

EFFECTIVE MANAGEMENT IN POWER SECTOR AND ITS IMPLICATION FOR NATIONAL SECURITY

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INTRODUCTION

In the modern age, we are primarily dependent on power. Efficient and affordable power supply is essential for rapid economic growth and poverty reduction. Industry and commerce need accessible and reliable electricity. Households need reliable and reasonably priced electricity to realize their full socio-economic potential and attain decent living standards. The coverage of electricity in Bangladesh is limited to only one-third of the population. Electricity consumption grew at an average annual rate of 8.1% during the last ten years. Identical growth in electricity demand is expected to continue in next decade.

The country inherited a weak power generation and distribution system. In recent years, power generation within the country has been a victim of inefficient leadership, over-centralization, corruption and greed. The net countrywide system loss is probably among the highest in the developing world. The system is also characterized by heavy losses and poor collection performance. Maintenance of generating units has been ignored grossly resulting in unscheduled shut downs of units causing acute power shortages. The power sector cannot attain optimum production due to frequent breakdowns of power generation plants. The cumulative effect is gross shortage of power coupled with frequent interruptions of power and random load shedding.

In Bangladesh, demand for power has always outstripped supply. Generation of power cannot keep pace with requirement. The current net generating capacity is about 4120 MW as against an installed capacity of over 5000 MW, while peak demand is about 4832 MW. To cope with the situation, private participation in power generation capacity was encouraged in the 90s. The government announced an incentive-oriented energy policy to attract private investment and participation in the power generation sector. Unfortunately, the policy met formidable obstacles causing the power shortage to peak.

For sustained economic growth, availability of uninterrupted power is essential. Power is thus directly linked to national development. However, the power sector escapes notice until one faces scarcity of it. As a matter of fact, per capita power consumption is an index of the level of development of a country and testifies to the living standard of the people. With 145 million people, Bangladesh is the world's most densely populated country. Here 975 people live in one square kilometer area. With 75% of its population concentrated in rural areas, Bangladesh has amongst the lowest per capita power consumption in the world.

The Government is, at present, locked in bitter recrimination, primarily on the tariff issue. The unreasonably high tariff is the result of problems at the planning,

policy, institutional and operational levels. As a result, the financial capacity of PDB has been crippled with a consequent adverse impact on the already fragile economy of the country. This has led to demonstrations, strikes, violence, low production and in some cases, closure of industries. The cumulative effect has affected the overall security of the country.

The term ‘security’ has different connotations in different fields of human activity. Currently, security is more linked to the economy, poverty and the level of development in the case of developing countries like Bangladesh. The emphasis is now on the flow of vital economic resources of national state functions and in today’s world the vital economic resources in energy, agriculture, industry, trade etc. Hence, there is an urgent need to address this issue at the national level.

NATIONAL SECURITY

In the modern world, security has become a multidimensional concept and is to be addressed as the collective aspiration of citizens. Threats are no more seen as restricted to the military domain. Physical protection and psychological freedom must be addressed. National security now relates to the protection of citizens; economic, cultural and ecological as well as military aspects must be addressed. A nation can be secure when it is economically developed, politically stable and socio-culturally cohesive. This transformation of the concept of security basically entails a broad shift from traditional ‘state and military’ centric ideas to ‘people’ centric ones.

Determinants of Security

Food, energy and environment are prime determinants of security. Financial stability along with technological upkeep is also a critical element of national security. To establish credible armed forces, there is a requirement to commit huge resources through economic and technological activities.

Security in the Energy Spectrum

History of civilization demonstrates the growing consumption of per capita energy. The basic principle of energy security is to ensure the supply of adequate energy to meet the demands. Insecurity arises due to the failure of supply with respect to time, availability and purchasing capability. Energy insecurity leads to a number of vulnerabilities and adversely affects the national economy. Therefore, energy security is an important dimension of national security.

Vulnerability of Energy Insecurity and its Alternative

Energy insecurity can be due to uncertainty arising from social, political, financial or military reasons. If the supply depends upon foreign sources, it is

then a matter of real concern. Energy insecurity may occur at different levels; individual, household, community, national and even global. After the Arab Israeli war of 1973, the whole world ensured an energy crisis. Bangladesh had also to suffer then from the shortage of kerosene.

Long term sustainable development in the energy sector requires a gradual shifting towards renewable sources of energy. Bio-gas technology is a cheap option. Bio-gas generation based on disposal waste of animal husbandry, agricultural residues, human excreta, and poultry dropping is an environmental friendly technology. The gas generated from a bio-gas plant can meet the fuel requirement of cooking without causing any environmental problem.

About 39 million tons of organic matters are burnt in Bangladesh every year. As a result, community and public forestry are being depleted at an accelerating rate creating environmental and ecological problems. Natural gas deposits in the country are limited and can meet energy demand for only 20 years or so. At present, Bangladesh meet 46.15% of its energy needs from agricultural residue, 10.5 % from fuel wood and 33% from tree residue. Use of bio-gas can reduce energy deficit by 15 %.

POWER SECTOR IN BANGLADESH

Evolution of Power System

At the time of partition, power generation and distribution were in the hands of some private companies. Power used to be supplied to most districts at night, with Bhola being the one exception. There were no long distance transmission lines. In aggregate, the generation capacity of the country was only 21 MW.

In 1948, the Electricity Directorate was created to plan and improve power supply situation. WAPDA was created in 1959 and subsequently merged with the Electricity Directorate in 1960. The basic philosophy was to give more autonomy to this organization for development of basic infrastructure. At that time, plants with relatively higher capacity were built at Siddhirganj, Chittagong and Khulna. At the same time, Kaptai dam with unit size of 40 MW was constructed by the Irrigation Department. The construction of Dhaka-Chittagong 132 KV transmission line was also initiated then.

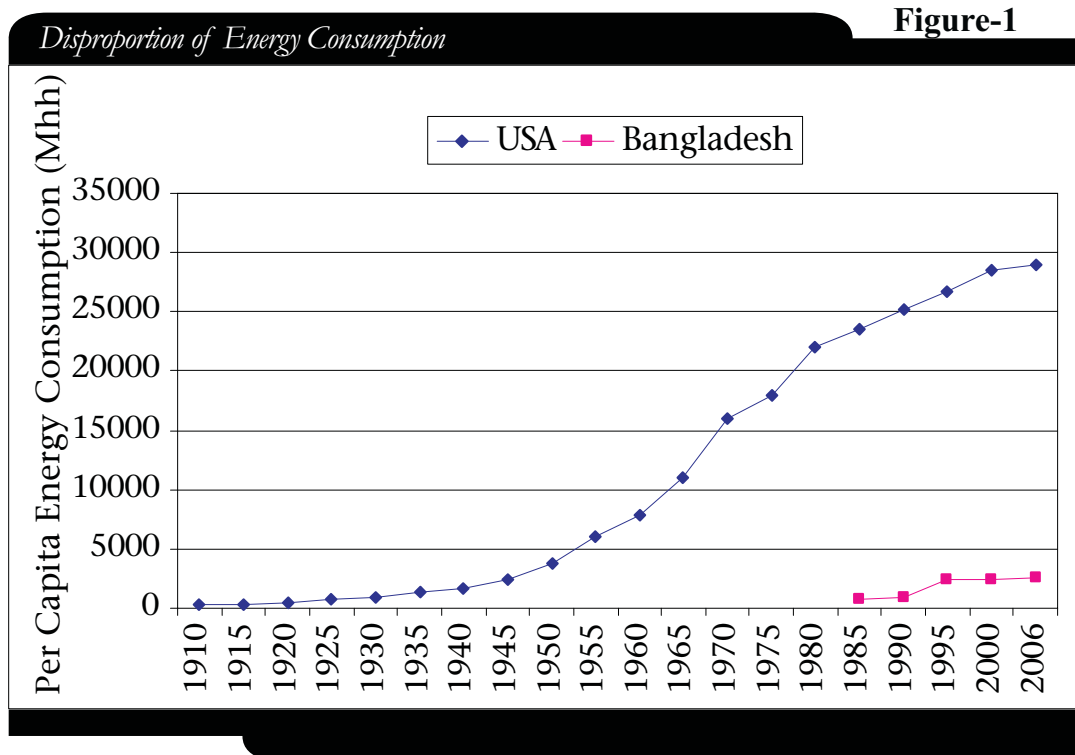
In 1972, BPDB was created as a public sector organization to boost the power sector. In mid 70s, the government emphasized on the need for rural electrification. A comprehensive scheme was undertaken to arrive at this goal. As a result, the government created REB in October 1977. Later in 1991, DESA

was created to improve the distribution system in and around Dhaka and bring about improvement of customer service and collection of revenue and lessened the administrative burden of BPDB.

Since the inception of REB, 67 PBSs have been established, covering almost 90% of Bangladesh. Over 34,000 of a total of about 64,000 villages have been electrified and almost 4 million connections have been given. PBSs are keys to the electrification strategy of the REB. REB has resulted markedly in lower system losses in distribution and its system is better than either BPDB or DESA. REB has also shown superior performance in terms of bill collection.

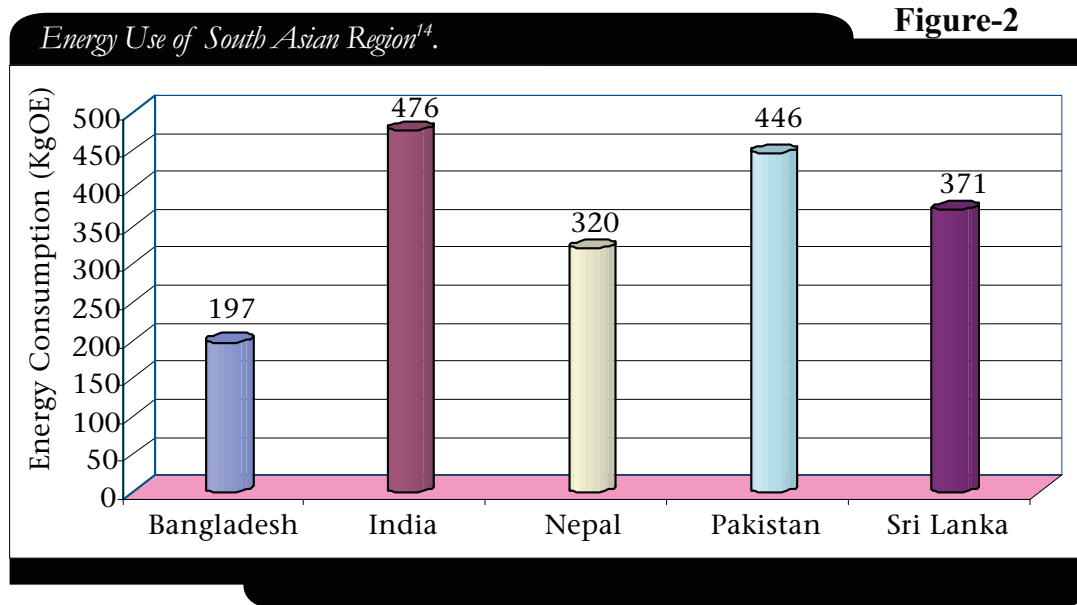
Energy Use Scenario in Global Perspective

Since industrial revolution, global use of energy has betrayed enormous disparity between developed and developing countries since the industrial revolution. 70% of world population, for example, in developing countries account for less than 30% of global energy consumption. In contrast, the USA alone with only 5% of the world's population consumes 26% of the world's energy. On an average a person from a developing country consumes less than one-tenth of a US citizen. In fact, the energy content of food eaten by an average North American is more than the total energy used by a Bangladeshi for cooking, lightening, transportation, industry, agriculture etc.

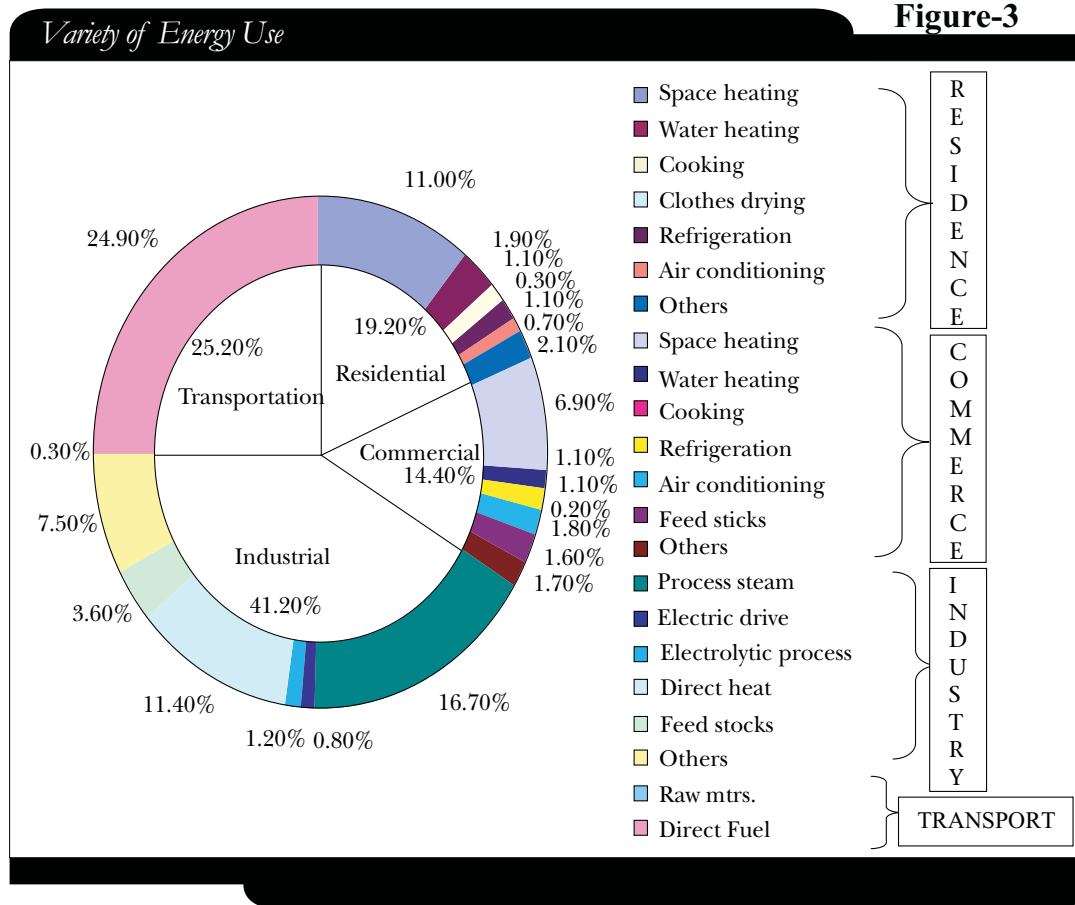


Energy Use – South Asia and Bangladesh

The per capita energy consumption in Bangladesh is the lowest in the South Asian region. Even after the discovery of 22 gas fields and one oil field, the country cannot provide energy security to her people. Only 10% people enjoy pipeline connection of gas to their kitchen and less than 30% households are connected to electricity. The per capita energy use is shown in Figure 2.



Food, shelter, health and education are basic human needs, all involving energy input. Energy is required for cooking food, construction and maintenance of houses, production of weather-appropriate clothing, providing sufficient and safe drinking water and maintaining a healthy environment. Forms of energy utilization in human life are shown in Figure 3.



Energy Resources

In Bangladesh, energy resources are neither adequate nor varied. Natural gas, petroleum products, coal and hydropower are used to produce electricity, of which petroleum products are being imported at a high cost. Electrical power generation from 1996 to 2005 by various fuels is shown in Table 1. The contribution from GFUs, LFUs and HUs are 87.33%, 6.67% and 6.0% respectively though the available capacities are about 83.03%, 10.17% and 6.80% respectively.

Table-1

Generation of Electricity by Various Types of Fuels.

Year	Total (GWh)	Gas		Liquid Fuels		Hydro	
		GWh	O/O	GWh	O/O	GWh	O/O
1996	10806	9512	88.03%	922	8.53%	372	3.44%
1997	11474	9994	87.10%	741	6.46%	739	6.44%
1998	11858	10021	84.51%	1118	9.43%	719	6.06%
1999	12882	10896	84.58%	1121	8.70%	865	6.71%
2000	13872	12278	88.51%	761	5.49%	833	6.00%
2001	14318	12603	88.02%	688	4.81%	1027	7.17%
2002	16653	14535	87.28%	1148	6.89%	970	5.82%
2003	18221	16561	90.89%	980	5.38%	680	3.73%
2004	19178	17173	89.55%	1168	6.09%	837	4.36%
2005	20820	18531	89.01%	1486	7.14%	803	3.86%

Power Generating Units

As on June 2007, BPDB had a total of 70 generating units with capacities ranging from 02 MW to 360 MW. Total installed capacity as of 23 April 2007 was 5167 MW including IPP (BPDB - 3907 MW and IPP - 1260 MW). Total 15,417 Gwh gross energy was generated in public sector power plants managed by BPDB. In addition, total 8286 Gwh of energy was purchased by BPDB from IPP. The transmission network of BPDB is 3919 km long comprising 230, 132 and 66 KV lines. The total numbers of grid sub-stations are 7 and the capacity is 13,309 MVA.

Table-2

Sharing of Power Plants by BPDB & IPP18.

Owned by	No. of Units	Installed Capacity		Available Capacity	
		MW	%	MW	%
BPDB	58	3907	75%	2056	63%
IPP	12	1260	25%	1220	37%
Total	70	5167	-	3276	-

It is a matter of great concern that although 30% (1560 MW) of existing generators have already crossed their service life of 20-25 years, but they are still in use; indeed, 11 % generators will terminate their life in the next three years. These ageing generators cannot produce rated electric power. Consequently, forced shut downs are common, lowering the available capacity and creating power shortfalls.

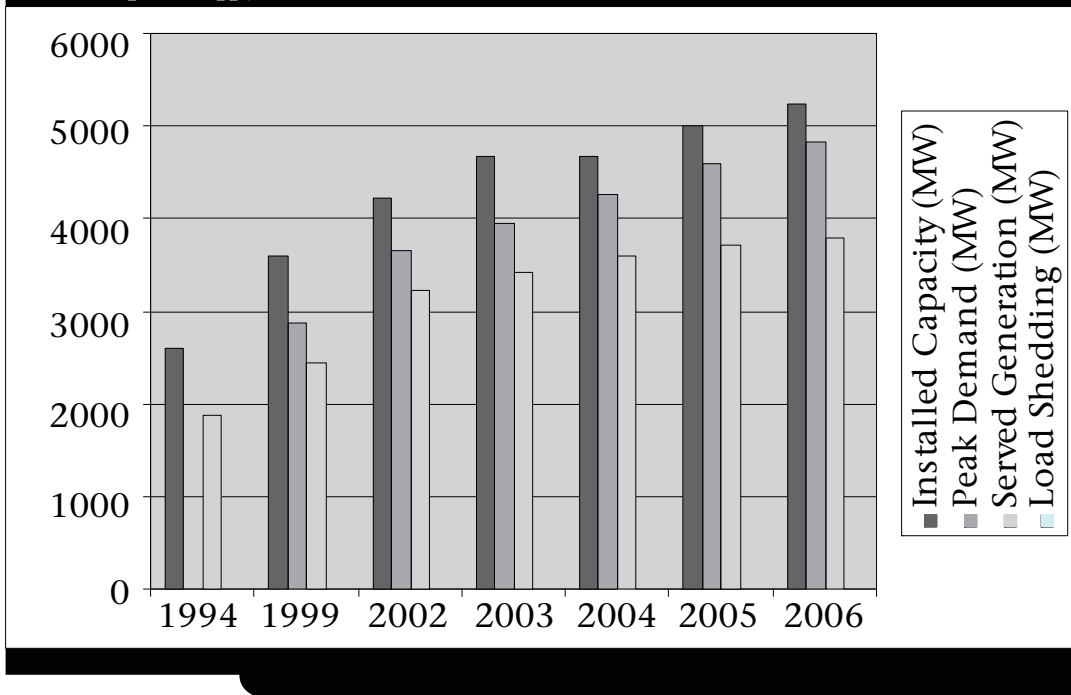
Demand versus Supply Growth in the Country

Electricity demand increases by 250-300 MW per year. National demand for power has increased manifold. While demand has been growing in absolute terms, availability and growth of electricity generation has been negligible. The inverse equation is best demonstrated by the fact that while demand has grown by over 2000 MW between 2001 and 2006; actual supply has grown by only 80 MW. Ideally, the minimum capacity to be installed in a year should be the MW to be phased out that year plus the yearly incremental MW.

Item	1994	1999	2002	2003	2004	2005	2006
Installed Capacity (MW)	2608	3603	4230	4680	4680	4995	5245
Peak Demand (MW)	-	2881	3659	3947	4259	4597	4832
Served Generation (MW)	1875	2449	3217	3428	3592	3720	3782
Load Shedding (MW)	23-500	16-774	5-367	5-468	2-694	7-770	29-1050

Figure-4

Trend in power supply and demand



Energy requirements have to be assessed in the light of continuing and chronic shortage of power and distressingly low per capita consumption. Only around 30% of the population (50% in urban areas and 15% in rural areas) has access to electricity. Thus, power availability must be increased urgently to meet the growing demand. Unhappiness amongst the people due to shortfall of electricity has made the PDB face trouble repeatedly in recent times.

Another major problem facing the power sector is lack of regulation. The tariff rates for the non-productive domestic sector are lower than that for productive sectors like industry and agriculture while efforts have been directed towards improving the supply situation, while the “demand regulation”, a vital ingredient of comprehensive and cost effective planning has been completely ignored. This has also encouraged the high rate of growth in the domestic sector.

POWER SHORTAGE: CAUSES

The total generating capacity of East Bengal, in 1947, was a mere 21MW, all of it privately owned. After 60 years, total installed capacity has increased to 5245 MW, an increase of more than 250 fold. Though an impressive achievement by international standards, per capita consumption of electricity in Bangladesh is, in effect, extremely low. There is a wide gap between demand and

supply of electrical energy. This gap has been increasing due to non-existence of a comprehensive and compatible plan. Shortage of power hinders overall development of the country to a great extent. The power sector has ended up in this situation due to various reasons.

Organizational Weakness

Electricity Distributions and System Loss. Power sector is incurring high losses in the distribution system. Theft and pilferage of electricity at the user end level are the root causes of high system loss. Employers and a significant number of customers have teamed up in an unholy alliance. Unless radical reforms and restructuring are taken up in this sector, it will be very difficult to provide energy security to the country. As a matter of fact, no technical explanation can account for the 22% system loss in the power distribution system. System loss for technical reasons should at best be 5% as per International Standard.

Lack of Supervision. The number of illegal connections is enormous though no one knows the actual figure. Theft also takes place by way of tapping distribution lines, bypassing meters, 'fixing' meters, and free misuse of electricity supply by BPDB employees. High-tension consumers, particularly textile mills, jute mills and chemical plants, often remove fuses from instrument transformers in order to disable energy meters. The cumulative effects pose great hindrance in providing electricity to 145 million people of Bangladesh. If this impediment cannot be overcome, only generating power will not suffice in providing energy security.

Inadequate Maintenance of Power Plants. There have been gross irregularities in the maintenance and setting up of new power plants. Experts are amazed that some of the existing power plants are still operating and generating power. Any power station, according to manuals, needs major overhauling every three years. Unfortunately, most power plants of the country do not undergo such overhauling even in six to seven years. As overhauling requires complete shut down of the plant, authorities have been reluctant to undergo such procedures as that would cause load shedding of great magnitude. And so the ageing power plants continue to operate, albeit in fits and starts.

Technological Backwardness. The Energy sector is closely related to technology. Almost all projects in this field are dependent upon foreign technology and expertise. Since its inception, Bangladesh has not been attentive to the needs of a knowledge based economy and has not developed techno-based manpower. Even after three decades of independence, foreign experts have been summoned for very simple decisions. The size of energy sector organizations has expanded

both vertically and horizontally although quality work is absent. As a result, the problems cannot be solved instantly on indigenous capacity.

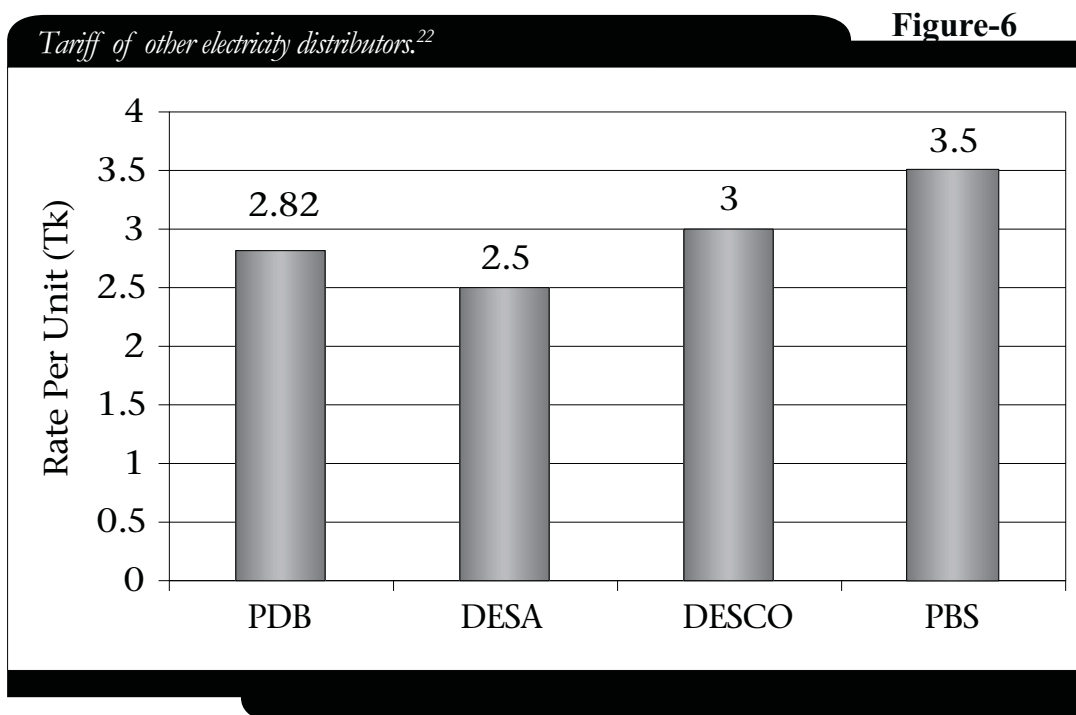
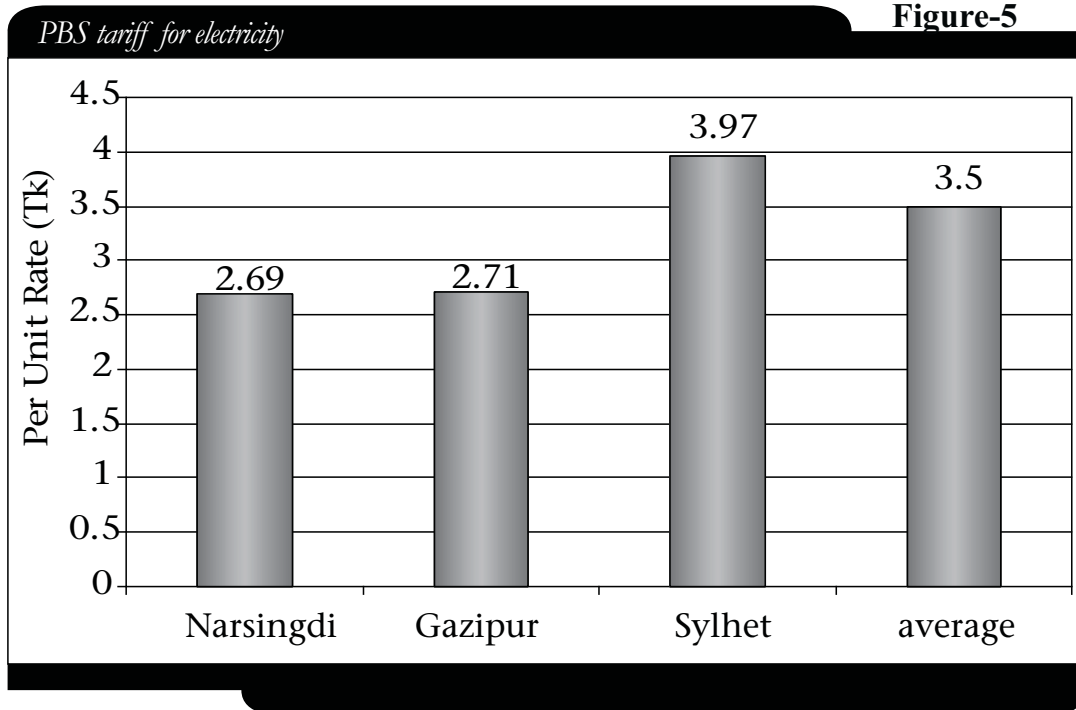
Operating Inefficiency. The power sector is not in good shape as far as operating efficiency is concerned. It requires considerably more employees per customer served than is the case in many other countries. According to unofficial statistics, 40% of the 6000 or so DESA employees do not work regularly or at all. In addition to their regular wages, many workers collect overtime money, part of which finds its way into the union's coffers. The country has been unable to establish tariff structures and billing procedures that could enable the power sector to be financially self-supporting. The resulting losses require subsidies from government or donor agencies that divert revenue away from other important programmes. This problem has afflicted the Bangladesh power sector entities in varying degrees.

Unprofessional Conduct in the Sector

There have been gross irregularities in management. Electricity tariff continue to be higher in some cases than rates prevailing in regional countries. Consumers facing high electricity bills relative to their income are tempted to get their bill totals reduced by bribing meter readers, billing clerks, and account keepers.

Unjust Stances. 75% of the country's population live in rural areas. But adequate attention has not been paid to meet the energy needs of rural people. Next to food and water, rural people struggle for cooking. Unplanned use of bio-fuels has been contributing to environmental degradation. Moreover, production cost in rural areas is also high due to higher cost of energy. As a whole, only 15% rural people have been connected to electricity. Although rural electrification programme has made positive contribution to some targeted areas, large number of households within a designated area can remain beyond electric service.

Disparity in Charging Electricity Bill. The per unit PBS tariff for electricity at Narsingdi is Taka 2.69 and Taka 2.71 at Gazipur. Surprisingly, the same unit costs Taka 3.97 at Sylhet. On the other hand, the per unit electricity tariff of PDB's electricity is Tk 2.82 on an average, DESA's and DESCO's tariff is Tk 2.50 to Tk 3, but rural people pay Tk 3.50 on an average. As a result, variations in electricity bill within the same country cause discontent resulting in demands for fair treatment by the government.



Discrepancy of Zones.

- a. **Energy Security for West Zone.** In Bangladesh most of the known commercial energy resources are located in the East zone of the country covering the geographical areas of Chittagong, Sylhet and Dhaka Division (excluding greater Faridpur district). The ratio of electricity generation of the East and West zone is 9:1. The production cost of electricity in the Western Zone is about 6 times than that of the East. The vast majority of electricity consumption also takes place in the east. The entire west zone accounts for only 22% of the total consumption. Greater Dhaka alone consumes around 45% of electricity from the national grid. Economic development activities of the east zone got momentum due to secured energy supply. On the contrary, development activities of the west zone have been considerably constrained due to energy insecurity.
- b. **Energy Security of Coastal Area and Offshore Islands.** The coastal area and offshore islands of Bangladesh lack energy security. Electricity is a dream in many places in coastal belt and islands. The situation worsens after a tidal surge or cyclone. So the challenges of energy security for these areas are severe in nature.

Ineffective Administration. Both BPDB and DESA are hostages in the hands of union leaders whose sinister influence reaches every section of the organization. They dictate what can or cannot be done in matters of posting and transfer of officers, award of small contracts and settlement of the financial claims of contractors and suppliers. Union leaders collect overtime money in addition to regular wages, part of which finds its way into the union's coffers. About 30% of the staff are active participants in union activities. Very few officers dare challenge the unions' illegal authority for fear of bodily harm, knowing that support from the head office would not be forthcoming.

Corruption in the Sector

The number of new 'Jamuna Bridges' that can be built from the savings arising from the reduction in 'system loss' in the power sector may be a somewhat contentious issue. What is more relevant to BPDB today is how much generation capacity it could finance out of its own resources by plugging some of its revenue and expenditure leakage. At a rough estimate, a 10% reduction in system loss would yield Tk 3 billion in savings, sufficient to add to the system 200 MW of simple cycle gas turbine generation every year. Alternatively or additionally, a mere 5% reduction in inefficiency would yield Tk 750 million, sufficient to add another 50 MW to the system, thereby raising total additional generation capacity by 250 MW. In one year, the current power crisis of greater Dhaka could

be tackled and in two years, the shortage of generation capacity in the entire country could be put right.

Genesis of Corruption. Corruption in the power sector did not assume serious proportion until after the independence of Bangladesh. In 60s, electricity theft was significantly more widespread in West Pakistan than in East Pakistan. Suspicions about corruption were mainly focused on purchase and construction contracts relating to power, and not so much on execution of large projects. As shame and remorse once attached to corruption gradually vanished and certain sections of employees became gradually emboldened under protection of their CBA, corruption spread to the wider sphere of BPDB's activities and cases once confined to only subordinate staff extended to other sections.

Causes of Corruption. Scarcity increases the opportunity cost of any service and provides opportunities for corruption. The acute shortage of generation capacity and its consequent effects, frequent load-shedding, low voltage and low frequency led to many types of corruption. The most pernicious phenomenon nurturing corruption is the so-called system loss which involves the theft of a substantial volume of electrical energy. What was initially a minor issue became gradually more serious due to the neglect in enforcing discipline at a time when things were still under control. With no disciplinary actions forthcoming, delinquent power sector employees developed the attitude of having the "right to steal". The BPDB employees have been an active party to system loss, causing huge revenue losses and undermining financial viability.

Corruption in Getting Connection. Getting an electric connection from BPDB/DESA is a difficult process, involving hassles, delays and, for the average consumer, bribery. The application form for a service connection asks for details of property ownership, lease deeds and, for industrial connections, clearance certificates from the Fire Department and the Health Division are also needed. It is easy to find faults in the dozen or so attachments, unless appropriate palms are greased. Six signatures of various officials are required for the approval and the time involved for moving the case is inversely related to the amount of gratification paid.

Corruption in Procurement. Major corrupt practices in large contracts take place outside the organization, which is indicated to be the ministry. The existence of minor vices at different levels of BPDB is also a common phenomenon. The rate of corruption is over 20% of the value of procurement contracts, although in limited cases it is reportedly as high as 30%.

Analysis

The significant causes of corruption in BPDB/DESA are:

- a. Absence of significant anti-corruption drives and court actions against corrupt employees. Instances of departmental inquiries or disciplinary actions against lower grade employees are absent due to the supposed or real fear of retaliation by trade unions.
- b. Centralization of decision-making powers with respect to procurement of capital equipment in the hand of political governments who are less accountable and controllable in comparison to BPDB/DESA officialdom.
- c. Unnecessarily stringent and lengthy procedures for getting connection.
- d. The acute shortage of generation capacity and consequent scarcity of electricity, which has opened up many opportunities for corrupt transactions.
- e. Inadequate special magistrate courts and mobile courts to handle cases.
- f. Vested interests inducing illegal gains.
- g. The maintenance of the status quo benefits many vested interests. Conscientious officers eventually fall in line with the system, some perhaps joining it, when they discover that the known culprits enjoy the protection of powerful godfathers, some of whom surface as lawmakers.

SHORTAGE OF POWER: ITS CONSEQUENCES

Impact on Economy

There is no escape from the globalization. The entire world is turning into an open market. Attaining high productivity, efficiency and competitiveness is a must. A nation's economic emancipation greatly depends on the development and use of energy sources. Electricity is the prime energy source for industrial and other socio-economic development. Unfortunately, electricity generation in the country presently benefits only 30% of the total population. Moreover, frequent and prolonged load shedding causes hamper to industrial production and disrupt economic activities.

Extensive recourse to captive power by export-oriented industries raises production cost and reduces export competitiveness as well as productivity of personnel. It causes time loss, and compels users to use expensive alternate sources of energy thus leading to negative impact on the environment. According to WB estimates, the load shedding and black outs cost the economy almost US\$ one billion per year. Canadian consultants have revealed that every unit (Kwh) of load shedding costs a minimum of Tk 25 - 30 to the economy of the country.

Loss of Production. This is a fast-moving world. Bangladesh needs to move fast to compete in it. Her exports are price-competitive in relation to countries like China, India and Vietnam, owing to the fact that labour costs are substantially lower. But Bangladesh loses out badly on “time-to-market”: lead times are 90-120 days, compared to less than 90 in India, or 50-60 days for Asian benchmark competitors. The unreasonable time is high due to power interruption, political unrest and bureaucratic complexities. As a result, garments industries which have investment of 8 billion US dollars are hampered. Production in hundreds of export-oriented industries in the country has dropped to a low level resulting in a huge loss to the economy. The situation can be summarized thus:

- a. Export-oriented industries experience loss of nearly Tk 10 crore on an average per day.
- b. Shrimp export and fish preservation companies have been affected due to extreme power crises in the Khulna, Barisal and Chittagong regions.
- c. Frequent power outages have affected other electricity based industries negatively.
- d. Irrigation has been causing food grain shortages. Irrigation connection in 2006 had to be stopped, resulting in less crop production.

Foreign Investment. A foreign investment is a key to bringing the technology, modern management systems, finance and access to markets. On paper, Bangladesh can boast of having the most liberal investment regime in South Asia. To exploit it many foreign investors have showed considerable investor interest in mid-1990. Unfortunately, that enthusiasm has died down. The impediments to investment extend far and deep owing to the critical constraint of infrastructure. Bangladesh is the most power scarce country in South Asia, and unreliable power supply is often seen as a big ‘negative’ for the investment climate. Given the importance of adequate power supply for economic growth and poverty reduction, donors have been keen to help in the sector but to little avail. New generation plant construction has been delayed by a consistent pattern of questionable tendering and re-tendering. As a result, generation of power remains far below requirement.

Reduction of GDP Growth. Energy plays the role of prime mover for the flow of vital economic resources contributing to GDP growth. The situation in garments industries is grim due to continuous load shedding. The BGMEA President has unsuccessfully demanded supply of power for five to ten hours everyday on a rationing system to keep production uninterrupted. However, the table below can substantiate the situation.

Table-4*GDP growth rate in Bangladesh³²*

Year	GDP – real growth rate	Rank	Percent Change	Date of Information
2002	4.40 %	51		2002 est.
2003	5.30 %	48	20.45 %	2003 est.
2004	4.90 %	84	-7.55 %	2004 est.
2005	6.40 %	50	30.61 %	2005 est.
2006	6.10 %	62	-4.69 %	2006 est.

Damage of Equipment. Innumerable electric motors used in irrigation pumps have been burnt due to frequent power interruptions. Abrupt power failures have also rendered a good number of medical equipment at public and privately-owned health and diagnostic centres inoperative. Costly medical equipment have become dysfunctional; 349 registered privately owned clinics in Dhaka and 811 in other parts of the country have been affected by power interruption. The loss incurred in household equipments is even greater although proper statistics have not been produced in this case.

Impact on Society

Frequent load shedding has made the lives of common people miserable. Power shortage creates problems in social sectors; affects students, increases criminal activities, affects water supply and sanitation services, disrupts vital life saving medical services, etc.

Human Sufferings. The elite who live in cozy apartments and shopping malls have their own generators and therefore suffer from interruption of power supply. The rich people can afford to have IPS, UPS and generators to provide them with electricity when load shedding strikes. But the poor and marginalized middle classes neither have the purchasing power nor the capacity to buy diesel regularly for generators. Thus sufferings are enormous. Below are listed only a few:

- a. The water supply drops drastically due to the power crisis while other power-based activities get stalled, multiplying the miseries of city residents.
- b. The situation is so acute that patients in different parts of the country fail to get their diagnostic reports in time. In most cases, they have had to wait for long in diagnosis centers due to the frequent load shedding.
- c. Life-saving drugs can also become ineffective leading to loss of human lives, especially in rural areas where load shedding is higher.

- d. Many patients fail to have dialysis in time because of water crisis and some have to leave hospitals without treatment.
- e. Sufferings worsen in hospitals located in multi-storied buildings as lifts and escalators become dysfunctional due to power outages.

Social System. Power outages have also had an adverse impact on safety and security systems. Outages make hospital unsafe for patients, attendants and even the staff. A number of cases have been reported in which people, including doctors, were robbed of cell phones and other valuables in hospital premises. Black outs enable hijackers to conduct anti-social activities. People feel insecure to move after sunset despite urgent need.

Impact on Poverty Alleviation. Energy use has had a direct link with poverty reduction. Access to modern energy has significant effects on the poor in terms of time and effort because of the reduced need to gather bio-mass fuels. This allows diversification of labor and results in increased individual productivity. Generally, the poor spend a much higher portion of their income on energy than the rich. Thus, poverty reduction measures are influenced by the availability of modern forms of energy, particularly electricity. Lower income households spend higher proportion of their income to meet the energy needs. Lower income households are supposed to use inferior type energy sources (fuel wood, straw rice husk, dung and trash etc. for cooking and kerosene for lighting).

Environmental Degradation. At present Bangladesh meet 46.15% of its energy need from agricultural residue; 10.5% from cow dung, 12.9% from fuel wood and 33% from tree residue. This means that to meet our energy need we are depriving ourselves of organic fertilizer and creating environmental imbalance by deforestation.

Cumulative Effects on Society Due to Shortage of Power

Human security is of central importance for a nation. The history of the last two hundred years confirms beyond doubt that the foundation of a modern nation lies on the social and economic well being of its people. National security ensures flow of vital economic resources contributing towards the GDP and the overall development of the country.

Load shedding and power failure is a recurring phenomenon. On paper, the progress made in the field of power generation is impressive and commendable. In reality, it is far from being even satisfactory. Consumers experience two spells of load shedding every year, one during January and early February and the other from mid-April to mid-July. The peak shortage is to the tune of 1000 MW to

1500 MW. This necessitates extensive load shedding, ranging from 4 to 5 hours for domestic consumers in larger cities and up to 16 hours daily in far-flung rural areas. The situation warrants immediate intervention but initiative on the part of the government is absent.

COMPREHENSIVE POWER MANAGEMENT: WAY OUT

Efficient and affordable power supply is essential in Bangladesh for rapid growth and poverty reduction in Bangladesh. Industry and commerce need accessible and reliable electricity to conduct business and expand economic activities. Households need reliable and reasonably priced electricity to realize their full socio-economic potential and ensure a decent standard of living. For mechanized irrigation, farmers rely more on diesel than on electricity. To address the situation, projected load is imperative to take into cognizance.

Projected Load Growth

To cope with the present trend of power demand, an ambitious range of 10-20% total annual growth and retirement of existing plants should be set up. The cost of such plants is 4 crore/MW, while the cost for grid and transmission is another 3 crore/MW. Thus generation and distribution of 1 MW electricity will cost 7 crore. Bangladesh has to go for immediate construction of minimum 3200 MW of generation to meet power requirements up to 2011 at the cost of Tk.42,350 crore.

Table-5

Anticipated growth rate of power and corresponding cost

Year	Peak Demand (MW)	Generation	Shortage against peak demand	Construction cost (Tk)	Growth & Retirement % from 2007
2007	5500	3000	2500	17500	10
2008	6250	3100	3150	22050	25
2009	7250	3200	4050	28350	45
2010	8250	3200	5050	35350	65
2011	9250	3200	6050	42350	85

Managing the Crisis

Procrastination on the part of BPDB and the government has led to the gradual worsening of the power crisis. We have no alternative then to fully implement the aforementioned projects which require a lot of foreign currency. Thus the possibility of installing such power plants is quiet remote. How, then, should the problem be tackled? It should be made very clear that although the government can do very little at this stage, power consumers can help to a great extent by economizing power consumption. This can be achieved by adopting various measures.

Immediate Measures

- a. **Curbing Corruption.** Before embarking into any actions, sufficient funds are to be made available for “golden handshakes” to all corrupt meter readers, bill clerks, and inefficient supervisors whose assets do not match their legal income in order to clean the slate in one go. Simultaneously, disconnection drive must continue with heavy penalty. These measures will save at least 10% of total electricity production (300 MW).
- b. **Ad hoc Arrangements of Staff.** Until new meter readers, bill clerks, and supervisors are appointed or alternative arrangements made, non-commissioned defence officers should be employed for meter reading and billing in order to establish a benchmark position.
- c. **Economizing.** Citizens should economize so that other consumers can share power with them. Every household and commercial consumer can help overcome the situation partially by reducing consumption. The government can educate people through programmes designed to teach people to use power economically.
- d. **Holiday Staggering.** The government in consultation with the FBCCI could take appropriate measures for holiday staggering for industries. This will save some power which can be utilized for essential needs.
- e. **Use of Power-saving Bulb.** Most consumers in the household sector use conventional 60 W or 100 W bulbs which can be replaced by 23 W power-saving bulbs or 40 W tube lights. The use of less power consumable blasts for tube lights will lead to the consumption of 25% less electricity, i.e. a 40 watt tube light will consume 30 watt electricity.
- f. **Subsidizing Power-Saving Bulbs.** The government can encourage use of power-saving bulbs and tube lights by helping manufacturers through fiscal incentives to keep prices low so that low-income consumers can also buy them. Local offices of PDB, DESA, DESCO and REB can be utilized to distribute power saving bulbs at a low cost.

- g. Use of Captive Power.** The large number of generators available to the private sector should be utilised for running mills and factories. The generators can also be effectively utilized for public use.
- h. Community Based Private Generators.** Since the electricity supply is unlikely to improve in near future, an alternative system of power supply by small generators can be organized. In rural market areas such system has already been developed on a commercial basis. The changes incurred are rather low, indicating that the system is efficient. System can be expanded by combining community action and commercial operation by private entrepreneurs.
- j. Pre-paid Meter.** System loss, more precisely pilferage of electricity is still a major problem. Introducing pre-paid meters can reduce system loss to a great extent and can also smoother revenue collection. This will improve the financial capacity of the power sector, encourage investment and reduce dependence on external funding.
- k. Use of Industrial Power Saving Device.** Industrial power saving devices are extensively used worldwide. These devices can save as much as 25% power. Plants and industries such as cold storages, central AC super markets, hotels etc can undertake the projects.
- l. Power Plant Improver in the Industries.** 80% of the industrial load is inductive which is about 1135 MW ($80\% \times 47.32\% \times 3000 \text{ MW} = 1135\text{MW}$). This load can be reduced by installing PFI.
- m. Rational Distribution of Power by CLDC.** Zone wise distribution of electric power is to be judicial and implemented systematically with special attention being paid to the areas having irrigation schemes.
- n. Tariff Adjustment.** There is an urgent need for cost-reflective tariffs and mechanisms for addressing inequities and distortions in deriving the benefits of the subsidies through BPDB and DESA. Urban residents are the main beneficiaries of energy subsidies.

Medium Term Measures. Large scale electricity generation requires massive investment and a long implementation period. But some medium-term measures can improve the situation considerably. Medium-term measure could include:

- a.** Adopt effective steps to contain corruption within the sector. If tackled properly, it will add billions of taka to the exchequer of power development authorities which will then enable them to invest more in that area.

- b. Set up an independent body to undertake technical auditing of all installed capacity and also come up with project proposals either for repairs, maintenance or fresh generation units. The regulatory body could be composed of technical experts both in engineering as well as accounting.
- c. Persuade the private sector and the existing PBS to invest in small power plants with generation capacities of between 10 and 15 MW each. Such a step could lead to generation of over 1600 MW within two years.
- d. Install small-scale power companies in rural areas which could also provide employment for landless and marginal farmers.
- e. Enhance efficiency of older power stations by ensuring regular maintenance.
- f. Use bio-mass as an alternative energy. According to one source, the use of bio-gas will reduce the energy deficit by 15%. The gas generated from bio-gas plant can meet fuel requirements of cooking without causing any environmental problem.

Long Term Measure. The energy sector has to be restructured through adoption of macroeconomic concepts. The changes may entail repercussions. Power generation capacity must be increased on a continuous basis, assuming around 10% increase in demand every year. This means that electricity demand will be around 9250 MW by 2011 and 13000 MW by 2016. So, the capacity of electricity generation should be raised 2.5 fold in the next 5 years and 4.3 fold in the next 10 years. To attain these goals, following measures should be taken:

- a. Projects can be undertaken to procure Berge-mounted and Rail-mounted small power plants of the capacity of 20 - 100 MW. About 20 such stations can significantly improve the situation in about four years.
- b. The viability of electrification can be enhanced through decentralized small grids using small gas turbines and solar cells etc. With appropriate technologies local power plants can offer cheaper electricity as transmission losses are avoided.
- c. Consider the financial and strategic implications of nuclear energy by convening a committee of nuclear scientists and economists. Without this measure, we will not be able to attain our anticipated requirements and there will be no poverty eradication or economic development.
- d. The most pressing problems in the power sector have been in the distribution system, which is characterized by heavy system loss and poor collection performance. To make it efficient and effective, its administration must be restructured. System loss in any power distribution system should not exceed 10%, i.e., collection–import ratio should be above 90%.

RECOMMENDATIONS

To date, no government has demonstrated the political will to take on the powerful nexus composed of dishonest workers, corrupt officials in government agencies, opportunist traders, lobby groups and most certainly political leaders. A government having the required political conviction may consider the following recommendations:

- a.** Immediate measures as suggested may be undertaken to improve the situation of the power sector.
- b.** The tariff of all distribution authorities may be enhanced and brought at par so as to remove anomalies in tariff structure.
- c.** All distribution organizations to be converted into limited companies with private sector participation.
- d.** Rationalize the staffing of utility organizations, revise salaries and allowances, making them commensurable with the cost of living, and provide employment on contract basis with the flexibility of hiring and firing.

CONCLUSION

Power generation; be it hydroelectric, thermal or nuclear is a highly technical and complex subject. It requires commitment, political will, vision, perspective planning as well as a large pool of highly skilled electrical and mechanical engineers. The juxtaposition of all these elements can lead to the creation of the necessary infrastructure. Since its inception, Bangladesh has not opted for a knowledge-based economy and has not been able to develop techno-based manpower. Even after the discovery of 22 gas fields and one oil field, the country has not been able to provide energy security to its people.

Statistics indicate urgent need of power for daily life. There is a wide gap between demand and supply of electrical energy. The gap is increasing with the passage of time due to non-existence of comprehensive and compatible plan. Shortage of power hinders the overall development. The unhappiness amongst the people due to shortfall of electricity has brought power management authorities to their knees several times in recent years.

History confirms that the future of a modern nation lies in the social and economic well-being of its people. National security is thus related to meeting all the basic needs and the ability to shield from dreadful mishap. Food, energy and environment are three physical determinants of security. Shortage of power has become so widespread in our society that it affected all areas of public life. It not only threatens our economic security, it also caused dissatisfaction,

disillusionment with the government and thus poses a direct threat to our national security.

Increased generation of power could lead to increased revenue collection. Greater access to electricity will result in improved living standards and contribute to rapid socio-economic development. It will be possible to supply more efficient and lower cost power under a competitive market structure, with greater private sector participation. Rationalization in the cost of electricity will remove the sense of discrimination from poor people thereby neutralizing the possibility of security threats.

Policy makers will have to think beyond emergency management to ensure that economic activities are not hampered for long due to power shortage. The situation thus necessitates undertaking immediate action to overcome problems through effective management of the sector. Viable energy policies have to be formulated for 50 years and even beyond. Above all, it is vital to have a vision for a society with equitable distribution of wealth and a knowledge-based economy, which can in turn provide national security in general and the energy security in particular.

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LIST OF ABBREVIATIONS

BPDB	Bangladesh Power Development Board
DESA	Dhaka Electric Supply Authority
DESCO	Dhaka Electric Supply Company
FBCCI	Federation of Bangladesh Chamber of Commerce and Industry
IPS	Interuptable Power Supply
KV	Kilo Volt
PDB	Power Development Board
MW	Mega Watt
REB	Rural Electrification Board
UPS	Un-Interuptable Power Supply
WAPDA	Water and Power Development Authority
CLDC	Central Load Dispatch Circle
GFU	Gas Fired Units
HU	Hydro Units
LFU	Liquid Fuel Units
IPP	Independent Power Plant

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