রেজিষ্টার্ড নং ডি এ-১

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা

কর্তৃপক্ষ কর্তৃক প্রকাশিত

সোমবার, জানুয়ারী ১৫, ১৯৯৬

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

বিদ্যুৎ, জ্বালানী ও খনিজ সম্পদ মন্ত্রণালয়

প্রজ্ঞাপন

তারিখ, ২৩শে পৌষ, ১৪০২বাং/৬ই জানুয়ারী, ১৯৯৬ইং

নং-বিজ্বাখস/পিআইসি-৪৩/৯৫—গত ১১-৯-৯৫ইং তারিখে সরকার কর্তৃক অনুমোদিত জাতীয় জ্বালানী নীতিটি সংশ্লিষ্ট সকলের অবগতির জন্য প্রকাশ করা যাইতেছে।

এ, কে, এম, সামসুদ্দীন

উপ-সচিব।

NATIONAL ENERGY POLICY

1.0. INTRODUCTION

1.1 Background

In recognition of the importance of energy in socio-economic development, the Government of Bangladesh has given continuing attention to the overall development of energy sector. It involved survey, exploration, exploitation and distribution of indigenous natural gas; survey and exploitation of hydropower; survey of coal and peat; establishment of petroleum refining facility and distribution systems; and establishment of power generation plants and networks for

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transmission and distribution of electricity. During last two decades, about 20 percent of total public sector investment was allocated for the development of energy sector.

Despite all these efforts per-capita consumption of commercial energy and generation of electricity in 1990 were 56 KGOE/year and 73 kWh/year respectively. Per capita consumption of commercial energy and electricity in Bangladesh is one of the lowest among the developing countries. In 1990, more than 73% of total final energy consumption was met by different type of biomass fuels (e.g. agricultural residues, wood fuels, animal dung etc.).

In 1990 only 2.2% of total households (mostly in urban areas) had piped natural gas connections for cooking and 10% of households had electricity connections and only 3.9% of total households used kerosene for cooking.

Shortcomings of the past energy development programmes and management practices are identified as follows.

(a) Due to shortage of capital it has not been possible to undertake systematic survey, exploration and exploitation of energy resources throughout the country. As a result, it has not been possible to ensure balanced development of energy resources of different zones of the country and balanced development of different sub-sectors of the energy sector.

(b) Necessary attention has not been given to formulate appropriate policies to encourage private sector participation in energy sector development programme to meet the shortage of fund.

(c) Development programmes of energy consuming sectors (e.g. industrial sector) have been constrained due to shortage and unreliable supply of commercial energy.

(d) Energy agencies have not been operated and managed efficiently.

(e) Energy prices have not been set on a rational basis.

(f) Effective measures have not been taken to ensure rational use of energy.

(g) Unplanned use of biomass fuels are contributing to environmental degradation.

(h) Adequate attention has not been given to meet the total energy needs of rural areas.

(i) Adequate attention has not been given to undertake systematic research programmes to develop indigenous technological capabilities.

(j) Adequate attention has not been given to develop trained manpower for the efficient management of the sector.

In the above context the Government has decided to formulate National Energy Policy (NEP) to ensure proper exploration, production, distribution and rational use of energy sources to meet the growing energy demand of different zones, consuming sectors and consumers groups on a sustainable basis.

1.2 Objectives

The objectives of the National Energy Policy (NEP) are outlined as follows.

(i) To provide energy for sustainable economic growth so that the economic development activities of different sectors are not constrained due to shortage of energy.

(ii) To meet the energy needs of different zones of the country and socio-economic groups.

(iii) To ensure optimum development of all the indigenous energy sources.

(iv) To ensure sustainable operation of the energy utilities.

(v) To ensure rational use of total energy sources.

(vi) To ensure environmentally sound sustainable energy development programmes causing minimum damage to environment.

(vii) To encourage public and private sector participation in the development and management of the energy sector.

2.0 EXISTING INSTITUTIONAL ARRANGEMENTS

In addition to the Planning Commission, different Ministries and agencies are involved directly and indirectly with the planning of commercial energy resources and biomass fuels as shown in Table 2.1. Different Ministries and agencies involved with overall development and management of energy resources are shown in Table 2.2.

3.0 ENERGY RESOURCES

3.1 Primary Commercial Energy Resources

Presently known primary commercial energy resources of the country include natural gas, oil, coal, peat and hydro-electricity. Estimated quantity of known and exploitable commercial energy resources are shown in Table 3.1. Potential reserves of primary commercial energy resources are shown in Table 3.2. Existing known reserves of commercial energy sources are very modest in comparison to development needs of the country.

It is known that in Bangladesh the exploration for energy resources is neither comprehensive nor systematic. There are prospects for augmentation of reserves through systematic surveys and exploration, for which investment by the public and private sector is essential.

3.2 Primary Biomass Fuels

Biomass is defined as all organic matters produced by photosynthesis process in plant kingdom. Depending upon their characteristics and quality, biomass resources are used as food, fodder, building materials, fuel and manure. Only a fraction of total biomass is used as fuel. In Bangladesh, biomass fuels are obtained from three sources: Trees (e.g. woodfuels), Field crops (e.g. agricultural 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 the data are shown in Table 3.3. As the biomass fuels are consumed near the place of its production, for their planned development, there is a need to assess the demand and regenerative supply of different biomass fuels specific to different locations (e.g. district/thana/village etc).

3.3 Animal Power

There are about 10.3 million draught animals including 0.7 million cows. Milch cows are used for land preparation to meet the shortage of draught cattle. At present power tillers and tractors are used to meet the shortage of animal draught power. Energy need for these devices is accounted under agriculture sector.

3.4 New Renewable Energy Technologies

3.4.1 Mini-hydropower

According to the report of the Working Committee on Mini-hydropower Generation of Bangladesh, there is potential for producing 10 GWh of electricity annually.

3.4.2 Solar

The average daily solar radiation varies from 5.05 kWh/sqm in Winter to 8.76 kWh/sqm in Summer. At present solar energy is mainly used as a convenient and low cost means of drying crops, fish and salt. Some PV units have been installed in different parts of the country mainly for demonstration. Solar photovoltaic technology for the generation of electricity is being costly, its prospects are to be ascertained for specific end uses and locations.

3.4.3 Wind

Average wind speeds are low (less than 3 m/s). The prospect of wind power generation using low speed wind turbines in selected areas and for specific end-uses.

3.4.4 Tidal and Wave Power

The prospects of tidal and wave power in coastal areas need to be assessed.

3.5 Imported Fuels

Total yearly import of petroleum fuels is about 2 million tonnes, of which about 1.2 million tonnes is imported as crude, while the import of refined diesel and kerosene account for rest. In comparison to this, indigenous production of liquid fuels (oil, natural gas liquid) is only about 2.5% total annual demand.

4.0 STATUS OF ENERGY CONSUMPTION

4.1 Primary Energy Sources

4.1.1 Use of Natural Gas

Energy balance table of the country in 1990 has been presented in Table 4.1. It may be observed from the table that in 1990, 34.5% and 65.5% of primary energy were supplied by commercial energy and biomass fuels respectively. Natural gas accounted for 21.4% of total fuel or 61.8% of commercial fuels.

So far 17 gas fields have been discovered in the country, of which 8 gas fields are in operation. Their total recoverable reserve was 12.42 TCF and the remaining recoverable reserve as of June 1993 was 10.44 TCF is shown in Table 4.2. Maximum daily production capacity of the wells in 1993 was 644 MMCFD in comparison to average demand of 578 MMCFD. Peak gas demand was 760 MMCFD. The existing transmission network is capable of handling a throughput of 800 MMCFD.

Total consumption of natural gas in 1990 was 0.165 TCF, which was equivalent to 163 PJ (3.8 MTOE) and the consumption mix were as follows: power 47%, fertilizer 35%, industries 9%, domestic and commercial 9%. The consumption of natural gas has increased to 0.21 TCF (208 PJ or 4.87 MTOE) in 1993. The shares of different end users were as follows: power 44%, fertilizer 33%, industries 7%, tea garden and brick fields 9%, domestic and commercial 7%.

It may be noted that during 1993 total system losses of all the gas systems were 0.017 TCF (8% of total gas) in comparison to acceptable loss of 1.5-2.0%. All out efforts are to be made to reduce the system losses to acceptable limits.

4.1.2 Use of Biomass Fuels

Biomass fuels play an important role (contributed 65.5% of primary energy in 1990) in meeting total energy need of the country; but they are now being consumed beyond their regenerative limits. Unplanned and uncontrolled use of biomass fuels are causing environmental degradation.

In the foreseeable future there are limited prospects of increasing the supply of biomass fuels. On the other, hand it is not economically possible to substitute all the biomass fuels by commercial fuels. From environmental consideration there is a need to maintain the supply of biomass fuels within the regenerative limits and the demand of biomass fuels in excess of sustainable limits is to be met by commercial fuels.

In future, the demand of commercial energy will increase to meet the growing needs of different end use sectors as well as to meet the demand exceeding their regenerative limits.

4.1.3 Use of Renewable Energy Sources.

In 1990, 65.9% of total primary energy sources was supplied by indigenous renewable energy sources (e.g. biomass fuels 65.5%, and hydropower 0.4%). With the present state of technology, unavailability of land and paucity of exploitable hydro power there is very limited opportunity for further increasing the contributions of renewable sources of energy in meeting the total energy need.

4.1.4 Use of Imported Fuels

Of the total energy consumed in 1990, 87.2% was met from indigenous energy sources (e.g. natural gas 21.4%, hydropower 0.4%, biomass fuels 65.4%) and 12.7% from imported sources (e.g. petroleum fuels 11.1%, coal 1.6%).

Of the total petroleum product (about 2 million tonnes) consumed in the country, about half is imported as refined product, while about 1.20 million tonnes of imported crude is refined in Eastern Refinery Ltd. in Chittagong.

In 1993, total quantity of petroleum fuels consumed in the country was 1.9 million tonnes and the shares of different end uses were: transport 47.5%, domestic 24.0%, agriculture 13.0%, industry 12.0%, power 3.5%.

Total amount of coal imported in 1990 was about 4,50,000 tonnes and was used mostly for brick burning.

4.2 Power

4.2.1 Power Generation Distribution & Consumption

Total installed power plants of the country is about 2600 MW of which 2100 MW is located in the East Zone and 500 MW in the West Zone. Of the total installed power plants, the effective operational capacity is about 1900 MW against the peak demand of about 1800 MW. Timely maintenance and replacement of old units have not been possible due to non-availability of funds. As a result, it is difficult to maintain a reliable supply with reserve margin of only about 6% against desirable level of 20-25%. In case of emergency outage and/or major overhauling, the supply is managed by load shedding. In 1993, load shedding occurred for 268 days for a total duration of 621 hours. The situation may aggravate in future unless emergency measures are taken to increase the firm capacity by installing new power plants and by undertaking maintenance and rehabilitation of existing power plants.

Indigenous energy sources (e.g. natural gas, hydro) are used for the generation of power in the East Zone and imported petroleum fuels (e.g. Furnace oil LDO, SKO, HSD) are used to generate power in the West Zone. In order to minimize the effect of fuel cost on power generation, electricity generated in East Zone is transferred to the West Zone via East-West inter-connector established in 1982. The transfer capability of the inter-connector has almost reached its limit

(450 MW). In order to maintain adequate and reliable power supply in the West Zone a second inter-connector was planned to be installed by 1992-93. However, it has been decided to be built over the Jamuna Bridge, which itself is expected to be completed by 1998. Power supply in the West Zone will be severely constrained till the second inter-connector is established and new power plants are built in the West Zone.

In 1990, total electricity generation was 7732 GWh and fuel mix was as follows: hydro (11.4%), natural gas (84.3%) and petroleum fuels (4.3%). Total electricity generation in 1993 was 9206 GWh and the fuel mix was as follows: hydro (6.6%), natural gas (86.6%), petroleum fuels (6.8%).

In 1993, the average tariff of BPDB was Tk. 1.90/kWh against the cost of supply of Tk. 2.47/kWh. As a result, the utility had to incur financial losses for each unit of power sold to the consumers.

Distribution of service connections in 1993 among the three utilities were as follows: BPDB 925,510 (43%), DESA 426,868 (19.8%), REB 798,441 (37.2%). Distribution of energy sales by the three utilities were as follows: BPDB 6906 GWh (including bulk sale to DESA and REB), DESA 2309 GWh (including bulk sale to REB) and REB 652 GWh.

The consumption of electricity in 1993 in different end-use sectors were as follows: domestic (36.8%), commercial (11.8%), industrial (42.3%), irrigation (4.6%) and others (7.3%). During the period from 1982 to 1993 the share of domestic consumption of electricity has increased from 15.3% to 36.8%; whereas the productive use (commercial, industrial, agriculture) has decreased from 77.3% to 60.3%. In order to increase the contribution of electricity in economic growth it is necessary to increase the productive use of electricity.

4.2.2 Rural Electrification Programme

The overall programme of rural electrification is administered by the Rural Electrification Board; and the specific distribution system within a particular area is owned and managed by the respective Rural Electricity Co-operative known as Pallibiddyut Samity (PBS).

On the average, a PBS covers an area of 1500 km² and 4 to 6 thanas (thana head quarter and adjacent rural areas). Total number of PBSs established upto 1993 was 40. Average investment costs of establishing a PBS during the period from 1986-1993 was Tk. 512 million/PBS.

The total installed transformer capacity of 40 PBSs upto September 1993 was 660 MVA as against the peak demand of 210 MW (using 0.8 as the factor of coincidence). Thus the capacity utilisation of the installed distribution network in terms of peak demand was only 33.8%.

In 1993, total number of consumers of REB were 7,98,441 and the mix of consumers was as follows: domestic 80.7%, commercial 12.9%, irrigation 3.8%, industry 2% and street lighting 0.6%. The total energy consumption in 1993 was 652 GWh and the shares of different categories of consumers were as follows: domestic 30.7%, irrigation 22.3%, industry 41.2%, commercial and other 5.8%.

Based on the REB standard of 4 km per village, the network now covers about 12,500 villages. Additional 2000 villages have been electrified by Bangladesh Power Development Board. Thus now roughly 21.3% of villages have electricity network.

4.2.3 Load Management

The annual load factor of the national electricity grid is about 57%. The characteristic of demand is such that the evening peak is very sharp. In order to improve the performance of the system, reduce investment as well as to rationalise the energy use there is a need to undertake appropriate measures for the management of loads. Recently Government has decided to adopt some load management measures to reduce electricity consumption during peak hours such as early closer of commercial shops, prohibition of using irrigation pumps during evening peak hours etc. These measures are however, yet to be implemented fully.

4.2.4 System Losses

High system loss is a major concern for Bangladesh Power Sector. During the last twenty years overall losses including station auxiliary use have varied between 30.1% and 42.6% of gross generation. During this period losses at transmission and distribution (T&D) level varied

between 27.2% and 40.2% of net generation. A high proportion of losses at T&D level includes non-technical losses (e.g. theft, pilferage etc.).

Analyses of BPDB and DESA systems show that present T&D technical losses should be about 18% of gross generation, including transmission loss of about 5.4%. Thus total loss including station use should not be more than 23.4%. But in fiscal year 1993 the loss was 36.9%. Therefore, balance 13.5% of gross generation accounted for non-technical loss.

Existing T&D loss in DESA system is 32% with respect to energy received at 132 kV. According to calculations technical losses of DESA including 132 kV transmission loss should be between 15%-18%. Overall distribution losses in REB is reported as 16% with respect to energy received at 33kV. According to a recent calculation technical losses for REB system varied between 4.2% to 14% at 20 different sub-stations.

Reduction of technical losses depends on large investment for upgradation and reinforcement of transmission and distribution network and retrofiting of plants with more efficient auxiliary devices. Reduction of non-technical losses depend on good management through administrative measures with some investment on supportive hardware such as meters and test instruments. Poor management, weak administration, indisciplined employees, corruption both at utility and consumer levels, lack of firm political support were responsible for high non-technical losses in the power sector.

Recently, BPDB and DESA have laid down procedures for better management in commercial operation. In DESA this could not be implemented due to resistance from employees. In BPDB also this has not yet been fully implemented. Nevertheless losses could be brought down from 41% in 1991 to 36.9% in 1993. Continuance of high losses is totally undesirable for sustainable operation of the utilities. All out efforts should be made to eradicate non-technical system loss. The procedures introduced by BPDB and DESA should be fully implemented to reduce non-technical loss.

4.3 Final Energy Consumption

The total final energy consumption in 1990 was estimated as 683 PJ (Table 4.1). The share of different type of energy sources in final energy mix were as follows: natural gas 12.2%, oil 10.1%, coal 1.8%, electricity 2.8% and biomass fuels 73.1%. Various end uses of final energy were as follows: domestic 64.8%, industrial 19.5%, commercial 1.3%, transport 4.0%, agriculture 1.7% and non-energy (fertilizer) 8.7%.

The consumption of high proportion of final energy in domestic sector and heavy dependence on biomass fuels are indicators of subsistence nature of the economy. In order to enhance economic growth, energy demand in productive sectors are to be increased and the demand is to be met by commercial fuels.

4.4 Energy Conservation

In Bangladesh efficiency of energy use is quite low. There are good potential to reduce energy demand through conservation measures (introduction of efficient technologies and better management practices) in all the end-use sectors: domestic, industrial, commercial, transport and agriculture. Some attempts have been made to implement energy conservation projects in industrial sector and domestic sector; but it could not achieve notable success.

4.5 Rural Energy Needs

More than 80 percent of total population of the country lives in rural areas. At present major portion of total energy needs is met by locally produced biomass fuels which is mostly consumed in the household sector for cooking. Ongoing rural electrification programme meets a small portion of total rural energy needs. For overall national development there is a need to pay special attention so that the energy needs of rural areas for subsistence and productive requirements (e.g. agriculture, industries, transport) are met on a sustainable basis. An area based planning methodology will have to be considered to meet the energy needs of different locations.

5.0 DEMAND SCENARIOS

Two economic growth scenarios (Low Scenario and Reference Scenario) considered to forecast future energy demands are shown in Table 5.1. Projected demands of commercial energy and electricity upto the year 2020 under Low Scenario and Reference Scenario are shown in Table 5.2 and Table 5.3 respectively.

6.0 SUPPLY OPTIONS FOR THE DEVELOPMENT OF ENERGY RESOURCES

Two supply options (Current Option, Reference Option) have been proposed to meet the projected energy demand. Salient features of the two supply options are presented below.

6.1 Current Option

The basic principle of Current Option is that the existing practices of energy development programme will continue in future. There will be no major change in strategies. The important conditions for the Current Option are listed below.

(i) Development of known indigenous natural gas will continue;

(ii) Development of indigenous coal at Barapukuria will continue;

(iii) Development of known oil deposits and use of natural gas liquid will continue;

(iv) Development of peat will continue;

(v) Imported oil will meet the major energy needs of liquid fuels;

(vi) Imported coal will meet part of the energy need mainly for brick industries;

(vii) Indigenous natural gas, coal, hydropower and imported petroleum fuels will be used for power generation;

(viii) There will be no effective programme on energy conservation;

(ix) Development and management of biomass fuels will be considered without having any linkages with commercial energy development programme.

Demand-supply balance corresponding to the conditions mentioned under Current Option is shown in Table 6.1. It may be observed from the table that indigenous natural gas will continue to play a dominating role in meeting the non-renewable energy needs of the country. The average daily supply of natural gas will attain its maximum level of 1000 MMCFD (0.365 TCF per year) by the year 2000. This supply will continue upto the year 2020. The extraction of 1 million tonne of indigenous coal will start by the year 2000 and will continue at the same rate upto the end of the life of the mine (about 65 years).

It may be noted from Table 6.1 that even under Low Scenario the dependence on imported commercial fuels will increase from 19.4% in the year 2000 to 79.9% in the year 2020. Correspondingly the need for deficit fuels will increases from 2.32 MTOE in 2000 to 38.34 MTOE in 2020. In order to reduce the gap between the projected demands and indigenous supply the country will have to implement a more serious exploration programme or it would be very difficult to meet the huge gap from imported sources.

Primary energy mix for power generation is shown in Table 6.2. It may be noted that even under Low Scenario the dependence on imported commercial fuels for power generation will increased from 7.0% in the year 2000 to 70.5% in the year 2020. Serious attention will have to be given to meet the primary energy needs for future power generation.

6.2 Reference Option

In comparison to Current Option, additional issues to be considered in Reference Option are as follows: (i) enhancement of exploration, appraisal and extraction of indigenous non-renewable energy sources, (ii) implementation of effective programmes on energy conservation

and (iii) integration of commercial energy and biomass fuels programme to maintain sustainable supply of biomass fuels. Specific assumptions for the Reference Options are presented below :

(i) Exploration and appraisal of oil and natural gas will be enhanced;

(ii) Development of natural gas will continue;

(iii) Development of coal will be enhanced;

(iv) Development of oil and use of natural gas liquid will continue;

(v) Development of peat resources will be enhanced;

(vi) Harnessing of new-renewable sources of energy will be undertaken;

(vii) Imported oil will meet the major energy demand of liquid fuels;

(viii) Imported coal and gas will meet a part of total energy needs;

(ix) Indigenous natural gas, coal, hydropower and imported coal, petroleum fuels and nuclear power will be used for electricity generation;

(x) Effective programme will be undertaken for conservation of commercial energy and biomass fuels;

(xi) Development of biomass fuels will be considered along with the development of commercial energy sources.

6.3 Observations on the Supply Options

It is felt that implementation of Current Option would create strain on the economy by the sharp increase in energy import bill. It would also require additional fuel due to lack of conservation measures; and would cause severe environmental degradation due to neglect of biomass fuels problem under energy sector development programme. Therefore, considering the long-term benefit, it is recommended that country should aim to follow the Reference Option.

6.4 Observations on the Use of Indigenous Natural Gas

Natural gas can be used either as fuel or as rawmaterial for various petrochemical products depending on its composition. Natural gas available in Bangladesh contains mostly methane; it is not a good rawmaterial for producing different petrochemical products, except chemical fertilizer and methanol.

Bangladesh has no indigenous source of commercial fuel other than natural gas and recently discovered coal. In order to reduce the burden of fuel import bill on national economy, during the last two decades, Government has been following a persistent policy to reduce dependence on imported oil and increase the use of indigenous natural gas in meeting the total energy demand of the country.

Considering the importance of electricity in boosting national economy and the prospect of distributing the benefit of indigenous natural gas to different parts of the country through national electricity grid, Government has given priority in maximising the use of natural gas for power generation. Moreover, extension of natural gas pipe networks to power generation centres has helped in improving the financial return on of investment in gas infrastructures.

From the year 2000, indigenous coal output will be one million tonne per year; most of which will be consumed for power generation. However, availability of indigenous coal will not appreciably reduce dependence on natural gas for power generation in the foreseeable future.

Chemical fertilizer plays an important role in increasing agricultural production. For strategic reasons Government has given necessary attention to allocate a substantial portion of natural gas to produce chemical fertilizer for meeting local needs as well as for export. It may be mentioned that on the same consideration natural gas for fertilizer production is being supplied at a price cheaper than its economic price. Implications of export of fertilizer at such a price of gas should be assessed properly in determining future allocation of gas for fertilizer production. It is therefore, recommended, to limit the total production of natural gas based fertilizer to domestic demand.

Because of the above mentioned reasons, it is recommended to allocate adequate quantity of natural gas to meet the demand of commercial fuels for various end use sectors such as power, industrial, commercial, domestic etc.

It is, therefore, considered appropriate to allocate existing reserve and projected supply of 1000 MMCFD natural gas as follows:

Power Generation	45-50%
Fertilizer Production	25-27%
Industry	13-18%
Commercial and Domestic	8-10%

It may be noted that in the present world it is not competitive to use natural gas as a feedstock (rawmaterial) for petrochemical industries in comparison to higher hydrocarbon gases obtained as byproducts during extraction and refining of crude oil. In future if sufficient natural gas is discovered the possibility of establishing a methanol plant may be given due consideration.

7.0 POLICY ISSUES AND RECOMMENDED POLICIES

Policy formulation is a continuing process for decision making at different levels by different institutions and individuals. At the time of operationalising National Energy Policy there is a need to ensure that these decisions are taken in a synchronised manner to achieve the stated objectives. Various levels at which there is a need for synchronised decision making are stated as follows:

(i) At macro level, policy decisions are to be synchronised to ensure that the outputs of the energy sector meets the energy demands of all the end use sectors, zones and socio-economic groups on a sustainable basis.

(ii) At the sectoral (energy sector) level, policy decisions are to be synchronised to ensure balanced development of different sub-sectors (e.g. coal, oil, gas, power etc.). As for example, development in power sector may be affected due to inadequate development in natural gas sub-sector.

(iii) At the sub-sector (utility) level, policy decisions are to be synchronised to ensure balanced development of different programmes under a particular sub-sector. As for example, the ultimate outcome of gas-subsector depends chronological development of exploration, appraisal, extraction, processing, transmission and distribution projects. Similarly, in Power Sub-sector, it is necessary to consider chronological development of generation, transmission and distribution systems.

Major policy issues and recommended policies are to be considered to achieve the objectives of National Energy Policy have been presented in the following paragraphs.

7.1 Policy Issues

7.1.1 Database

A reliable database on different type of energy sources, their conversion, supply, consumption, prices etc. are to be established and maintained by the utilities, concerned agencies and the Planning Commission for systematic planning (e.g. forecasting) and development of energy resources of the country. These data are to be published on a regular basis to support planned development of energy resources.

7.1.2 Resource Assessment

Geological Survey of Bangladesh and Petrobangla are to complete the geological and geophysical survey of the whole country, so that the survey results can be used to assess the prospects of mineral and fuel resources of the country.

For energy planning purpose assessment of all type of energy resources (e.g. oil, gas, coal, nuclear minerals, hydropower, biomass fuels, solar, wind, tidal, wave etc.) are to be undertaken on a regular/continuing basis by the appropriate authorities.

Special incentives are to be given to undertake exploration and appraisal of petroleum resources in the West Zone and off-shore ares.

7.1.3 Technology Assessment

Necessary arrangements are to be made to select appropriate technologies for application in energy sector programmes. Different factors to be considered in assessing the technologies are: conversion efficiency, transferability, adaptability, environmental effects, cost etc.

7.1.4 Management of Gas Systems

National gas grid will be established for maintaining reliable gas supply. To improve management efficiency, production, transmission and distribution systems of gaseous fuels will be managed as separate cost and profit centers. Each of the units will be corporatised and allowed to operate on a commercial basis.

To consider development of gas fields through private sector, as a part of Government's privatization policy.

In allocation of additional reserves the West Zone will get the priority.

7.1.5 Management of Petroleum Fuels

In course of time import, processing, distribution and marketing of petroleum fuels will be opened to the private sector provided the private sector investors develop their own infrastructure like pipeline(s) including common carriers, storage and distribution/ handling facilities.

7.1.6 Management of Coal

Coal will play an important role in meeting the future energy needs of the country. A coal mining project is under implementation to extract coal from Barapukuria Coal Field. To ensure efficient management a Coal Mining Company need to be established for the management of Barapukuria Coal Mine. In future when mining of coal at Khalaspir will be considered, a separate mining company may need to be formed.

7.1.7 Management of Power System

To improve management efficiency; generation, transmission and distribution systems of power sector will be managed as separate cost and profit centers. Existing power utilities will be corporatised and allowed to operate on commercial basis.

Rural Electrification Board will be allowed to continue the implementation and management of Area Coverage Rural Electrification (ACRE) programme for designated rural areas of the country.

7.1.8 Energy Conservation

End use based energy planning method is to be undertaken to incorporate energy conservation measures in energy planning process. Energy conservation measures will be considered in generation of power, refining of crude oil and use of energy for various end-uses (e.g. domestic, industrial, commercial, transport, agriculture). Necessary incentives (e.g. technical support, preferential credit, tax exemption etc.) will be given to achieve the targets of energy conservation.

There is a need to adopt Energy Conservation Act (under preparation) to provide a legal basis and to decide appropriate strategies for energy conservation.

7.1.9 Environmental Consideration

Environmental issues will be considered for all type of fuels and in each and every step of fuel cycle; namely, exploration, appraisal, extraction, conversion, transportation and consumption.

It may be reiterated that at present per capita emission of carbon dioxide gas is very low. It is envisaged that in foreseeable future, emission of carbon dioxide gas would not exceed the existing average emission of low income developing countries.

7.1.10 Pricing Policy

Tariffs of different type of final energy will be fixed on the basis of economic cost. When it is decided to give any subsidy it will be made at end users' level and Government shall make necessary arrangement with the utilities on this account.

7.1.11 Investment Policy

To allow healthy competition and to ensure efficient operation both public and private sector enterprises will enjoy similar/uniform investment incentives offered by the Government.

Corporatised public sector utilities shall be allowed to raise finance from the market through floating of shares and debentures and also bank loans.

Considering the energy sector as the infrastructure for development, its projects, when financed by the Government shall be allowed interest rates not more than the lowest slab of interest for commercial loans.

7.1.12 Zonal Distribution of Energy

Different projects being considered and that may be considered to meet the energy demand of the West Zone are presented below:

(i) Special incentives for the survey; exploration and development of oil and gas.

(ii) Development of Barapukuria coal mine.

(iii) Implementation of energy conservation projects.

(iv) Construction of LPG pipe line upto Elenga for the assured delivery of LPG in the West Zone.

(v) Development of coal bed methane.

(vi) Development of peat

(vii) Development of Khalaspir coal mine.

(viii) Establishment of coal and oil based power plants.

(ix) Exploration and development of coal in unexplored areas.

(x) Establishment of petroleum depots at Chalna Port and up country to maintain reliable supply of petroleum fuels.

(xi) Establishment of handling facilities of coal at Chalna, if coal has to be imported for power generation.

(xii) Expansion of natural gas pipe line.

(xiii) Construction of Electric Inter-connectors.

(xiv) Implementation of Rooppur Nuclear Power Project.

(xv) Establishment of Petroleum Refinery.

(xvi) Augmentation of tree plantation programme (by the Department of Forest).

7.1.13 Area-based Energy Planning

Area-based energy planning methodology is to be followed to ensure sustainable supply of biomass fuels and to meet the energy needs of rural areas. At the implementation stage commercial energy development programmes and biomass fuels development programmes are to be co-ordinated. Areas (thana/district) having scarcity of biomass fuels will be given priority attention under commercial energy distribution programme and biomass fuels conservation programme (e.g. improved stoves). Reliable supply of commercial fuels to rural areas is to be ensured.

7.1.14 Strategic/Emergency Stock

(a) Petroleum Fuels

The strategic stock of petroleum products is to be increased from the present level of 40 days to 60 days consumption. Such reserves in storage tanks are to be distributed all over the country and reserve capacity for each location are to be determined by considering extreme natural events like cyclone, drought and flood.

(b) Coal

Adequate emergency stock of coal is to be maintained in off-shore islands and flood prone areas to meet the cooking fuel needs of such places at the time of emergency.

(c) Natural Gas

Stand-by wells are to be provided to meet emergency situation. The reserve margin in this case is recommended to be 20% of the producing wells.

7.1.15 Implementation and Evaluation of Projects

A Master Plan for the sector is to be developed, identifying projects along with the recommended phasing of implementation. Bankable project documents are to be produced for projects in accordance with its schedule identified in the Master Plan.

Necessary attention should be given for reducing the delay in the approval process. The existing procedure should be modified as to enable the concerned utility to complete the project in time.

In addition to existing practices followed by IMED, Performance Evaluation Report (PER) should be prepared to evaluate the actual performance of the projects after some time of its completion.

7.1.16 Research and Development

Systematic research programmes will be undertaken for each type of the energy utility. Necessary facilities and resources will be made available to implement different research programme on a continuous basis. Collaborative linkages among universities-utilities and R&D institutions will be strengthened to implement different research programmes. A certain percentage of earnings of the utilities should be dedicated for R&D purpose.

7.1.17 Human Resources Development

Comprehensive programme on human resources development will be undertaken for each type of energy utility. Necessary funds will be provided to implement different training programmes. Collaborative arrangements between universities and utilities will be established and strengthened to plan and implement need based training programme linked with career planning of professionals. A certain percentage of earnings of the utilities should be dedicated for human resources development programme.

Training programmes are also to be organised for consumer groups to create awareness on efficient use of energy.

7.1.18 Institutional Issues

Energy Modelling and Economics Wing of the Planning Commission and data management units of different utilities need to be strengthened and closely linked to maintain reliable sets of database for national energy planning. All utilities are to develop their respective Management Information System (MIS).

Planning Commission along with the Ministry of Energy and Mineral Resources should undertake the tasks of preparing a long-term energy plan (perspective plan) including all type of energy sources covering the period upto 2020. The proposed plan should ensure balanced and sustainable development of different parts of the country. There is a need to develop in-house institutional capabilities to prepare National Energy Plan.

One single Ministry (Ministry of Energy and Mineral Resources) shall administer and co-ordinate the entire range of energy related activities of all the sub-sectors (e.g. non-renewable, renewable, power, rural etc.).

Appropriate institutional arrangements are to be established to implement area-based energy development programmes to ensure sustainable development of biomass fuels and to meet rural energy needs.

Renewable Energy Developments Agency (REDA) is to be established under the Ministry of Energy and Mineral Resources for the development and diffusion (dissemination/extension) of different type of renewable energy technologies.

A Coal Mining Company is to be established for the management of Barapukuria Coal Mine. In future when mining of coal at Khalaspir will be considered a separate mining company may be formed. Depending on the development of coal mining activities and the growth in coal demand of the country the need for establishing a Coal Marketing Company may be considered.

A national regulatory authority (National Energy Authority) attached to the Ministry of Energy and Mineral Resources is to be established to carry out the following regulatory functions:

(a) Issue license to different agencies (both public sector and private sector agencies) to deal with energy/fuel;

(b) Create and implement methodology for setting tariffs at retail and bulk dispatch sale points and approval of proposed tariff changes according to agreed formula;

(c) In collaboration with the Planning Commission review the demands of energy/electricity projected by different organisations/utilities and determine agreed national energy demand. Allocate the use of primary energy sources for different end-uses;

(d) Establish, monitor and enforce technical standards for the energy agencies/utilities;

(e) Investigate and resolute complains of customers and utilities;

(f) Any other function to be entrusted with it by the Government time to time.

National Energy Authority (NEA) may have different wings/divisions to deal with non-renewable energy, renewable energy and power.

Existing function of Electrical Advisor and Chief Electric Inspector and Chief Inspector of Explosive would come under the jurisdiction of NEA.

7.1.19 Legal Issues

(i) Implementation of National Energy Policy will necessitate introduction of Energy Conservation Act and modifications of the relevant Acts and Ordinances in this regard.

(ii) Environmental issues to be considered under National Energy Policy are to be mandated under National Environment Policy and Environment Act.

7.1.20 Regional/International Cooperation

Regional/International Cooperation on energy may be explored for minimising the gaps in energy supply of the countries in the region.

7.2. RECOMMENDED ENERGY POLICY

I. NON-RENEWABLE ENERGY POLICY

I.1 Assessment of Indigenous Resources

a. A comprehensive assessment of non-renewable energy resource base is essential irrespective of the actual prospects of their exploitation under prevailing techno-economic situation.

b. A comprehensive data base, containing all information and data required for exploration, is required to be developed by continuously updating geological, geophysical and geochemical information.

c. Extensive exploration need to be continued to upgrade structural leads to established structures.

d. Steps are to be taken to drill the established structures/plays to ascertain their status.

e. Intensive exploration need to be continued to delineate new structures in the hitherto unexplored frontier and virgin areas.

f. Special incentive packages similar to those offered for oil and gas exploration in off-shore areas are to be given for exploration of oil and gas resources in the west zone.

g. Foreign and local entrepreneurs are to be encouraged to invest in exploration for petroleum and solid fuels in the country.

h. The public sector utilities are to intensify exploration. For this, the present policy of the Government to allow one exploration drilling per year with internal resources is inadequate. Number of exploration drilling with internal resources is to be increased to at least four per year.

I.2 Supply and Augmentation of Indigenous Resources

I.2.1 Oil and Gas

a. Comprehensive reservoir study of the developed gas fields need to be undertaken to determine their actual field potential.

b. Systematic appraisal of the discovered, partially developed and undeveloped gas/oil fields is to be undertaken to determine actual recoverable reserve. In this context, the possible reserves of presently exploited gas fields and the discovered oil fields at Haripur, Kailashtila and Fenchuganj are to be given priority.

c. Efforts are to be made to reduce the abandonment pressure to optimum level wherever possible, to augment the recoverable reserve of natural gas.

d. The number of production wells are to be increased by the year 2000 to 77, including 15 stand-by wells for ensuring reliability and an average supply of 1000 MMCFD gas.

e. Producible wells, which may now be idle for different reasons, are to be brought under production on a priority basis. If needed, internal resources are to be allocated for attaining this target.

f. Gas fields having higher NGL content are to be given priority for development in order to increase NGL supply. In this context, the Beanibazar gas field is to be brought into production at the earliest.

g. NGL plants at Ashugonj and Kailashtila are to be commissioned at the earliest.

h. Development of the national gas grid, inter-connecting all the producing fields with the transmission network as well as connecting the demand centres with it should be completed as soon as possible.

i. Since reserve of Kutubdia Gas Field has been considered in the energy balance, due consideration is to be given to its development and availability for use.

I.2.2 Coal

a. The target of producing one million tonne of coal from Barapukuria by the turn of the century is to be achieved.

b. Techno-economic feasibility of Khalaspir coal deposit in Rangpur is to be taken up at the earliest.

c. Appraisal of coal basins in Rangpur-Dinajpur belt is to be completed and depending on the findings, techno-economic feasibility of their exploitation are to be taken up.

d. Exploration for coal in the north-western part of the country including the identified potential coal basins is to be undertaken on a priority basis.

e. The feasibility study on extraction of Coal Bed Methane (CBM) from Jamalgonj and Khalaspir is to be undertaken on a priority basis, if needed internal resources are to be allocated for this. Depending on the findings of the Feasibility study, commercial exploitation of CBM is to be considered for these and other prospective areas of coal deposit. Private entrepreneurs may be encouraged to extract CBM.

I.2.3 Peat

a. A number of semi-commercial to commercial scale projects on peat extraction and briquetting plants may be set up at different peat deposit areas on the basis of findings of the under-implementation project on peat.

b. Problems like reclamation of land after extraction of peat, drying, briquetting of peat as well as the logistics of transportation and distribution are to be solved before this fuel is considered for use on a large scale.

I.2.4 Nuclear Minerals

Areas having prospects of uranium and thorium deposits are to be appraised and, studies may be conducted on the techno-economic viability of production at prospective sites.

I.3 Reduction of Imbalance in Energy Consumption

I.3.1. Rural-Urban

a. Penetration of commercial fuels backed up by appropriate pricing policy is to be accelerated to ensure equitable distribution of benefits.

b. Reliability of energy supply to the rural areas in terms of availability in adequate quantity, in time and at a fair price is to be ensured.

I.3.2 East Zone and West-Zone

Considering the importance of equitable development of different regions of the country, it is important to undertake special measures for the planned development of energy supply in the west zone. The following measures/projects for the west zone are to be considered in this connection:

a. Special incentives for exploration and production of oil and gas;

b. Exploration and development of coal, including that at Barapukuria and Khalaspir, and CBM;

c. Use of furnace oil from ERL for power plants and industries;

d. Establishment of adequate oil depots at the Chalna port and up country;

g. Ensuring reliable supply of LPG through extension of LPG pipeline to Elenga and establishment of bottling plants there;

h. Extension of natural gas pipeline;

i. Development of infrastructure for handling and inland transportation of imported fuels like coal and oil;

j. Establishment of Petroleum Refinery.

I.4. Fuel-Mix

a. Supply of indigenous fuels is to be maximized to the extent possible in meeting the future demands. The deficit is to be a mix of coal,oil and nuclear energy.

b. The mix of imported fuels and their end-uses are to be determined on the basis of their relative advantages and disadvantages. Reliance on a single fuel type is to be avoided in order to minimize the effect of any future global energy crisis. Security of energy supply, logistics of transportation and handling, environmental pollution along with economics of energy supply will influence the evolution of the mix of the imported fuels.

c. Import of liquid fuels is to be determined by the market force. However, its consumption is to be limited primarily to such uses, like transport for which alternatives are not either available or affordable by the vast majority of the population.

d. Size of new refinery(ies), whenever required, is to be determined on the basis of growth in demand. At least one of the new refineries may be considered for installation in the west zone.

e. Infrastructure for transportation of crude to the refinery site, including pipeline if the site is inland, should be developed in parallel to installation of the refinery(ies).

f. Logistics of handling at the port and inland transportation are to be developed in keeping with the growth in import of coal.

I.5. Allocation of Non-Renewable Energy Sources

I.5.1 Natural Gas

a. Existing reserve and projected supply of 1000 MMCFD is to be allocated as follows:

Power Generation	45 - 50%
Fertilizer Production	25 - 27%
Industry	13 - 18%
Commercial and domestic	8 - 10%

b. In case of any commercial discovery in the west zone, the same is to be developed on a priority basis.

I.5.2 Petroleum Products

a. Allocation of liquid petroleum products will depend on the dynamics of market economy.

b. Furnace oil produced in the ERL is to be allocated mostly for power generation and other industries in the public and the private sectors of the west zone.

c. In the event of Compressed Natural Gas being available, the share of the transport sector in the consumer-mix may be slightly changed as it will be possible to replace part of the liquid fuel by CNG in engines operating in the dual fuel mode.

I.5.3 Liquified Petroleum Gas (LPG)

Most of the LPG is to be allocated for the west zone, primarily for the domestic sector. LPG may also be imported for meeting the demand of the country.

I.5.4 Coal

a. Local coal is to be used mostly in the west zone, while a part of it may be allocated for brick burning in both the zones. The indicative allocation for indigenous coal is as follows.

Power generation	75-85%
Domestic/Industrial	15-25%

b. Allocation of imported coal will depend on the dynamics of the market economy.

I.5.5 Coal Bed Methane

The future production of Coal Bed Methane is to be used for power generation, domestic, commercial and industrial purposes in the west zone.

I.5.6 Peat

Use of peat is to be popularised. Private sector is to be encouraged to participate in extraction, processing and distribution of peat.

I.6 Pricing

I.6.1 Overall Policy

a. All forms of non-renewable energy are to be priced at their economic cost of supply.

b. A cross-subsidy or trade-off may be made among different forms of energy or within different products of a particular form of energy to promote growth and ensure social justice. A differential price structure for different groups of consumers based on social and other considerations may be retained.

c. An equalized pricing principle for a particular product throughout the country, at least upto certain point of delivery, say, district/thana/depot level is to be continued.

I.6.2 Specific Policy

a. The present price of natural gas is to be raised annually to reach its economic cost of supply in course of next five years.

b. In case of large scale participation of the private sector in the oil and gas exploration under PSC, the price of gas is to be linked to the price of high sulphur furnace oil as recommended in the Petroleum Policy.

c. The present subsidy on gas price for power and fertilizer is to be removed gradually. Subsidy, if required, is to be given at the end-user level and the related liabilities can not be passed on to the utilities.

d. Differential tariff is to be applied for use of gas by the bulk user (e.g. power and fertilizer) for the off-peak and peak hours.

e. Some subsidy on gas price for domestic use may be given on social considerations.

f. Cross-subsidy of liquid fuels may, however, be considered to promote growth, substitution and social justice.

g. While fixing up price for Diesel, MS, Kerosene, LPG etc., adequate care has to be taken to prevent adulteration of one product by the other or to discourage smuggling of the product outside the country.

h. The price of coal is to be set at its economic cost of production and supply.

I.7 Conservation

Following categories of conservation measures are to be strictly enforced to ensure rational,economic and efficient use of energy.

I.7.1 Energy Audit

Energy audit is to be enforced at all levels, so that wastage of energy can be checked and corrective measures taken. To this end, the Energy Conservation Act is to be introduced and the role of Energy Monitoring and Conservation Centre (EMCC) is to be strengthened.

I.7.2 Reduction of Wastage

a. Use of efficient processes in fertilizer production, BMRE, retrofiting and other measures are to be taken to reduce specific gas consumption in fertilizer production first to the level of the present average consumption of the national fertilizer factories and then at least to the specific consumption of Jamuna Fertilizer Factory. Any new fertilizer factory must have an specific gas consumption no more than that of the Jamuna Fertilizer Factory.

b. Use of efficient technologies for power generation, BMRE or retrofitting are to be undertaken for the existing power plants of different types having efficiency lower than the national average of that technology. Future power plants must have an efficiency acceptable at the international level.

I.7.3 Demand Management

a. Single/double shift industries are to be operated during off peak period.

b. Decision on establishing gas-based new fertilizer factories will be taken in such a way that total production is limited to the level of national demand.

c. Export of Fertilizer produced with subsidized price of gas is to be discouraged.

d. Incentives for fuel efficiency for all categories of end-uses may be given.

e. Fiscal incentives, including reduced taxes and duties may be given to promote the use of Compressed Natural Gas (CNG) in transports.

I.7.4 Efficient Use

a. Use of improved cooking appliances and lighting devices using commercial fuels are to be encouraged.

b. Use of efficient engines and furnaces as well as co-generation in industries, are to encouraged wherever feasible.

1.8 System Loss Reduction

a. All types of technical system losses are to be reduced to acceptable levels and non-technical losses are to be eliminated.

b. Adequate number of meters (system meters) are to be installed by the utilities at designated points of the gas network at the earliest.

c. Gas meters are to be checked and calibrated periodically and on a regular basis.

d. Power, fertilizer and all other industrial consumers are to provide their annual production and total gas consumption in order to estimate specific consumption.

I.9 Environment Policy

a. Environmental Impact Assessment should be made mandatory and should constitute an integral part of any new energy development project.

b. Use of economically viable environment friendly technology are to be promoted.

c. Use of fuel wood is to be discouraged and replacement fuels are to be made available at an affordable price.

d. Popular awareness to be promoted regarding environmental conservation.

e. In case of coal based power plants, disposal of ash and reduction of environmental emission are to be considered in technology selection.

f. In case of nuclear power plant, internationally acceptable criteria on radiation emission are to be observed. Abandoned hard rock mine faces may be considered for final disposal of such wastes.

g. Use of lead free petrol will be encouraged.

I.10 Emergency Stocks

I.10.1 Petroleum Fuels

The emergency stock is to be increased from the present level of 40 days to 60 days of consumption. Such reserves in storage tanks are to be distributed all over the country and reserve capacity for each location are be determined by considering extreme natural events like flood and cyclone, as well as drought.

I.10.2 Coal

Adequate emergency stock of coal, say equivalent to one month's consumption of off-shore island and flood prone areas may be maintained.

I.10.3. Natural Gas

Stand-by wells are to be provided to meet emergency situation. The reserve margin in this case is recommended to be 20% of the producing wells.

I.11 Investment and Lending Terms

a. Dependence on external donors is to be gradually replaced by internal financing to the extent possible. Public sector utilities are to be encouraged to mobilize own resources for their projects. The existing formalities for using internal resources of the utilities for implementation of their projects are to be simplified.

b. A part of the contributions of Petrobangla and the BPC towards the national exchequer is to be made available to the public sector utilities for investment in development of the non-renewable energy sector.

c. Public sector utilities are to be allowed to mobilize finance from the market through bank loans, debentures and floating shares.

d. Private sector financing is to be encouraged.

e. In case of government funding, same set of financing conditions are to be applicable for both the private and the public sector.

f. Considering the importance of energy as a vital infrastructure for development, interest on loans provided by the Government is to be equal to the lowest slab of interest for industrial loans.

g. Protection from foreign exchange fluctuations should be given to energy sector projects.

I.12 Project Planning and Implementation

a. A Master Plan for the sub-sector is to be developed, identifying projects along with the recommended phasing of implementation. The master plan may also include information on the project cost and economic analysis. Bankable documents are to be produced for a project in accordance with its schedule identified in the master plan.

b. Necessary attention should be given for reducing the delay in the process of project approval. The existing procedure should be modified so as to enable the concerned utility to implement the project according to the time schedule given in the project proforma.

I.13 Institutional Issues

Though Petrobangla has been organised in the functional line and operating companies have been registered as Public Limited Company, yet Petrobangla continues to remain as a Government Agency in the form of a Corporation. Petrobangla is to be corporatised and converted into a Public Limited Company (Holding Company) under the Companies Act of 1994 with necessary organisational and financial restructuring and the ownership to remain with Government. The new Company should have the right to select employees on its own terms and conditions of employment so as to attract and retain high quality staff.

A regulatory organization (National Energy Authority) is to be set up to facilitate co-ordination of the activities related to the future development of non-renewable energy and also to help the private and the public sector play complimentary roles in achieving various development targets. Terms of Reference of the proposed organization may include the followings, among others.

a. to decide a consensus projection on demand for commercial energy for planning of non-renewable energy sub-sector;

b. to develop tariff structures for commercial fuels in consultation with the public and the private sectors as well as the consumer groups;

c. to evolve a rational allocation of different fuel types.

I.13.1 Participation of Private Sector

a. Incentive packages defined through the Petroleum Policy are to be offered to the local and foreign entrepreneurs. Similar incentive packages is to be developed for the solid fuels as well.

b. In case of marketing of fuels by the private sector, the price fixation and the reliability of supply to all categories of consumers in the rural as well as the urban areas are to be regulated through the proposed regulatory authority (e.g. National Energy Authority).

I.14 Research and Development

a. A comprehensive R & D programme addressing the problems of development of non-renewable energy is to be drawn up and implemented in co-operation with the existing R & D and educational institutions of the country.

The areas for priority attention may include the following:

Policy Research

Resource Assessment

- Material
- Technology
- Management/Manpower

New Technology Acquisition and Adaptation.

Impact Assessment (Policy/Programme/Projects).

Standardization of Equipment and Procedures.

Data Base.

b. Sufficient funds are to be allocated for conducting the R & D programme according to a defined schedule. A certain percentage of PSC shares and revenue generated by the utilities is to be earmarked for this purpose.

c. Petrobangla should have a Research and Development Wing to help in achieving the above objectives.

I.15 Human Resource Development

a. A comprehensive programme on training linked with career planning of professionals is to be drawn up and implemented.

b. Sufficient funds are to be allocated for human resource development. A certain percentage of PSC shares and revenue generated by the utilities is to be earmarked for this purpose.

I.16 Legal Issues

Appropriate modifications/ revisions of the existing law, acts, regulations, ordinances, etc are to be made in consultation with the Ministry of Law in order to facilitate implementation of various provisions of the National Energy policy.

II. PETROLEUM POLICY[1]

(As approved by the Cabinet in its meeting held on 18.7.93)

II.1. Objective

The basic objectives underlying the policy are to:

i. undertake systematic survey, exploration and exploitation of petroleum resources and to ensure their rational use for sustainable development of the country,

ii. adopt uniform policy instrument for both public and private sector (local and foreign) enterprises,

iii. expedite exploration and development of indigenous petroleum resources,

iv. mobilize domestic and external financial and technical resources from private and public sector especially the former for the development of petroleum exploration, refining, import, export, storage, distribution and marketing,

v. consider development of gas fields through private sector, as a part of Government's privatization policy,

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[1] For the purpose of the Petroleum Policy, Petroleum means any naturally occurring hydrocarbon, whether in liquid, gaseous or solid state as defined in the Bangladesh Petroleum Act, 1974.

vi. replace 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 and all other possible sources of conventional and non-conventional energy,

vii. strengthen the research, technical and administrative capabilities of the government agencies responsible for making policies and their effective implementation,

viii. encourage involvement of private sector in the petroleum industry and trade,

ix. create a competitive environment for giving the best deal to the consumer in price and quality, and

x. promote measures for environmental impact assessment in this sector.

II.2. Implementation

For achieving these policy objectives, the measures specific to various segments of the oil and gas sector are spelled out below:

II.2.1. Legal and Procedural

i. steps will be taken to amend the existing acts and rules to implement the policy wherever necessary,

ii. all applications for exploration licenses will be decided within six months and disputed or contested applications will be decided within nine months,

iii. a comprehensive data base necessary for exploration promotion will be developed and made available on payment of necessary fees for the use of exploration companies and the confidentiality rules will be amended to bring it in line with the international practice wherever necessary, and

iv. the model production sharing contract will be reviewed at intervals.

II.2.2 Fiscal

i. repatriation of profit as per production sharing contract (PSC) provision will be allowed,

ii. private and public sectors will be treated uniformly,

iii. no administering fee or signature bonus will be necessary on signing of PSC. Contract service fee to be paid annually will be biddable with a minimum of US $50,000.00 (Fifty thousand US dollars),

iv. special consideration will be given to application for PSC in offshore areas,

v. for offshore production, rate of bonuses and the Government's share would be lower than onshore production,

vi. no duty will be levied on machinery, equipment and consumables imported for petroleum operation during exploration, development or production stage,

vii. the equipment imported for enhanced oil and gas recovery will also be subject to the same concessionary rate of duty, and locally manufactured machinery and equipment used by the exploration companies will be entitled to all such benefits as are admissible on their export,

viii. pre-shipment inspection of machinery and other imported items will be mandatory,

ix. companies will remain harmless of all corporate tax and such other taxes as are determined under the terms of PSC, and

x. incentive oriented agreements will be made for exploration in and recovery from deeper horizons.

II.2.3. Commercial

i. local private companies will be encouraged to seek joint ventures with foreign companies and/or with BAPEX in exploration,

ii. the current practice of accepting a commercial discovery on the basis of the first exploration well followed by one appraisal well to determine the extent of the reservoir will be changed and declaration of commerciality on conclusive ground will be accepted even on the basis of one well,

iii. the gas producing companies will be assured a market outlet within a reasonable time of commercial discovery, and if indication of an outlet is not given by the government within 12 months of the declaration of commercial discovery, the producer would be free to find market outlet within the country, and

iv. the companies would be required to undertake optimal development of oil and gas fields for maximum recovery.

II.2.4. Pricing

i. The pricing for associated gas would be on a cost plus basis, while for non-associated gas it will be 75% of international price of high sulfur heavy fuel oil with negotiated discounts, and to encourage exploration in offshore areas, associated or non-associated gas from such fields will be priced at 25% higher than those from onshore areas,

ii. the price of locally produced LPG will be linked to international kerosene price on BTU basis with appropriate discount to encourage its local production, and

iii. the value of oil from each production area will be determined on the basis of market value comparable to Asia Pacific Petroleum Price Index (APPI).

II.3 Oil Refining

i. Private sector will be free to set up new refineries,

ii. private sector will be encouraged to install secondary conversion units for upgrading residual fuel to higher value products in collaboration with the existing refinery,

iii. new marketing companies linked with investment in development of infrastructure (storage, pipelines, wharves and other facilities) will be allowed,

iv. joint venture companies for i., ii. and iii. outlined above will be encouraged,

v. the pricing formula for refinery products will be based on import parity prices with a negotiated discount,

vi. refineries will be allowed to import required crude oil after lifting locally produced crude oil allocated from local source(s), and foreign exchange for import of crude oil will be made available,

vii. refineries will be free to sell their products to any marketing company or directly from the plant to any customer(s) within the country, and

viii. foreign companies investing in refinery or in blending plants whether on their own or in association with local investors will enjoy the benefits of Foreign Private Investment (Promotion and Protection) Act, 1980.

II.4. Lubricating Oil

i. Lubricating oil products will be free from price control,

ii. no permission will be required for establishing lubricating oil blending plants, grease and wax manufacturing plants subject to registration for quality check,

iii. investors will be free to procure raw materials from local or foreign sources,

iv. used lubricating oil will be sold only to registered reclamation plants or their authorized agents operating on prescribed guidelines,

v. quality standards will be defined according to the international standards and enforced through checks; each plant will be required to establish adequate testing facilities; penalty for non compliance will be imposed, and

vi. it will be preferable to have a licensing arrangement with internationally reputed oil company(s) or lubricant blending plants for product formulation.

II.5. Marketing and Distribution

i. In consultation with the Government the prices of products will be fixed and equalized for main installation and depots at various places in the country and freight will be added beyond these points,

ii. subject to uniformity in coverage development of retail outlets will be done by the marketing companies and individual investors based on environment, explosives and safety rules,

iii. the commission of the marketing companies and dealers will be excluded from the notified prices, and the dealers' commission will be left out to be determined by the marketing company or by the individual retailer,

iv. the private sector will be encouraged to invest in infrastructure like pipeline(s) including common carriers, storage, and distribution/handling facilities,

v. private sector may also be involved in phases in import and distribution of POL,

vi. marketing companies (under BPC) may import POL products after lifting the locally produced products, and

vii. to check adulteration and to enforce quality existing laws will be enforced.

II.6 Liquified Petroleum Gas (LPG)

LPG may be imported for meeting the demand of the country.

II.7. Research and Development

To enforce this policy, the monitoring, research and development capabilities of Petrobangla, Bangladesh Petroleum Institute, Bangladesh Petroleum Corporation, Geological Survey of Bangladesh, Universities and other Institutions will be strengthened by allocating a fixed percentage of the government share of the PSC and by utilizing the technical assistance provided by the petroleum producing companies under production sharing contracts.

II.8. CNG in Transport

The use of CNG in all types of road and riverine transports including locomotives replacing motor spirit and diesel will be commercialized. No duty, sales tax or surcharges will be levied on equipment imported for compression and refueling of natural gas and for conversion of vehicles. Local as well as foreign private capital will be encouraged to invest in all phases of CNG business.

II.9. Consultation

A standing panel will be constituted by the Ministry of Energy and Mineral Resources to advise the government on policy and operational issues relating to all phases of petroleum operation.

II.10. Safety and Environmental Protection

Laws, rules and policies formulated by the Government in this regard will be followed.

II.11. Welfare

The private companies in consultation with the Ministry of Energy & Mineral Resources/Petrobangla will contribute towards the:

i. development of roads, water supply, health and education facilities in the areas of their operation and towards any such other activities to be undertaken,

ii. undertake programs to improve the state of environment in their areas of operation.

III. RENEWABLE AND RURAL ENERGY POLICY

III.1. General Policy Issues

III.1.1 Sustainable Energy Development

All energy development programmes are to be aimed at sustainable development with minimal environmental effect.

III.1.2 Rural Energy

Rural sector plays a vital role in the national life in terms of economic activities, agricultural production, and population. Therefore, energy needs of the rural areas are to be given priority in all activities related to the overall development of the energy sector.

III.1.3 Biomass Fuels

Direct and total replacement of biomass by commercial energy will be prohibitive for financial and infrastructural constraints. Biomass fuels will, therefore, continue to play an important role in the energy scene of the country for many years to come.

III.1.4 Commercial Fuels

Upper limit of supply of biomass fuels, imposed by the availability of land, would necessitate supplementing the supply side in the rural areas with commercial fuels. Penetration of commercial fuels into rural areas and all other activities related thereto are to be planned and implemented when the overall programme for development of the commercial fuels are drawn up.

III.1.5 Energy-Mix

Demand for total energy in the rural areas are to be met by a mix of bio-mass fuel, commercial fuels and the renewable energy technologies, and their composition would vary from place to place.

III.2 Specific Policy Issues

III.2.1 Resource Assessment and Planning Methodology

a. Systematic assessment of bio-mass resources of all types are to be made. In this process, scopes for alternate use of a part of such resources, like recycling a part of agro-residues into soil are to be identified.

b. Potentials of renewable sources of energy like solar, wind, mini/micro hydro, tidal, wave and geothermal are to be assessed along with the potentials for their harnessing as useful energy.

c. It would be prudent to conduct such assessment on an area basis, preferably considering Union or Thana as a unit for resource assessment.

d. End use based demands are to be balanced with the supply of fuel for each planning unit, which are to be used for planning and for projections , thereby turning such areas into individual units for a decentralized planning structure.

e. Rural and renewable energy database are to be established and updated on a regular basis to facilitate systematic planning.

III.2.2 Technology Assessment

a. Assessment of different technologies related to harnessing, conversion and consumption of bio-mass fuel and other types of new and renewable sources of energy is to be undertaken.

b. Testing, evaluation and standardization of different technologies are to be undertaken to assess their advantages and disadvantages under socio-economic conditions of Bangladesh, economic parameters, adaptability and other factors influencing their dissemination.

c Systematic research on other innovative technologies and for harnessing, conversion and consumption of bio-mass fuels and other renewable energy technologies is to be conducted.

III.2.3 Conservation

a. Conservation at end use level of biomass fuels is to be implemented through technological intervention, primarily by dissemination of technologies like improved stoves and biogas digestors, provided that these are otherwise found suitable on the basis of financial, socio-economic and technological considerations.

b. Conservation measures for use of woodfuel in urban households, for commercial places like hotels and restaurants and as fuel for certain industrial activities are to be encouraged. In this connection similar measures for households are to be given priority.

c. Motivation and incentives shall be provided in the rural areas for implementing conservation measures.

III.2. Environmental Policy

a. Ban on the use of woodfuel for brick burning is to be enforced strictly.

b. Use of woodfuel for melting bitumen for road carpeting is to be banned.

c. Use of woodfuel in urban areas and for brick burning shall be discouraged and at a later stage restricted by making alternate fuels (e.g. coal, peat, LPG, etc.) available for such purposes.

d. Alternate fuels are to be supplied in rural areas at an affordable price to encourage increase in recycling of agricultural residues back to soil in order to achieve and maintain sustainable agricultural production.

e. Watershed management should be an integral part of Hydropower project. Concerned government agencies should take care to the soil conservation and afforestation/reforestation issues and other activities to arrest soil erosion and consequently siltation within the dam area.

III.2.5 Afforestation/Reforestation

a. Afforestation/reforestation programmes are to be primarily aimed at bringing the forest coverage of the country to an environmentally acceptable level.

b. Availability of fuel wood as source of energy is to be considered only after afforestation has attained a sustainable level and an excess amount is available after meeting demands for its alternate value added uses like a source for timber.

c. Motivation is to be strengthened to establish that afforestation is a social and moral obligation for every citizen.

d. Research on identification of fast growing species of trees, having better fuel and/or timber values shall be strengthened keeping local climatic and soil conditions in view.

e. Extension programmes, especially those related to community or villages forestry, shall be planned and implemented through participation of the population living in that locality.

f. Phasing of afforestation/reforestation programmes shall be such that the areas like north-western part of the country, where deforestation has already assumed an alarming proportion, are taken up and continued on a priority basis.

III.2.6 Penetration of Commercial Fuels

a. Penetration of commercial fuels, including end user level distribution and retail outlets, shall be ensured and related projects planned and implemented with the same priority as in the case of urban areas.

b. Demand for commercial fuel for irrigation being extremely concentrated to specific season, the logistics of supply of such forms of energy shall be such that supply is reliable and price is fair at all times and particularly during the irrigation season.

c. Decentralized demand in rural areas may appear less lucrative to a private company as compared to the concentrated demand in the urban areas. Therefore, as and when the private sector is allowed to market commercial fuels, it should be made mandatory to ensure reliability of supply to rural areas at fair prices. Provisions of penalties should be incorporated for the failure of the distributor in ensuring this.

d. Retail outlets in the distribution network for commercial fuels shall be located so that the users can reach the nearest outlet easily and without spending much time.

III.2.7 Rural Electrification

a. The present concept of area coverage electrification with involvement of the population is to be extended to bring the entire country under electricity coverage in phases.

b. Rural electrification is to incorporate a component aimed at stimulating industrial activities and its other value added utilization. Linkages of the REB with different sectors, particularly the industrial sector, are to be established for identification and implementation of such potential end uses.

c. In order to enhance the impact of rural electrification programme, efforts are to be made to stimulate its demand at household levels. In mid-term perspective, the aim may be to provide electricity for at least 2 fluorescent tubes of 20 W capacity to each household under each PBS.

d. Planning of rural electrification is to be coordinated with that of the BPDB in order to avoid any mismatch between the demand and supply of electricity, particularly during the irrigation season.

e. Same set of criteria on reliability of power supply for different categories of consumers are to be applicable to the urban and rural consumers.

f. Rural consumers are to be motivated to adapt measures on conservation, to avoid wasteful uses of electricity and to support all measures leading to conservation, reduction of system losses, efficient load management and economic operation.

III.2.8 Renewable Energy Technologies

a. Biomass fuels have to be supplemented by commercial energy in order to help meet the demands in rural areas on a sustainable basis. But since resource constraints and other problems of logistics may actually impede attainment of such a target, renewable energy technologies are to be considered to bridge the resulting gap between demand and supply.

b. Remote and isolated areas, including the off-shore islands, Beel and Haor areas, which are not likely to be brought under the networks of commercial fuels in foreseeable future are to be considered as potential sites for implementing renewable energy technologies, in spite of their high capital cost.

c. Technologies like Solar Photovoltaic may also be considered even in other places for specific purposes like preservation of temperature sensitive drugs and vaccines, lighting and disaster management in cyclone shelters, where supply of reliable emergency power is more important than any other technical or financial/economic considerations.

d. Other technologies like those involving solar thermal conversion, may be considered for use in industries and rural hospitals.

e. Assessment of wind turbine technology, compatible with the average wind speed, is to be conducted and such units shall be built at specific locations depending on its economic performance and other technological considerations.

f. Technologies like mini/micro hydro, geothermal, tidal power, wave energy and others are to be assessed and considered for implementation based on their relative advantages/ disadvantages of economic, financial and technical parameters.

III.2.9 Tariff and Fiscal Policy

a. Pricing of commercial energy may influence both demand and mix of energy consumption in rural areas. Therefore, pricing policy at the macro level shall take due cognizance of its possible impact on rural energy demand-supply matrix.

b. Kerosene is used for lighting in the rural areas and lighting is indispensable for attaining socio-economic advancement including the government goal on universal literacy. Therefore, subsidy on kerosene price is to be considered.

c. All types of taxes and duties on renewable energy technologies shall be waived to encourage their promotion.

d. Finance for new and renewable energy technologies shall be provided at comparatively softer terms and conditions in order to encourage their promotion.

III.2.10 Legal Issues

a. Legal framework shall be developed and implemented to restrain use of fuel wood for brick burning and road carpeting, with the condition that alternate replacement fuel like coal and peat shall be made available for such purposes.

b. Legal framework is to be introduced for inter-connecting small and isolated electricity generating units with the national grids where applicable.

III.2.11 Human Resources Development

Management and utilization of bio-mass fuels, renewable energy technologies and overall rural energy are highly decentralized. Therefore, development of human resources for such task is to be taken up in a planned way.

III.2.12 Investment

a. Development of rural energy, and especially introduction of renewable energy technologies would require substantial financial support, especially as most of the rural population may not have such financial capability. As such, a separate financial institution may be organized with the mandate to provide financial support to the rural people on relatively softer term and conditions for helping implementation of energy related projects. Alternatively, existing commercial banks may be encouraged to earmark funds for such purposes.

b. Adequate funds are to be allocated for implementation of different programmes and projects related to renewable energy technologies and biomass fuels. Private sector investment shall also be encouraged.

c. Bank loans are to be provided for implementation of renewable energy technologies in the urban areas.

III.2.13 Institutional Issues

a. The Ministry of Energy and Mineral Resources is to administer all activities related to rural and renewable energy.

b. An institutional framework, like Renewable Energy Development Agency (REDA), is to be established for meeting the challenges of planned development of renewable energy technologies and efficient use of biomass fuels. This institution is to be under the Ministry of Energy and Mineral Resources.

c. Government funding for various programmes (including R & D, extension, studies, human resource development) related to rural energy, bio-mass fuels and renewable energy technologies shall be managed and coordinated by this institution (REDA).

d. At least 10% of the overall energy R&D fund, generated from contributions from production sharing contracts and also from government or external sources is to be made available for R&D in rural energy, biomass fuels and renewable energy technologies.

e. Extension of identified rural energy technologies is to be made through various government agencies dealing with extension and/or by the NGO's and the private sector.

IV. POWER POLICY

IV.1 Demand Forecast

a. The methodology of forecasting linking electricity with socio-economic goals of the country is to be used for projecting demands for electricity.

b. An agreed overall projection on demand is to be developed and used for all planning purposes. The projection is to be updated and if needed readjusted periodically based on achievement of targets.

c. A data base on the power sector is to be developed which shall be continuously updated .

IV.2 Long Term Planning and Project Implementation

a. Long term planning for development of the power sector is to be drawn up on the basis of the projection on demand, cost of supply, reliability and quality of supply and adequate transmission and distribution facilities.

b. Least cost approach is to be the basis for generation planning. Realistic exogenous constraints like transportation and logistics of fuel supply, energy security, maximum unit size, project management and environmental impact of technologies are to be defined and used as inputs for least cost expansion planning. Sufficient constraints may be built into the controlling factors related to supply in the west zone.

c. An overall master plan for electricity is to be developed incorporating the least cost generation expansion plan, transmission plan and distribution plan and phasing of projects. This master plan shall be the basis for all development programmes and projects of the power sector.

d. Bankable documents and detailed feasibility studies of such identified projects to be implemented at specific sites are to be prepared in advance by the respective utilities/ private companies for financing either by the Government or the commercial banks.

e. Special projects are to be identified (for example power plants in the west zone or the off-shore islands), implementation of which within a time frame are essential either to improve operational performance of the grid or to provide electricity on socio-economic considerations. Criteria for their acceptance may differ from the overall criteria for other projects of the sub-sector.

f. Distribution agencies such as REB, DESA as well as BPDB and the possible distribution companies in the private sector are to take up marginal expansion projects for their respective franchise area or a part or parts of it in annual rolling sequences under five year plans.

IV.3 Investment and Lending Terms

a. Development of the power sub-sector is to be such that the utilities can function economically and reliably and their financial situation permits generation of resources internally for financing at least a part of their development activities.

b. Utilities are to develop appropriate corporate financial structures along with efficient systems of accounting and financial management in order to facilitate accountability, transparency, to help assessing financial performance, decision making in investment, cost control and economic operation.

c. The terms of lending for finance offered by the Government to the utilities is to be fixed in such a way that the interest does not exceed the lowest slab of interest on loans offered by the commercial banks of the country.

d. The utilities are to be permitted to procure generating plants and other items of generation, transmission and distribution through international competitive bids and local suppliers/ manufacturers to be provided with adequate incentives to participate in such bids.

e. Efforts are to be made to raise capital from the market for the utilities as a whole or its individual projects through bank loans, floating share certificates and bonds. Efforts are to be made to encourage non-resident Bangladeshis, including wage earners abroad, to invest in the power sub-sector.

f. Incentives like tax exemption may be provided to encourage investments in the energy sector. A tax holiday of at least 5 years may be offered for the energy related projects.

g. No duty (including VAT) is to be levied on machinery, equipment, spares and other consumables for energy related projects. In case it becomes necessary to impose customs duties and taxes, then separate budgetary allocations are to be made to cover such expenses.

h. Public sector utilities, implementing Government financed projects, are to be allowed moratorium periods for repayment of loans covering at least the implementation phases of their projects.

i. Existing public sector institutions are to be transformed into public limited companies over a period of time in phases and when so done are to be registered with stock exchanges in Dhaka and overseas.

j. Public sector utilities are to have the option to enter into joint venture with private sector (Local and Foreign) in the fields of generation and distribution of electricity.

k. Protection from foreign exchange fluctuations should be given to power sector development projects.

IV.4 Fuels and Technologies

a. Efforts are to be made to maximize use of indigenous fuels, namely natural gas, coal, hydro-electricity and coal bed methane in the future generation mix of the country.

b. A mix of fuel for power generation is to be evolved so as to reduce reliance on any particular fuel type. Least cost fuel option for generation of electricity should be chosen.

c. Criteria for selection of a technology are to include its provenness, maintainability, reliability, adaptability, and efficiency and environmental compatibility.

d. Local coal is to be given preference for the future coal fired plants. In case of import of coal, infrastructure for its handling and transportation are to be developed in keeping with the volume of coal import for power generation.

e. Construction of nuclear power plants is to be considered on the basis of its cost-economics viz-a-viz alternatives using imported fuels and the problems of logistics of handling and transportation of oil and coal. Safety and waste management are to be given priority in selecting technology for nuclear power project.

f. Efforts are to be made to standardize systems, sub-systems and components of energy equipment so as to optimize cost, improve reliability of the system, facilitate operation and maintenance and optimize inventory of spares.

IV.5 Power Supply to the West Zone

a. Efforts are to be made to gradually bridge the gap in electricity supply between the west and the east zone.

b. The combined firm capacity of power plants in the west zone and the interconnector(s) is to be raised to at least half of the peak demand of the grid excluding the peak demand of Metropolitan Dhaka. This target is to be attained by the year 2010. The second East-West Interconnector is to be taken up on a priority basis.

c. The first coal fired plant in the west zone is to be taken up for implementation urgently.

d. Efforts are to be made to implement the Rooppur Nuclear Power Project, if this option is found competitive with the imported fuels, e.g. coal and oil.

e. Transmission and distribution network shall be developed in keeping with the planned growth in demand in the west zone.

f. Reliability and quality of supply in the west zone is to be improved.

IV.6 Power Supply to Isolated and Remote Load Centres

a. Plans for generation of electricity for isolated and remote areas like off-shore islands are to be drawn up separately and criteria for its acceptance shall be fixed on the basis of fuel and technology options relevant to such areas.

b. Transmission and distribution plans for similar load centres are to be developed on an area basis.

IV.7 Tariff

a. The tariff is to be reviewed and fixed in such a way that the utilities can be financially viable, can generate internal resources and at the same time the consumers can get electricity at a reasonable cost.

b Long run marginal cost is to form the basis for tariff formulation.

c. Subsidies, if provided due to social reasons, are to be given at the end-user level and the related liabilities can not be passed on to the utilities.

d. The slab system for domestic consumers and the tariff applicable for the low income group are to be reviewed periodically to decide on extent of relief.

e. Differential tariff related to time of the day is to be designed to facilitate efficient demand management. The difference in tariff shall be such that the consumers may have the incentive to avoid use of electricity during peak hours. Domestic consumers may be excluded from differential tariff.

f. Cross subsidy is to be provided in order to reduce burden of energy cost on identified consumer groups. In doing so, the burden on the other consumer groups is to be kept within reasonable limits.

IV.8 Captive and Stand-by Generation

a. Permission to install captive generation facilities are to be accorded by the regulatory authority.

b. Categories of activities where captive generation may be allowed shall include the following:

i. Process industries, where loss of power may cause loss of a batch of production.

ii. Co-generation by industries.

iii. Industrial activities like paper and rayon where fluctuations in frequency may cause the loss of a batch of production.

iv. Stand-by generation for Cinema halls, recreational facilities with capacity for not less than 100 persons, hospitals and other facilities of the health services like preservation of temperature sensitive drugs needing reliable power supply, cold storage, aviation, railway communication and related facilities, media services, including TV and radio, telecommunication and for high rise buildings.

c. Stand-by generation facilities allowed for the uses identified above shall be established to meet only extreme contingency. Capacity however should cover only the loads for maintaining essential services.

d. Price of gas used as fuel for captive generation (including stand-by) shall be at least equal to the price offered to the industrial sector. However, gas at concessional rate may be supplied to stand by generators having separate meter.

e. Price of diesel or other petroleum products for captive generation will be at least at par with that offered to the industrial sector.

f. Individuals/organisations living in an area not covered by the utilities can install captive generation facilities.

IV.9 System Loss Reduction

a Total system loss is to be brought down to a level typical to the successful utilities of the developing countries in the region, subject to cost effectiveness of such reduction in loss.

b. The auxiliary consumption of existing power plants is to be reviewed and attempts to be made to minimize such consumption through retrofiting subject to availability of financial resources.

c. Measures like transmission at higher voltages, optimum sizing of conductors, use of appropriate reactive power sources and adaptation of other technical measures are to be explored. Identified measures are to be implemented if found cost effective.

d. Optimization of the distribution systems through rehabilitation of distribution lines, sizing of transformers, use of capacitor banks are to be undertaken to reduce distribution loss. Standards for the distribution network are to be developed and implemented. Elevation of the existing distribution voltage is to be considered on the basis of its cost economics.

e. Energy meters are to be checked and calibrated periodically as follows:

i.	Bulk commercial and industrial consumers	:	at least once every 5 years.
ii.	Domestic consumers	:	at least once every 10 years
iii.	System meters	:	at least once every two years.

f. All industrial consumers are to provide information on their total production and total consumption of electricity in order to estimate their specific energy consumption.

g. Consumers are to be motivated through a social movement to realise that paying for electricity consumed is a social and moral obligation of each citizen.

h. Dishonest consumers and the personnel of the utility found guilty of collaborating with such dishonest consumers are to be liable to severe punishment.

i. Attractive incentive and prohibitive punishment scheme is to be developed and implemented in order to motivate utility employees to improve commercial operation.

IV.10 Load Management and Conservation

a. Measures are to be taken to reduce peak hour load. The possible areas where policy intervention can help implement such measures are as follows:

i. Commercial activities in shopping centres and mails are to be closed down at 6 P.M. on working days. Exception to this shall be restaurants, medicine shops, groceries and shops for provisions.

ii. Ceremonial illumination (for the purpose of private receptions, parties, wedding ceremonies) etc are to be restricted.

iii. Industries are to stagger their holidays so that the holidays are distributed over the week.

iv. Second off-peak tariff may be introduced for consumption between 11 P.M and 5 A.M. to encourage industries to stagger their second shift.

b. Following measures are to be taken for conservation of energy.

i. Use of Power Factor Improvement plants are to be mandatory for all new consumers using induction motors in industries, bulk commercial consumers and irrigation pumps. Existing consumers of these categories are also to be encouraged to instal such plants.

ii. Attempts are to be made by the utilities to improve efficiency of the operating plants to the extent possible through rehabilitation. Replacement of power plants shall be made if this is more economic than rehabilitation.

iii. High efficiency appliances like fluorescent lamps with efficient ballast, electronic regulators for fans and high efficiency electric motors are to be used. Replacement of existing devices shall be encouraged.

iv. Industries producing conventional appliances are to be encouraged to change/modify their production line for manufacturing identified efficient appliances.

v. The utilities, local R & D and educational institutions shall undertake a joint survey to identify measures of conservation at the end-use level. Consumers will be motivated to adapt such identified measures.

c. Commercial banks should be encouraged to provide loans at softer terms for implementation of conservation measures at the end-use level.

IV.11 Reliability of Supply

a. Adequate generation capacity is to be installed on an emergency basis to overcome the existing power crisis.

b. Adequate reserve margin is to be provided by installing capacities in excess of peak demand (say 25%) so that the system can reliably accommodate planned maintenance and forced outage. Reliability criteria like Loss of Load Probability of the system are also to be prescribed and reviewed from time to time, which are to be considered for generation expansion plans.

c. Planning of major maintenance, including overhauling, retrofiting and rehabilitation is to be done meticulously and ahead of time so that necessary spares, experts and logistics are available in time. Interim replacement or rehabilitation of power plants are to be ensured at appropriate time (12 to 15 years for steam turbine and 8 to 10 for gas turbines), for which adequate funds are to be made available in time.

d. Yearly maintenance schedule is to be drawn up and implemented strictly without any exception.

e. Procurement method for spares and expert services are to be simplified so that supplies and services can be procured on call from abroad. An optimum inventory of spares and consumable is to be maintained.

f. Continued training of maintenance personnel is to be ensured to develop an adequate number of maintenance manpower. Dissemination of knowledge and use of feedback from past maintenance works are also to be ensured. Attractive salaries, remuneration and other forms of incentives and facilities are to be given to such personnel.

g. Expertise is to be developed in the field of protection engineering so as to ensure coordination, reliability and availability of protection systems.

h. Maintenance of distribution system is to be separated from functions of commercial operations. Maintenance personnel are to be dedicated exclusively for operation and maintenance works.

IV.12 System Stability

a. Adequate transmission links between generators and major load centers are to be provided to enhance system stability.

b. Fast acting relays and breakers, auto reclosing of transmission line, co-ordination among protective devices, quick acting governors and excitation system along with automatic load shedding scheme are to be provided.

c. Continuous monitoring and analysis of problems, setting and resetting of control and protective devices to respond to changed conditions are to be ensured.

IV.13 Load Despatching

a. Load despatching Centre is to ensure coordination among the power stations and load centres for economic, efficient and reliable operation of the power system through continuous control of load flows, regulation of voltage and reactive powers, and reduction of transmission losses.

b. The load despatch centre of the concerned utility is to be equipped with state of the art techniques for ensuring the above objectives.

IV.14 Institutional Issues

a. The utilities of the power sector are to be presently divided into two following major groups according to functional responsibilities :

i. generation and transmission

ii. distribution

b. BPDB is to be restructured along functional lines. The functions of generation and transmission are to be separated from those of distribution of electricity and two separate corporatised entities, one for carrying out generation and transmission functions and the other for carrying out distribution function in those areas that are now being served by BPDB are to be established over a period of time in phases. These two (new) public limited companies are to be formed under the Companies Act of 1913 with necessary organizational and financial restructuring and the ownership remaining with the Government. In the longer-term, generation and transmission functions may also be needed to be separated.

c. DESA is to be corporatised and converted into a public limited company under the Companies Act of 1913 with necessary organizational and financial restructuring with the ownership remaining with the Government.

d. There is to be a Board of Directors, to be appointed by the Government for each of the companies as mentioned under (b) and (c) above, for directing and monitoring the performance of the company. Majority of the Directors, including the Chairman are to be from various interest groups outside the Government. Government may retain indirect control on specified matters through nominated Directors (from within the Government) with voting rights.

e. The new companies should have the right to select employees on their own terms and conditions of employment so as to attract and retain high quality staff.

f. Regulatory functions of the power sector are to be administered by a regulatory body to be initially attached to the Ministry of Energy and Mineral Resources. Its responsibilities may include, among others, licensing, tariff, safety standards, codes, performance standards and definition of franchise area of operation and licensing and development and updating of an agreed forecast.

g. The responsibility of policy formulation involving the power sector are to continue to be vested with the Government.

IV.15 Private Sector Participation

a. Local and expatriate entrepreneurs are to be allowed to participate in development of the power sector. Possible modes of participation in functional areas may be as follows.

i Generation: Specific projects included in the list of generation projects identified through national planning should be offered for private investment. Competitive tenders on the basis of Build-Own-Operate (BOO) and Joint Venture should be invited. Unsolicited offers received upto the approval date of this policy will be appraised by a competent group of experts (local and foreign) formed by the Ministry of Energy & Mineral Resources.

ii Distribution: The Government is to invite private parties, possibly, including co-operative societies of utility employees, to supply power in one or more localities on an experimental basis, after evaluating alternative ways to organize their participation (e.g. franchise, contract).

iii Contracting of Services: The government may consider contracting out some functions currently performed by BPDB and DESA particularly meter reading, billing and/or collections.

iv Wheeling Arrangement: The electricity generated by private generators may be supplied to the grid system of the Generation and Transmission Company of agreed terms and conditions. The private/public generators may also sell directly to large consumers though the transmission and distribution facilities of other companies provided the facilities are adequate and the commercial terms and conditions of such wheeling arrangements are acceptable to all concerned.

b. Terms and conditions under which the private sector shall participate in generation and distribution are to be settled jointly by the Government, the proposed regulatory authority, entrepreneur(s), and the concerned utility companies.

c. Privatization of the power sector is to be considered in future depending on experience with corporatisation.

IV.16 Human Resource Development

a. Organization charts for operation and maintenance of new plants are to be designed in such a way that total manpower is not allowed to exceed the optimum level.

b. Present manpower of the utilities are to be reviewed to identify excess manpower. Such excess manpower may be utilized for future projects and plants.

c. Persons specifically hired for project implementation are to be employed on a contract basis and their service conditions shall preclude their automatic absorption in the utility.

d. Distribution utility boundaries are to be rationalized in order to avoid parallel operation and to optimize human resource utilization.

e. Employment opportunities or labour intensiveness should never be a criterion for acceptance of projects of power sub-sector.

f. A comprehensive training programme is to be developed for the power sector, which shall encompass all functional areas of the power sector and specifically include system planning, construction management, system operation and maintenance, utility management, financial management and computer aided operation.

g. Training is to be linked to career planning of professionals of the utilities.

h. The Government and/or the utilities are to provide adequate funds for implementation of the training programme.

i. A personnel, trained in a specific functional discipline, is not to be transferred to any other discipline.

j. Local training facilities are to be strengthened. Professionals receiving training abroad are to participate in local training as resource personnel in specific training programmes for ensuring smooth dissemination of technology and knowledge.

k. Local training facilities are to be made available to the future entrepreneurs of the private sector on payment of prescribed charges.

l. Inter-utility linkage in the field of human resource development is to be strengthened.

IV.17 Regional/International Cooperation

i. Possibility of importing electricity from neighbouring countries may be examined.

ii. Attempts may be made to include inter utility cooperation in the list of SAARC activities.

iii. Linkages of local utilities with those in other countries are to be established to form a basis for exchange of experience in power development and training of human resources.

IV.18 Technology Transfer and Research Programme

i. Transfer of technology is to be given due consideration in development of the power sector.

ii. Efforts are to be made to substitute import by local inputs. This may include both hardware and software like engineering, design and project management. At distribution level in particular, locally produced materials and equipment are to be used to substitute import.

iii. Local industries are to be assessed in order to identify manufacturing capabilities relevant to projects of power sector. Industries, thus identified, are to be encouraged to manufacture identified items as per standards.

iv. Utilities are to form a group of experts to provide advisory and consulting service in the power sector. Such groups shall be allowed to function on a commercial basis.

v. A comprehensive Research and development programme addressing problems of electrical energy is to be drawn up and implemented in cooperation with local universities/ BITs and R & D institutions. Adequate funds are to be made available for implementation of the R & D programme.

IV.19 Environmental Policy

i. Development of power sub-sector shall be such that it is sustainable environmentally and cost-effective at the same time.

ii. Environmental Impact Assessment shall be mandatory for any project of electricity generation. Clearance of projects from environmental point of view shall be accorded without undue delay so as to avoid cost and schedule over runs.

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ii. Environmental Impact Assessment shall be mandatory for any project of electricity generation. Clearance of projects from environmental point of view shall be accorded without undue delay so as to avoid cost and schedule over runs.

iii. The Department of Environment shall prescribe standard contents and formats of EIA to be submitted on electricity projects and also define other regulatory codes, guides and standards on emission and thermal pollution from generating plants. Same environmental standards shall be applicable to the new plants in the private and the public sectors.

iv. All new projects shall conform to the limits, codes, guides and standards that may exist at the time of project planning. In case of power plants already existing or under implementation, efforts shall be made to reduce the pollution as close as possible to the permissible level. In such cases economics of power generation and its effect on tariff shall be taken into account in reducing their pollution level.

v. Provisions under the Nuclear Safety and Radiation Control Act (Act 21 of 1993, the Government of Bangladesh) and its regulations in addition to environmental standards of the Department of Environment shall be mandatory in installation, operation and maintenance of nuclear power plants.

vi. Mode of disposal of wastes in case of coal-fired plants and radioactive wastes of nuclear power plants, as defined by the Department of Environment and the Nuclear Safety and Radiation Protection Division of BAEC, shall be followed.

vii. Watershed management should be an integral part of a hydropower project. Concerned government agencies should take care of the soil conservation and afforestation/ reforestation issues and other activities to arrest soil erosion and consequently siltation within the dam area.

IV.20 Legal Issues

Appropriate modification/revisions of the existing Law, Acts, Ordinances, Regulations, etc are to be made in consultation with the Ministry of Law in order to facilitate implementation of various provisions of the National Energy Policy.

V. RURAL ELECTRIFICATION POLICY

V.1. General Policy Issues

a. Planning of rural electrification is to be made consistent with the overall goals of socio-economic development of the country.

b. Economic viability and overall economic sustainability are to be considered at the time of extension of rural electrification programme.

V.2. Specific Policy Issues

V.2.1. Demand Estimation and Planning

a. Demand for electricity in any rural area is to be duly assessed for different time horizons based on the demands for different categories of end-users.

b. Factors influencing growth in demand like possibilities of surplus income, changes in life style, scopes for diversification of economic activities and interdependence of end-uses and their effect on the demand for electricity are to be taken into cognizance and to be reflected in demand forecasts.

c. Area of coverage within a PBS or the PBS itself is to be determined on the basis of load quantum, numbers and mix of consumers and load factor.

d. Phasing of coverage of an area within a defined utility boundary and also an utility unit (PBS) is to be drawn up on the basis of growth of load and economics of extension.

e. The existing Master Plan is to be updated to provide a realistic programme on bringing all the rural areas of the country under electrification in phases. Such a Master Plan, delineating load centres and their growth potentials, is to be the basis for rural electrification irrespective of the utility to be actually involved in its implementation. Area based micro planning is to be integrated for preparing the Master Plan on rural electrification.

V.2.2 Approach for Extension

a. Primarily the techno-economic considerations are to determine the priority of areas to be electrified.

b. In case of resource constraints, areas with better prospects of utilization and better economic return shall be given preference over others.

c. In case an area within a PBS or a PBS itself is taken up for electrification for reasons other than technical and economic viability, then the concerned PBS is to be given financial support, including rescheduling of debt servicing (e.g. extended moratorium).

V.2.3 Palli Bidyut Samity

a. Electrification through Palli Bidyut Samity with scopes for participation of rural consumers in the entire programme is to be continued.

V.2.4. Financing for Extension of REB Network

a. Adequate financial resources are to be allocated for implementation of the Master Plan on rural electrification.

b. Conditions of financing (interest rate and repayment schedule) are to be such that a PBS can meet the debt servicing liabilities without frequently increasing the tariff rates.

c. The existing system of repayment of debts by the PBSs for 30 years including a grace period of 5 years may be continued. The conditions for repayment of debt may be further relaxed for financially weaker PBSs (having low load density and low utilization factor), especially during the initial years of their commercial operation.

V.2.5 Cost Optimization and Need for Import Substitution

a. Capital cost for establishing PBS and construction of distribution lines including other equipment is to be reduced by gradually replacing import with equivalent locally produced items.

b. The private sector is to be encouraged to produce identified items of rural electrification in sufficient quantities and according to the standard and quality to be specified by REB.

c. Local producers are to be offered the opportunity and terms and conditions equivalent to the imported items for rural electrification network in order to encourage them to produce such items locally. Reduced duties may be charged on imported raw materials to be used by the concerned manufacturing industries.

V.2.6 Number of PBS and the Average Size

a. Each PBS may cover on the average 6 Thanas and the average size of a PBS is to be of the order of 1,500 Sq. Kilometers.

b. Minimum size of a PBS in terms of installed capacity is to be 20 MVA, while the maximum size is to be determined by the trend of growth in demand. If management of a PBS of size larger than 100 MW appears to be difficult, then the PBS may be split into two PBS or a part of its load may be merged with an adjacent smaller PBS, if available.

c. Depending on the area served, physical distance of the furthest consumer from the PBS Headquarters, a PBS may be split into more than one rural electrification districts. In this case the overhead of maintaining district offices is to be optimized.

d. If a utility other than REB is given the responsibility for electrification of the districts in Chittagong Hill Tracts, then the expansion of rural electrification network in those areas is to meet the criteria followed for the REB network.

V.2.7. Capacity Utilization and Load Factor

a. Efforts are to be made to increase capacity utilization of the existing and future PBS in order to improve their economic performance.

b. Target minimum annual sale of a PBS is to be not less than 60 GWh in order to help them attain an economic break even point.

c. The annual load factor of a PBS is to be as close to the national grid as possible in order to improve economic performance.

V.2.8 Demand Management

a. Demand in a PBS is to be managed efficiently, so that the average to peak demand ratio may be as high as possible. The peak demand is also to be restricted so as to facilitate efficient demand management and economic operation of the national grid.

b. Use of energy during off-peak hours is to be encouraged in order to improve financial performance of the rural electrification network and the national grid.

V.2.9 Domestic Use of Electricity

a. Domestic connections to as many households in an electrified area as possible is to be aimed so that an average household can have two fluorescent tubes of 20 Watt capacity each.

b. Domestic consumers are to be encouraged to avoid wasteful use of energy.

V.2.10. Industrial Demand

a. Scopes for growth in industrial demand for electricity shall be exploited to the extent possible.

b. A congenial atmosphere and incentive packages are to be developed and offered to the private sector for establishing industrial units in the rural areas.

c. Categories of industries for implementation in rural areas are to be identified, and if needed new industries of such categories are to be allowed to be set up in rural areas only.

d. A list of industries may be drawn up for each PBS based on analysis of resources available, priority and other techno-economical considerations. Such a list of industries may be annexed to the master plan for rural electrification.

e. PBS with surplus cash may be encouraged to invest in local industrial ventures. The local financial institutions may be encouraged to accept a solvent PBS as a collateral security.

f. Credit for rural industries may be provided at softer terms and conditions based on the consideration that the resulting improvement in rural economy, diversification of activities and improvement in life style will help restriction of migration and unplanned urbanization.

V.2.11 System Loss Reduction and Conservation

a. Efforts are to be made through the PBS members to bring down the non-technical loss. Villagers are to be motivated to realize their social and moral obligations to reduce loss. They should be convinced that the reduction of loss will fetch many financial benefits to them, including scopes for equity participation in industrial projects.

b. Villagers are to be motivated to avoid wasteful use of energy and the use of electricity during peak hours is to be restricted.

c. Each Palli Bidyut Samity is to identify measures at different end-use levels so that wasteful use of energy can be avoided through technological interventions.

V.2.12 Power Generation

a. If it becomes necessary to install separate power plants for the REB network, the same are to be planned keeping in view the expansion plan for the national grid and cost economics of such a project *viz-a-viz* its effect on the tariff structure.

b. Renewable energy technologies like solar photovoltaic and wind energy may be considered for rural areas on their cost economics.

c. Gestation time for the solar PV being much lower (months) than other energy projects, these may be considered for large scale deployment whenever the capital cost comes down to an acceptable level. In case of wind turbines, suitable type is to be selected which can be operated optimally at the average wind speed of the selected site.

V.2.13 Environment

a. Environmental Impact Assessment for possible future power plants built by the PBS/REB are to be conducted in the same line as applicable for any other power plant.

V.2.14 Tariff Structures

a. Tariff structure for rural consumers is to be developed in such a way that the PBS are economically viable, while the rates are within the purchasing power of the rural communities.

b. Rural industries may be offered lower tariff than the urban industries during off-peak hours in order to stimulate rural industrial activities and to facilitate efficient demand management.

c. Considering the importance of agriculture, special tariff facilities is to be offered for irrigation pumps during off-peak hours.

d. Electricity consumption in rural commercial sector during peak hours is to be discouraged through the differential tariff structure.

e. Operation of husking and milling units during peak hours are to be discouraged by imposing high rates.

V.2.15. Rationalization of Utility Areas

a. The supply areas are to be such that the network can be efficiently planned, implemented and managed. If needed an utility area with low load density may be merged with the adjacent utility area.

b. System load is to have sufficient magnitude. A minimum of about 15 MW would be necessary while optimum levels would be over 50 MW.

c. The consumers served are to be at least of the order of about 15,000 with a good mix of consumer types.

d. The demarcation between adjacent operational units is to be such that efficient net work configurations can be attained.

The supply area is to be contiguous and one utility should not have pockets of supply areas within another utility.

V.2.16 Institutional Issues

a. Scopes of REB activities may be widened by incorporating activities related to stimulation of demands for electricity, especially in the industries sector.

b. Advisory roles of external agencies (BRDB, BADC and BSCIC) are to aim at rural industrialization and diversification of economic activities. The advisory board of REB is to be widened by inclusion of private sector representative.

c. REB is to be provided with additional financial resources enabling it to enhance its capability in expansion of the network to 10,000 Km per year by the year 2000 AD based on adequate demand and generation.

Table 2.1 **Agencies Responsible for Planning of the Energy Sector**

Energy Sources	Planning Commission		Ministries and Agencies
	Division	Section/Wing	
Commercial Energy	Industry & Energy	1. OGNR 2. Power 3. Rural & Renewable 4. Energy Modeling & Economics	Ministry of Energy & Mineral Resources and concerned agencies
Biomass Fuels	Agriculture and Rural Institution	Forestry Wing	Ministry of Env. and Forests and concerned agencies
Animal Draft Power	Agriculture and Rural Institution	Livestock and Fisheries Wing	Ministry of Fisheries & Livestock & concerned agencies

Table 2.2 **Agencies Involved in Development & Management of the Energy Sector**

Functions	Ministry/Agency
1. Commercial Energy	Ministry of Energy & Mineral Resources
1.1 Indigenous fuels	
a. Survey, geological mapping, Exploration of minerals.	a. Geological Survey of Bangladesh
b. Leasing for extraction of minerals	b. Bangladesh Bureau of Mines
c. Exploration, production, transmission, distribution & marketing of indigenous petroleum fuels.	c. Petrobangla and Its subsidiaries
c1. Exploration of oil and gas	c1. BAPEX
c2. Operation of gas fields	c2. BGFCL, SGFL
c3. Transmission & distribution of gas within franchise areas.	c3. BGSL, GTC, JGTDSL, TGTDCL
c4. Marketing of CNG	c4. RPGCL
d. Research Training on Oil and Gas	d. Bangladesh Petroleum Institute
1.2 Import of crude & petroleum products; processing, distribution & marketing of petroleum products	1.2 Bangladesh Petroleum Corporation and its subsidiary companies
a. Import of crude & petroleum products & export of refinery products	a. BPC
b. Refining of crude	b. ERL
c. Bitumen production	c. ABPL
d. LPG bottling	d. LPG Bottling Plant
e. Blending of Lube Oil	e. ELBP, SAOCL
f. Distribution & marketing of petroleum products	f. BPC & Oil Companies: JOCL, MPL, POCL

Table 3.1 **Presently Known and Exploitable Indigenous Primary Energy Resources**

Resource (Location)	Location	Net Recoverable Reserve	Production/Supply		Comments
			Present	Projected	
Coal (West Zone)	Barapukuria	70 Million tonnes	0	1 million Tons/year from 2000	Reserve 300 Million tonnes in place
Crude Oil (East Zone)	Haripur	5.5 Million Barrels (June '93)	16.4 tonnes/day (June '93)	Not yet ascertained	Appraisal of the field needed
Natural Gas (East Zone)	17 gas fields	10.44 TCF (June '93)	558 MMCFD (June '93)	1000 MMCFD by 2000	Reserve life-time upto 2020
Natural Gas Liquid (East Zone)	Producing Gas Fields	53.5 Million Barrels (June '93)	137 tonnes/day (June '93)	479 tonnes/day	After Commissioning of Kailastila & Beanibazar fields
Hydropower (East Zone)	Kaptai	N/A	1000 GWh/year	1000 GWh/year	Only Kaptai site being exploited

Functions	Ministry/Agency
1.3 Electricity	
a. Regulatory functions	a. Office of the Electrical Advisor and Chief Electric Inspector
b. Generation	b. BPDB (REB)
c. Transmission & Distribution	c. BPDB, DESA
d. Distribution	
d1. In rural areas	d1. REB (BPDB, DESA)
d2. In Metropolitan area of Dhaka and district headquarters of Gazipur, Manikganj, Munshiganj, Narayanganj and Narshingdi.	d2. DESA
d3. All other areas excluding d1 & d2	d3. BPDB
1.4 Import of Coal	1.4 Private Sector
1.5 Energy Conservation: Conservation of energy in industrial units through energy audits and studies.	1.5 EMCC
2. Biomass Fuels and Animal Power	
2.1. Production of Agricultural Residues	2.1 Ministry of Agriculture and its agencies, farmers and households
2.2 Development and Management of Forest Resources	2.2 Ministry of Environment and Forest Department of Forest for state owned forest and also for extension support to village forests.
2.3 Development of Livestock Resources	2.3 Ministry of Fisheries and Livestock, Department of Livestock.
3. Development of other Renewable Energy Sources.	
3.1 Hydropower	3.1 BPDB
3.2 Research & Demonstration on New-renewable Energy Technologies	3.2 BAEC, BAU, BCSIR, BUET, DU, REB

Table 3.2 **Prospects of Additional Reserves of Primary Energy Resources**

Resource (Location)	Source	Possible Additional Reserve	Comments
Coal (West Zone)	Jamalganj	1 Billion tonnes	Mining would depend on technology & economics of mining from deep seams (1000 Meters)
	Khalashpir	450 Million tonnes	Favourable for mining. Feasibility study needed.
	Other areas in North-West part	Not known	Prospects bright. Contract Signed on royalty basis.
Coal Bed Methane (West Zone)	Jamalganj and other coal mines	One seam at Jamalgonj has a CBM potential of 0.5 TCF	Studies leading to production at Jamalgonj and feasibility studies for other locations needed.
Peat (West Zone)	Faridpur Khulna	170 Million tonnes	Demonstration project undertaken at Madaripur.
Crude Oil	Kailashtila, Fenchugonj Different off and on-shore locations	Oil prospects reported. Prospects believed to be bright	Appraisal and testing required. Exploration needed. Financial Constraints may be solved by involving private sector
Natural Gas (East Zone)	Existing fields	2.5 TCF	Increase in recoverable reserve through appraisal of possible reserve.
	Existing fields	2.6 TCF	By reducing abandonment pressure to 500 psig in case of volumetric drive. Compressors would be needed
	Proven fields, undrilled structures and structural leads	4.2 TCF	42 TCF estimated in the Hydrocarbon Habitat Study, out of which 10% is assumed to be recoverable.
Hydropower (East Zone)	Matamuhuri	300 GWh/year	Inundation of land and interference with human settlement should be considered before taking decision
	Sangu	200 GWh/year	
	Mini-hydro sites at Sylhet, Chittagong and Chittagong HT.	10 GWh/year	Feasibility studies on three sites identified in the Chinese study on Mini-hydro may be undertaken.

Table 3.3 **Supply of Biomass Fuels in Bangladesh in 1981**

Type of Land	Area million acre	%	Biomass Fuels		
			Million tonnes	Peta Joule	%
Forests	5.41	15.30	0.68	10.30	2.15
Not available for Cultivation	6.36	18.00	0.08	1.20	0.25
Village Forests	0.74	2.10	4.66	65.60	13.70
Culturable Wastes	0.62	1.80	0.15	2.00	0.41
Current Fallow	1.40	4.00	0.33	4.70	0.98
Net Crop	20.77	58.80	23.08	288.48	60.20
Total Area	35.33	100.00	29.00	372.28	77.69
Livestock (20.5 million head)			6.70 (Dung)	77.72	16.21
Recycle Biomass			2.30	29.30	6.10
Total			38.00	479.30	100.00

Source: GOB (1987).

Table 4.1 **Energy Balance Table 1990**

In Peta Joule (10^{15} Joule)

Description	Commercial Energy					Biomass Fuels						
	Natural Gas	Crude Oil	Petroleum Product	Coal	Electri-city	Total Agric. Comm	Tree Residues	Fuel Residues	Fuel wood	Dung	Total Biomass	TOTAL ENERGY
I SUPPLY :												
Primary-Production	163.4	-	2.7	-	3.3	169.4	316.6	22.5	88.2	71.7	499.0	668.4
Import	-	53.4	48.0	12.3	-	113.7	-	-	-	-	-	113.7
Export	-	-	-6.3	-	-	-6.3	-	-	-	-	-	-6.3
Stock Exchange	-	-5.9	-6.8	0.1	-	-12.6	-	-	-	-	-	-12.6
Total Primary	163.4	47.5	37.6	12.4	3.3	264.2	316.6	22.5	88.2	71.7	499.0	763.2
Primary Percent	21.4	6.2	4.9	1.6	0.4	34.5	41.5	2.9	11.6	9.4	65.4	99.9
II TRANSFORMATION												
Refinery	-1.0	-47.5	44.1	-	-	-4.4	-	-	-	-	-	-4.4
Thermal Power	-69.3	-	-8.8	-	24.4	-53.7	-	-	-	-	-	-53.7
Losses & Own Use	-9.9	-	-4.0	-	-8.3	-22.2	-	-	-	-	-	-22.2
Total Final-Supply	83.2	-	68.9	12.4	19.4	183.9	316.6	22.5	88.2	71.7	499.0	682.9
III CONSUMPTION												
Domestic	9.3	-	23.6	-	4.9	37.8	243.0	22.5	67.3	71.7	404.5	442.3
Industrial	14.0	-	7.0	9.5	10.0	40.5	73.6	-	19.1	-	92.7	133.2
Commercial	3.1	-	-	0.4	3.6	7.1	-	-	1.8	-	1.8	8.9
Transport	-	-	25.0	2.5	-	27.5	-	-	-	-	-	27.5
Agricultural	-	-	11.0	-	0.9	11.9	-	-	-	-	-	11.9
Others	-	-	0.3	-	-	0.3	-	-	-	-	-	0.3
Non-Energy Use	56.8	-	2.0	-	-	58.8	-	-	-	-	-	58.8
Total Final-Consumpn.	83.2	-	68.9	12.4	19.4	183.9	316.6	22.5	88.2	71.7	499.0	682.9
Final Energy %	12.2	-	10.1	1.8	2.8	26.9	46.4	3.3	12.9	10.5	73.1	100.0

Conversion Factors

Natural Gas	1 MMCF = 0.00099PJ	Electricity	1 GWh = 0.0036 PJ
Crude Oil	1000 Tonne = 0.0427 PJ	Petroleum Product (Av.)	1000 Tonne = 0.0427 PJ
Coal	1000 Tonne = 0.027 PJ	Fuel-wood	1000 Tonne = 0.0151 PJ
Agri. & Tree Res.	1000 Tonne = 0.0125 PJ	Dung	1000 Tonne = 0.0116 PJ

Source: GOB 1990.

Table 4.2 Natural Gas Reserves of Bangladesh

Field	Discovery	Reserve		++			++	
		Proven+ Probable TCF	Recoverable TCF	Cummulative Production TCF	Net REC Reserve TCF	REC Condensate MMBBL	CUM Production MMBBL	Net REC Condensate MMBBL
Bakhrabad	1969	1.432	0.867	0.328	0.539	2.13	0.53	1.60
Feni	1981	0.132	0.08	0.0113	0.0687	0.24	0.03	0.21
Habiganj	1963	3.66	1.90	0.375	1.520	0.10	0.02	0.08
Kailastila	1962	3.65	2.53	0.0626	2.466	27.56	0.68	26.88
Rashidpur	1960	2.24	1.31	-	1.310	4.00	-	4.00
*Sylhet	1955	0.44	0.27	0.1521	0.114	0.89	0.52	0.37
Titas	1962	4.13	2.10	1.00	1.099	3.02	1.44	1.68
*Chatak	1959	1.90	1.14	0.026	1.114	0.08	-	0.08
*Kamta	1981	0.32	0.20	0.021	0.174	0.04	-	0.04
Beanibazar	1981	0.243	0.114	-	0.114	1.82	-	1.82
Begumganj	1977	0.025	0.015	-	0.015	0.01	-	0.01
Belabo	1990	0.194	0.126	-	0.126	0.31	-	0.31
Fenchuganj	1988	0.35	0.21	-	0.210	0.52	-	0.52
Jalalabad	1989	1.50	0.90	-	0.900	15.75	-	15.75
Kutubdia	1977	0.78	0.468	-	0.468	-	-	-
Meghna	1990	0.159	0.104	-	0.104	0.21	-	0.21
Semutang	1969	0.164	0.098	-	0.098	0.02	-	0.02
Total		21.354	12.416	1.977	10.439	56.70	3.22	53.48

* Production Suspended, ++ Cummulative Production upto June, 1993.

Source: Petrobangla.

Table 5.1 **Economic Growth Rates**

	1990—95	1995—2000	2000—05	2005—10	2010—15	2015—2020
Low Scenario	4.44	5.25	5.24	5.24	6.65	6.65
Reference Scenario	5.0	6.0	6.7	7.2	7.5	8.0

Table 5.2 **Projected Demand for Commercial Energy and Electricity (Low Economic Growth Scenario).**

	1990	1995	2000	2005	2010	2015	2020
Population (million)	107	118	130	141	153	165	177
GDP Growth Rate	4.44%	5.25%	5.24%	5.24%	5.24%	6.65%	6.65%
Per capita GNP($)	190	214	242	276	317	366	424
Energy Co-efficient	1.62	1.37	1.37	1.37	1.08	1.08	1.08
Energy Growth Rate	7.13%	7.19%	7.18%	7.18%	7.18%	7.18%	7.18%
Per Capita KGOE	56	68	92	127	157	219	272
Total Energy (MTOE)	6	8	12	18	24	36	48
Total Energy (PJ)	256	342	512	769	1025	1537	2050
MJ/$ GNP	13	14	16	20	21	26	27
Electricity							
Percentage in Fuel	35%	37%	39%	37%	33%	33%	33%
Total GWH	8207	11584	18315	26063	30994	46491	61988
Per capita kWh	77	98	141	185	203	282	351
Load Factor	55%	57%	57%	57%	58%	59%	60%
Peak Load MW	1703	2320	3668	5220	6100	8995	11794

Table 5.3 **Projected Demand for Commercial Energy and Electricity Reference Economic Growth Scenarios)**

	1990	1995	2000	2005	2010	2015	2020
Population (million)	107	118	130	141	153	165	177
GDP Growth Rate	4.5%	5.4%	6.4%	7.2%	7.7%	8.2%	8.7%
Per capita GDP($)	190	214	254	318	416	560	774
Energy Co-efficient	1.62	1.37	1.37	1.37	1.08	1.08	1.08
Energy Growth Rate	7.34%	7.4%	8.77%	9.86%	8.32%	8.86%	9.40%
Per Capita KGOE	56	72	94	131	194	269	384
Total Energy (MTOE)	6	8	12	19	31	46	72
Total Energy (PJ)	256	362	531	827	1314	1979	3055
MJ/$ GDP	13	14	16	18	20	20	21
Electricity							
Percentage in Fuel	35%	37%	39%	37%	33%	33%	33%
Total GWH	8207	12280	18971	28060	39750	59858	92402
Per capita kWh	77	104	146	199	260	363	523
Load Factor	55%	57%	57%	57%	58%	59%	60%
Peak Load	1703	2459	3799	5620	7823	11581	17580

Table 6.1 **Demand Supply Balances of Current Option**

In Peta Joule

Description	1990	1995	2000	2005	2010	2015	2020
Demand							
Low Scenario	256.0	342.0	512.0	769.0	1025.0	1537.0	2050.0
Ref. Scenario	256.0	362.0	531.0	827.0	1314.0	1979.0	3055.0
Indigenous Supply							
Natural Gas	168.84	262.31	366.83	366.83	366.83	366.83	366.83
NGL & LPG	1.56	2.97	7.27	7.27	7.27	7.27	7.27
Oil	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal	0.0	0.0	27.0	27.0	32.4	32.4	32.4
Peat	0.0	0.0	0.0	0.08	0.15	0.15	0.15
Hydro	11.43	11.43	11.43	11.43	14.86	14.86	14.86
Sub-total	181.83	276.71	412.53	412.60	412.51	412.51	412.51
Deficit in PJ							
Low Scenario	74.17	65.29	99.47	356.40	612.49	1124.49	1637.49
Ref. Scenario	74.17	85.29	118.47	414.40	901.49	1566.49	2642.49
Deficit in MTOE							
Low Scenario	1.74	1.53	2.32	8.34	14.34	26.33	38.34
Ref. Scenario	1.74	1.99	2.77	9.70	21.11	36.68	61.88

Table 6.2 **Primary Energy Mix for Power Generation**

(Figures in GWh)

Type	1990	1995	2000	2005	2010	2015	2020
Total Generation							
Low Scenario	8207	11584	18315	26063	30994	46491	61998
Ref. Scenario	8207	12280	18971	28060	39750	59858	92402
Gas	7285	10500	15000	15000	15000	15000	15000
Coal	0	0	1030	2000	2000	2000	2000
Hydro	800	800	1000	1000	1300	1300	1300
Total Generation from Indigenous Fuel	8085	11300	17030	18000	18300	18300	18300
Deficit+							
Low Scenario	122	284	1285	8063	12694	28191	43698
Ref. Scenario	122	980	1941	10060	21450	41558	74102

+ To be generated by imported fuels.

মোঃ মিজানুর রহমান, উপ-নিয়ন্ত্রক, বাংলাদেশ সরকারী মুদ্রণালয়, ঢাকা কর্তৃক মুদ্রিত।
মোঃ আতোয়ার রহমান, উপ-নিয়ন্ত্রক, বাংলাদেশ ফরমস্ ও প্রকাশনী অফিস,
তেজগাঁও, ঢাকা কর্তৃক প্রকাশিত।