy, 1996.

Nonetheless, apparently unavoidable problems like corruption and inefficiency in all aspects of operations (production, distribution, filling and collection) have overshadowed the development mood in

the energy sector in the past one decade, in particular. Insufficient investments in new facilities, low levels of commercialization and financial indiscipline coupled with low tariffs, excessive bureaucratic interventions and inadequate expertise in the corporate level has aggravated the energy scenario. In broad terms, the problems stem from lack of attention to the financial performance of utilities. Financial rehabilitation is undeniable, if the sector is to recover. The changed mood is that there is no rationale for supporting the gas and power sectors on *social equity grounds*. Bangladesh could change this. Under a sector reform, energy shortages could be substantially reduced within a few years as systemic issues of inefficiency, corruption and mismanagement begin to be addressed in a modest way. Sector reforms have already started – the momentum must be increased with the modification/amendments of Electricity Act, 1910 and not necessarily instituting a new so called independent regulatory policy with significant private participation, on thoroughly modern grounds. At the core of such a strategy should be a far-reaching institutional reforms over a five to ten year period, including segregation of generation from distribution (with BPDB) and corporatization. Transmission component has already been corporatized under the companies law. The top priority area to be addressed is distribution. In the gas sector, Petrobangla should immediately be corporatized and transformed into a holding company under the companies law.

In broad terms, restructuring can take place only after a large number of strategic decisions have been made and the detailed arrangements of the new framework have been adequately examined and decided. The framework is shown below:

Implications of Sector Restructuring

Institutional	<ul style="list-style-type: none"> ● Unbundling integrated monopolies into three companies namely generation, transmission and distribution companies respectively ● Corporatization of entities
Financial	<ul style="list-style-type: none"> ● Unbundling of accounts, apportionment of assets, debt, and working capital ● As required, capitalization of enterprise
Personnel	<ul style="list-style-type: none"> ● Reassignment of staff to the various entities ● Transfer of acquired rights
Network Operations	<ul style="list-style-type: none"> ● Elaboration of network codes, standards and dispatch rules
Pricing	<ul style="list-style-type: none"> ● Elaboration of financial policies and tariff policies
Commercial	<ul style="list-style-type: none"> ● Elaboration of contracts between producers, transmitters and distributors
System development	

Source : Energy Strategy Note, 1998 (the World Bank)

Nevertheless, it must be understood that restructuring and corporatization are difficult to handle and sensitive in most respects. Many hard decisions have to be taken in several areas that are politically delicate – the valuation of facilities, the configuration of the sector, or the fate of personnel. Such issues could easily derail the process or suspend them indefinitely. A particular difficulty arises with the workers unions, which feel threatened by sector reform and corporatization. For the process to succeed, it is important to reach a broad consensus on the sector strategy at an early stage.

BPDB is characterized, for instance, by low productivity, and high labour costs as a result of over employment (almost 24,500 employees are engaged in BPDB, about 5500 in DESA), relatively generous wage and benefits, and inappropriate skills mixes. Thus employment concerns have exacerbated by the lack of information on the mechanisms available to governments to reduce the political and social costs.

14.0 Energy Security

14.1. Today the GOB faces *formidable challenges* in the energy sector- harnessing its energy resources for sustained, long term socio-economic development and the more immediate challenge of overcoming gas and power shortage and new gas pipeline facility cannot be underestimated. However tricky or difficult it might have been on the ground the decision makers experienced that serious efforts were needed to attract private investment in the electricity and gas sectors.

14.2. There were two intricate issues involved : one, a *dynamic vision* was needed to address the fast growing gas sector, and the other, was to face the realities of the power sector and conduct crisis management forthwith in the late 1990s. The task of securing adequate investment for meeting the growing demand was very difficult. On top of that oil companies started putting pressure on *marketing gas outside Bangladesh*.

14.3. In order to define the policy objective, and strategies required to realise them, a number of questions needed to be addressed then. These questions included : does Bangladesh have sufficient proven natural gas reserve to meet domestic demand in the foreseeable future and also consider likely benefit from potential export possibilities. If yes, what strategies would be most beneficial for the nation. If no, how expeditiously exploration and exploitation of gas could be conducted. In the electricity sector what logical sequence of actions under the reform process be most appropriate from the country's point of view? Whether the existing public sector monopoly in generation be replaced overnight by private sector or a continuation or public-private sector development would be more profitable for the country. To face these challenges the GOB successfully promoted private participation both in the upstream and downstream energy sector activities i.e., gas exploration and production under the Production-sharing contract (PSC) with the IOCs, and power generation through IPPs. In both the cases transparent and competitive bidding was the procedure that was followed.

14.4. Energy is a strategic input necessary for socio-economic development. It is required in meeting basic needs and to enhance economic growth. Then there is a need to pay special attention to ensure energy security for different category of customers and the people at large. Unfortunately, there is a lack of understanding about the need for and importance of energy security of the people for sustainable development. More than 80 percent (if not more) of households depend on unsustainable supply of biomass fuels for cooking. According to some estimates per capita availability of recoverable commercial energy (non-renewable e.g., gas and hydropower reserves of Bangladesh (low income) is about 2 tonne oil equivalent (Toe), which is only one year's average per capita energy consumption of middle-income countries. Despite low energy resources base (on per capita basis) and low per capita

energy consumption, in recent time vested interests have initiated a campaign in favour of export of very low natural gas reserves, compared to the need of the country, by ignoring the energy security of the people. In their campaign, hypothetical numbers regarding gas reserves are being used i.e., *over estimation* of figures one the one hand and undermining of energy security for sustainable development of the people on the other.

14.5. Although limited biomass fuels, petroleum products, natural gas and hydropower are used in the country, the basic principle of energy security is to *ensure the supply* of appropriate sources, to meet the demand of different end-use sector. The supply of energy is already less than demand, which becomes more acute at individual level, household level, and community level in the country for various reasons at a particular time of the day or during certain period or the year, for some years. Indeed, energy insecurity is a multidimensional problem.

14.6. In the past energy development programme suffered long term perspectives in a comprehensive manner. Decision-making in energy sector projects in particular was *influenced* by the donor assistances and political parties own agendas. In some cases, projects have remained heavily underutilized due to lack of synchronization of implementation schedule. As a result the nation suffered immensely and the country submerged into an energy crisis. Development activities of the west zone (across river Jamuna) have been severely affected due to serious shortage in supply of primary (gas and coal for example) and secondary electricity energy.

14.7. Besides the periodic *forced outage* of electricity, as a consequence economic development the country has been pushed back words. Great majority of rural people has not been supplied with modern sources of energy like electricity, gas, and petroleum products. Millions of poor people are living miserable life due to energy shortage. Millions of women folk are cooking with inferior biomass fuels and are exposed to harmful pollutive environment. Human security of the population in the Hill Tract area (Chittagong) has already become irisecuxe due to Kaptai dam to generate hydropower. Reportedly, some 40 per cent of agricultural lands of the area have been submerged. More people will be hurt if an addition in generation capacity is planned at Kaptai.

14.8. Environmental aspects in Bangladesh is less cared for in Bangladesh, even by the policy planners, decision makers. Remedial measures are not usually undertaken, which also affects energy security.

14.9. Thus, there is a great necessity to consider optimum use of available energy sources to ensure energy security for sustainable human development in the long-run, particularly in case of (depletable) gas reserves of Bangladesh.

15.0 A Brief Analysis of the Financial Impacts Under IOC and IPP

Gas Sector

15.1 A common man generally expects that all governments, regardless of the nature of the government, are enjoined to serve the interest of the people, not self interest. Nevertheless, it is the right of a citizen to demand that the actions of those who are entrusted with the responsibility of governance should be transparent and accountable to the people. It is, therefore of paramount importance today to objectively examine the Bangladesh gas sector's present status in the light of its past, its potential and future prospects.

15.2 To start with the implications of *contracting* out the development of the country's gas resources on the *macro-economic balance* and the domestic *price structure* may be looked at in the context of gas reserves-present and potential ; *supply- demand* and pricing ; the impact of gas contracts with IOCs ; the nation's own exploration capability. efforts and prospects ; the issue of export ; and the need, if any, to review the current developments.

15.3 Although the search for hydrocarbon resources in the region started as far back as 1908, it is during one of the phase (1980-90) that major thrust in the gas sector was made, based on Hydrocarbon Habitat Study undertaken with the World Bank assistance. With the assistance of other donor agencies countries, gas field development and expansion network programmes were also undertaken. In the phase (1993-94) shortly after the Petroleum Policy was framed, the country was divided into 23 blocks on geological considerations (the first initiative was in the 1970s when 16 blocks were made and only six off-shore blocks were awarded to six foreign oil companies in 1974-75. Subsequently, PSCs were also signed in 1981 and 87, the emphasis at that time was *discovery of oil* and sharing liquid hydrocarbon discovered. It is only in the 1990s the scenario changed, based on *gas-prone* consideration. In 1994, a new turning point in PSC became visible, previously discovered geological structure known as Jalalabad (in Sylhet) was made over to Messrs Occidental (now UNOCAL). Almost concurrently, an off-shore block (block 16) was awarded to Messrs Cairn (now Shell) under PSC. During the 1990s (and in the early 21st century in diffident phases, almost all potential blocks have been awarded to the IOCs leaving nothing for Petrobangla). However, it may be noted that exploration conducted so far yielded discovery of 22 gas fields (including eight big gas fields having a reserve of 1 TCF and over) and a oil well, out of which 12 gas fields are in production, as under :

Gas Fields in Production

Gas Fields	No. of wells (drilled)	Production (MMCFD)
Petrobangla		
1. Titas	14	300
2. Bakhrabad	8	40
3. Habiganj	7	195
4. Sylhet	7	6
5. Kailastilla	4	110
6. Rashidpur	4	85
7. Benibazar	2	35
8. Narshingdi	1	20
9. Meghna	1	20
10. Saldanadi	2	15
IOCs		
11. Sangu	6	160
12. Jalabad	4	100
Total =	60	1086

Source : Petrobangla, 2001

15.4 How much gas the sub-surface of Bangladesh holds has been a topic for unnecessary debate and speculation, mostly by non-professionals and vested interested groups. The situation has also been unduly aggravated by some vested quarters, perhaps for their self-interest. A recent USGS-Petrobangla joint study report, for instance, provided some figures based on statistical predications (Monte-Carlo simulation model). The study divided the Petroleum System of Bangladesh (designated as Total Petroleum System or TPS) in 6 (six) Assessment Units based on geological structural attributes. The prospect shows a range between 65.7 TCF (5% confidence) to 8.4 TCF (95% confidence). What is very important in this study is that a *Resource Assessment* has been made and not a *Reserve Assessment*. Therefore, one can use this number as potential gas resource based on *risk investment* to be made in future, but not for conducting any commercial transactions.

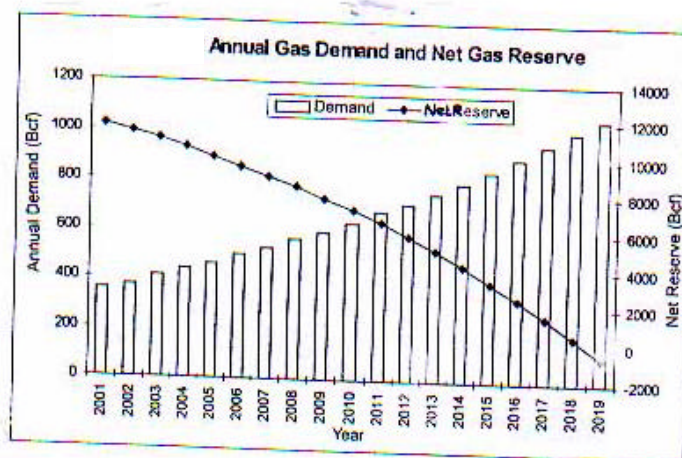
15.5 There are a number of gas demand projections or estimates depending on their respective assumptions on the variables related to that projection. That the results obtained under the process may conclude with great deal of uncertainties. The current industry practice is to limit the forecast for a period not exceeding 25 years. National Energy Policy, 1995 has also forecasted energy demand for twenty-five years, from 1996 to 2020. However, a 50 year natural gas demand forecast in Bangladesh is linked with a wide range of uncertain issues, such as : the role of non-renewable and renewable energy supply under global energy scenario, regional and sub-regional energy cooperation, and energy pricing. When this global considerations are translated into the national level issues, they consider : expected electricity growth and its implications to GDP growth, demand of urea fertilizer for domestic use, price of natural gas in domestic market, and of course natural gas reserves. Nevertheless, Petrobangla has carried out an exercise for 50 years forecast (2001-2050), which indicates a demand of about 63 TCF as under :

50 year Gas use forecast

	2001-2010	2011-2020	2021-2030	2031-2040	2041-2050	Total
Power	2511	2564	8263	11030	12722	39790
Fertilizer	973	1123	881	887	887	4752
Industrial	812	1684	2861	3788	4368	13522
Don/Comm/others	537	794	1051	1212	1339	4933
Total (BCF)	4843	8865	13056	16917	19316	66997

Source : Petrobangla, March 2001

15.6 However, for the purpose of present exercise with the remaining recoverable reserve of 11.68 TCF or gas, the country gas reserve would be exhausted by 2019 as shown below :



This clearly demonstrates the urgency for further field appraisal and exploration efforts and discover new geological structures and drill them so that supply constraint would not slow down the desired GDP

growth and distort the country's energy security. This also indicates that current level of reserve could not ensure secured supply of gas as per contractual obligation within the lifetime or some existing power plants including IPP plants.

15.7 It may be noted that the demand forecast (50 years) has however been made by Petrobangla on the projection / information available from BPDB and Bangladesh Chemical Corporation (BCC) (whose total annual demand in percentage terms exceed 85 per cent in 2001). Results that have been obtained indicate that annual gas demand will increase from its current level or 365 BCF (1000 MMCFD) to about 1.14 TCF (3115 MMCFD) by 2020 and 2.02 TCF (8200 MMCFD) by 2050. On the other hand *current known reserves* will atmost sustain production upto 2020 and thereafter Bangladesh will have to solely rely on import (of hydrocarbon) if no substantial new reserves / discoveries are added. Thus the current demand supply already offers an alarming signal.

15.8 There is also another aspect or demand supply scenario over the ten years. This would help to appreciate a clear picture of IOC supplies under the PSC. There are two important elements ; first, the *sharing* of gas between Petrobangla and IOC, and second, its *pricing*. The price of gas (being purchased from IOCs) is linked to the international price of High Sulphur Furnace Oil (HSFO) ex-Singapore on the basis of a complicated formula that makes the off-shore gas (of Sangu) and the payments in US dollar and only marginally in local currency. Sangu gas, for example, is 92.5 per cent in foreign exchange and 7.5 per cent in local currency. In respect of volume sharing between IOC and Petrobangla, there are again two elements to serve the basis for determination of IOCs share, namely, cost recovery (CR) gas and the profit gas (PG) and Petrobangla getting a portion of the gas that remains after IOCs take of its cost recovery gas. The following sample calculations ⁸⁾, based on modest US \$ 2.25 MCF (thousand cubic feet) for Sangu (Sangu price actually rose to US \$ 2.90 per MCF with crude oil prices rising above US \$ 30 per barrel and corresponding price rise in HSFO) and US \$ 1.75 / MCF for Jalabad (on-shore) gas, show the IOCs and Petrobangla's earnings and volume splits over a span of 13 years (the run out period of gas field at 7.5 per cent annual field of recoverable reserve) is :

Ex-Sangu			
IOC :	$60 \times 2 \text{ MMCFD}$	$= 120 \text{ MMCFD}$	- CR gas
	$19 \times 2 \text{ MMCPD}$	$= 38 \text{ MMCFD}$	- PG
		158 MMCFD	value \$ 355,000/day
			= US \$ 129 million / year (approx)
Assumption 4 year period at US \$ 2.25 / MCF			
Petrobangla :	$21 \times 2 \text{ MMCFD}$	$= 42 \text{ MMCFD}$	PG value = US \$ 94,000/ day
			= US \$ 34 million / year (approx)

15.9 The dollar amounts shown against Petrobangla are notional only, since the exploration take would be in volumes of gas and not in dollar terms. It will be seen with great horror that even at modest 300 MMCFD (between Sangu and Jalabad), the financial liabilities of Petrobangla are going to be very high indeed. The actual picture over a span of 13 years is going to be far worse for three main reasons : first, as already stated, the prices are going to be higher than indicated ; second, the bulk of cost recovery may not take place in 4 (four) years and the remaining cost recovery gas is likely to be higher (may be as high as 20/25 per cent) than the 10 per cent being assumed ; and third, the taka liability vis-a-vis US dollar, which Petrobangla would have to generate, would continue to go on being higher every year. For example, when the Sangu GPSA (Gas Purchase and Sales Agreement) was signed in early 1997 the Taka-Dollar exchange rate was Tk. 42 = 1 US\$ - now it is Tk. 57 to a dollar, a rise of 36 per cent over a period of 4 years only. One can well imagine what would be the situation by 2005, let alone 2010.

8) Azimuddin Ahmed, former Energy Secretary

15.10 It is indeed unfortunate for the nation that almost all *gas prone* blocks have been awarded to the IOCs, disregarding the need for keeping them for Petrobangla or for the State so to say. When Bibiyana gas come to production, the bulk of incremental gas supplies upto 2005 and beyond would be under PSC only. Thus under very conservative estimates, the additional 400 MMCFD would require atleast US \$ 200 million a year at current prices in addition to what is being purchased now. Since part of the volume under PSC, although small, belong to Petrobangla, it can be estimated that altogether around 600 MMCFD would come from the IOC share of gas. At a modest US \$ 2.0 / MCF (as the average of on-shore and off-shore gas), it would come to about US \$ 400 million or equivalent to approximately Tk. 22800 crore a year.

15.11 The situation that makes award of more blocks to the IOCs not only inexplicable, but *dubious*. These awards are antipeople and must be reviewed in the interest of the public. It is inconceivable that without natural gas in ever increasing volume to cater to the needs of the country over the years, whatever development Bangladesh has been able to achieve, would never have been possible. This resource is an asset that belongs to the people, not only of the present generation but of the future generations as well. This issue of national interest must be debated with boldness: "as a moral equivalent of war" against enemy.

Power Sector

15.12 Power sector is a horrendously mismanaged sector that has been allowed to deteriorate gradually over the years. Solving the constraints and problems and removing the road blocks needed honesty, efficiency and integrity. Many people involved in this sector's management seems to have set aside these virtues. Luckily the crippling failure was not so much at the technical level where, on many occasions, the poorly paid technicians and junior engineers ran downrated plants under very difficult circumstances.

15.13 Some of the donors, such as the World Bank at times provided advices that came out misdirected (for instance the creation of DESA), most others patiently waited for years to witness improvement in the operational performance of the sector. The donor withdrawal that has become a talked about issue, is because of the sector's corrupt practices that ultimately turned out to be nobody's business. It is in this context arguments are made that mere augmentation of generation capacity, whether in the public or private sector, is not likely to improve the sectoral performance in the least. The IPP generation, in particular, is going to add to the nation's financial burden. But the situation in 1996-97, in terms of shortages in supply, load-shedding and voltage fluctuation, must also be taken into cognizance about the much needed crisis management in those days. Without those IPP plants load-shedding would have crossed 600 MW in the summer months of FY 2000 and FY 2001.

15.14 Contrary to the general belief, slow growth in power output has not been a major problem of the sector. Rather the system loss continued to remain as the number one culprit. Ideally, had there been no non-technical loss (of say 20.25 per cent), the power supply situation would have been more comfortable to the legal customers. The data and information in this regard indicate that there has been quite a satisfactory growth over the years. For instance, generation of electricity in 1976-77 was 1618 GWh with per capita energy consumption of only 12 kWh. In 1996-97 (20 years later) shortly before the induction of IPPs in Bangladesh, it had risen to 11,857 GWh with per capita consumption of 76 kWh. In 1976 -77 electricity had reached to 295 thanas (later Upazilas) 1424 villages, 410 huts and bazars and 1280 irrigation pumps; by 1976-77 it had covered 443 upazilas, 3017 villages, 1581 hats and bazars and 19,774 irrigation pumps. Given the funding limitations and donor withdrawal mainly on account of poor management and financial indiscipline, this was not an unsatisfactory performance. Apart from extension of power network to almost all upazilas and more villages, it had spread to more rural growth centres and commercial and business focal points like huts and bazars. Equally, if none more, important were the very rapid extensions of power for irrigation pumps (almost 15 times) resulting in savings in the consumption of imported diesel.

15.15 While the generation was being augmented along with distribution, the *volume* of system losses and account receivable was increasing manifold, causing financial *collapse* of the power sector. One can well imagine the monetary loss when, say, 35 per cent system loss of 1618 GWh is compared to the same percentage of 11,587 GWh. To add to the financial miseries of BPDB and DESA's *account receivable*, which under donor pressure and some strict monitoring had been brought down in the early 1990s has now reached over 12 months. All these losses put tremendous pressure on the public exchequer. Again while power generation was increased, the load-shedding, instead of going down, kept on worsening. For instance, in 1988-89 there was load shedding on 29 days covering 51 hours, whereas in 1996-97 it occurred on 310 days covering 2870 hours.

15.16 Instead of improving both financial and management performance, additional generation capacity has been opted for, which is the most lucrative for decision makers. The IPPs (the already completed Barge Mounted Plants of 330 MW capacity) where average tariff is around 5.1 US cents per kWh (as against then prevailing 6.5 to 7 US cents per kWh in India and Pakistan respectively) but higher than combined cycle plants at Haripur (360 MW) and Meghnaghat (450 MW) have brought in the factor of payment in US dollars. The payment of tariff in foreign currency has already become a burden, and will have much higher financial impact by 2003 when the total IPP generation would reach around 1140 MW from four IPPs.

15.17 Incidentally, as a rule of thumb, 100 MW simple cycle (Gas Turbine) plant used to cost about US \$ 100 million even in the late 1980s, which has now drastically gone down to US\$ 30-35 million (less than one third the cost) including installation. Government did not even consider allocating US \$ 50 million/annually for five years for procurement of power plants but merrily continued allocating US \$ 500 million annually for import of crude oil and petroleum products. If the government did consider a reduced allocation of, say, US \$ 450 million (instead of US \$ 500 million / year), and allocate the saving of US \$ 50 million to the power sector, the power scenario would have been different altogether.

15.18 The growth in power consumption has been more rapid than the growth in population. The extension of electricity, even in the rural areas, has not been unsatisfactory either. But the failure to address the chronic mismanagement and corruption in areas like sales, billing and collection together with non-upgradation and non-rehabilitation of the power system has fielded more negative results. Financially, the power sector's performance is worse than ever before.

15.19 It may be interesting to note that the amount to be paid to contracted IPPs for purchasing electricity on an annual basis would be as under :

Annual payment upto 2006 BMPP contracts are for 15 years, while land-based plants are for 22 years.

Sl. No.	Name of IPP & Location	Energy Purchased M kWh	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total
1.	KPCL, Khulna	578							
2.	NEPC, Haripur	578							
3.	Westmont, Baghabari	551/715							
4.	AES, Haripur (360 MW)	111/2200							
5.	AES, Meghna ghat	2750							
6.	RPC, Mymensingh	573							
Total =			94.4	136.6	151.5	162.7	179.6	179.6	904.4

Source : BPDB, IPP Cell, 14 August, 2001

15.20 The entire issue of IPPs should therefore, be subjected to an in-depth financial and economic analysis along with the recent procurement proposals (generation plants) under the suppliers credit.

16.0 The Hard Decisions

For optimized exploitation of the power sector and also to firm up the gas reserves and their utilization a *consensus* needs to be arrived at (between the Government and the opposition political parties) within 100 days of the assumption of Government on critical matters relating to :

- i. Reforms and Regulatory Commission.
- ii. Gas *reserve estimate* of all 22 discovered fields through internationally known independent specialized company.
- iii. A decision on *gas-export-moratorium* for 5 years until 2006.
- iv. *Reserve Management and Depletion Policy* of gas supply.
- v. Installing more Power Plants in the Western Zone (in the ratio of 80:20) during the next 5 years.
- vi. Initiating Regional cooperation in the Energy Sector.

