

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF POWER, ENERGY AND MINERAL RESOURCES



NATIONAL ENERGY POLICY

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TABLE OF CONTENTS

1.0.	INTRODUCTION	1
1.1	<i>Background</i>	1
1.2	<i>Objectives</i>	2
2.0.	EXISTING INSTITUTIONAL ARRANGEMENTS	3
3.0.	ENERGY RESOURCES	4
3.1	<i>Primary commercial energy resources</i>	4
3.2	<i>Primary Biomass Fuels</i>	4
3.3	<i>Animal Power</i>	4
3.4	<i>New renewable Energy Technologies</i>	4
3.4.1	Mini-Hydro	4
3.4.2	Solar Energy	5
3.4.3	Wind Energy	5
3.4.4	Tidal Energy	6
3.4.5	Wave Energy	6
3.4.6	Bio-Mass	6
3.4.7	River Current	7
3.4.8	Waste to Electrical Energy	7
3.5	<i>Imported fuels</i>	7
4.0.	Status of energy consumption	8
4.1	<i>Primary energy sources</i>	8
4.1.1	Use of Natural gas	8
4.1.2	Oil Potential	8
4.1.3	Coal Prospects	9
4.1.4	Peat Prospects	9
4.1.5	Use of Biomass Fuels	9
4.1.6	Use of Renewable Energy Sources	10
4.1.7	Use of Imported Fuels	10
4.2	<i>Power</i>	11
4.2.1	Power Generation Distribution & Consumption	11
4.2.2	Rural electrification Programme	11
4.2.3	Load management	12
4.2.4	System Losses	12
4.3	<i>Final Energy Consumption</i>	13
4.4	<i>Energy Conservation</i>	13
4.5	<i>Rural Energy Needs</i>	13
5.0.	Supply options for the development of energy resources	14
5.1	<i>Current Option</i>	14
5.2	<i>Reference Option</i>	14

5.3	<i>Observations on the Supply Options</i>	15
5.4	<i>Observation on the Use of Indigenous Natural Gas</i>	15
6.0.	Policy Issues	17
6.1	<i>Database</i>	17
6.2	<i>Resources Assessment</i>	17
6.3	<i>Technology Assessment</i>	17
6.4	<i>Management of Gas Systems</i>	18
6.5	<i>Management of Petroleum Fuels</i>	18
6.6	<i>Management of Coal</i>	18
6.7	<i>Management of Power System</i>	18
6.8	<i>Energy Conservation</i>	18
6.9	<i>Environment Consideration</i>	19
6.10	<i>mining inside the forest areas</i>	19
6.11	<i>Pricing Policy</i>	19
6.12	<i>Investment Policy</i>	19
6.13	<i>Zonal Distribution of Energy</i>	19
6.14	<i>Area-based Energy Planing</i>	20
6.15	<i>Strategic / Emergency Stock</i>	20
6.16	<i>Implementation and Evaluation of Projects</i>	20
6.17	<i>Research and Development</i>	21
6.18	<i>Human Resources Development</i>	21
6.19	<i>Institutional Issues</i>	21
6.20	<i>Legal Issues</i>	22
6.21	<i>Regional / International Cooperation</i>	22
6.22	<i>Energy Advisory counCIL</i>	22
7.0.	recommended energy policy	23
7.1	<i>NON-RENEWABLE ENERGY POLICY</i>	23
7.1.1	<i>Assessment of Indigenous Resources</i>	23
7.1.2	<i>Supply and Augmentation of Indigenous Resources</i>	23
7.1.3	<i>Reduction of Imbalance in Energy Consumption</i>	24
7.1.4	<i>Fuel Mix</i>	25
7.1.5	<i>Allocation of Non-Renewable Energy Sources</i>	25
7.1.6	<i>Pricing Policy</i>	26
7.1.7	<i>Conservation</i>	26
7.1.8	<i>System Loss Reduction</i>	27
7.1.9	<i>Environment Policy</i>	27
7.1.10	<i>Emergency Stocks</i>	28
7.1.11	<i>Investment and Lending Terms</i>	28
7.1.12	<i>Project Planning and Implementation</i>	29
7.1.13	<i>Institutional Issues</i>	29

7.1.14	Participation of Private Sector-----	30
7.1.15	Research and Development-----	30
7.1.16	Human Resource Development-----	30
7.1.17	Legal Issues-----	31
7.2	<i>Petroleum Policy</i> -----	31
7.2.1	Objective-----	31
7.2.2	Implementation-----	31
7.2.3	Oil Refining-----	33
7.2.4	Lubricating Oil-----	33
7.2.5	Marketing and Distribution-----	34
7.2.6	Liquefied petroleum Gas (LPG)-----	35
7.2.7	Research and Development-----	35
7.2.8	CNG in Transport-----	35
7.2.9	Safety and Environmental Protection-----	35
7.3	<i>Marginal Gas Field Development Policy</i> -----	36
7.3.1	A. OBJECTIVES-----	36
7.3.2	B. DETERMINATION OF MARGINAL GAS FIELDS-----	36
7.3.1	Welfare-----	38
7.4	<i>Renewable and Rural Energy Policy</i> -----	38
7.4.1	General Policy Issues-----	38
7.4.2	RENEWABLE ENERGY POLICY-----	39
7.5	<i>Power Policy</i> -----	46
7.5.1	Demand forecast-----	46
7.5.2	Long Term Planning and Project Implementation-----	46
7.5.3	Investment and lending terms-----	46
7.5.4	Fuels and Technologies-----	47
7.5.5	Power Supply to the West Zone-----	48
7.5.6	Power Supply to Isolated and Remote Load Centres-----	48
7.5.7	Tariff-----	48
7.5.8	Captive and Stand-by Generation-----	49
7.5.9	System Loss Reduction-----	50
7.5.10	Load Management and Conservation-----	50
7.5.11	Reliability of Supply-----	51
7.5.12	System stability-----	52
7.5.13	load Dispatching-----	52
7.5.14	Institutional Issues-----	52
7.5.15	Private Sector Participation-----	54
7.5.16	Organizational and Human Resource Development-----	55
7.5.17	Regional / International Co-operation-----	56
7.5.18	Technology Transfer and Research Program-----	56
7.5.19	Environmental Policy-----	56
7.5.20	Legal Issues-----	57
7.6	<i>Rural Electrification Policy</i> -----	57
7.6.1	General Policy Issues-----	57
7.6.2	Specific Policy Issues-----	57
F.	<i>DEMAND ESTIMATION AND PLANNING</i> -----	57

LIST OF TABLES

- Table 2.1 Agencies Responsible for Planning of the Energy Sector
- Table 2.2 Agencies Involved in Development and Management of the Energy Sector
- Table 3.1 Presently Known and Exploitable Indigenous Primary Energy Resources

ACRONYMS AND ABBREVIATIONS

ABPL	Asphaltic Bitumen Plant
ACRE	Area Coverage Rural Electrification
ADB	Asian Development Bank
ADP	Annual Development Programme
BAEC	Bangladesh Atomic Energy Commission
BAPEX	Bangladesh Petroleum Exploration Co. Ltd.
BAU	Business As Usual Option
BBL	Barrels
BBM	Bangladesh Bureau of Mines
BCF	Billion (10 ⁹) Cubic Feet
BCSIR	Bangladesh Council of Scientific and Industrial Research
BEPP	Bangladesh Energy Planning Project
BGFCL	Bangladesh Gas Fields Co. Ltd.
BGSL	Bakhrabad Gas System Ltd.
BMEDC	Bangladesh Mineral Exploration and Development Corporation
BMRE	Balancing Modernisation Rehabilitation and Expansion
BOGC	Bangladesh Oil and Gas Corporation (Short name Petrobangla)
BOGMC	Bangladesh Oil, Gas and Mineral Corporation (Short name of Petrobangla)
BPC	Bangladesh Petroleum Corporation
BPDB	Bangladesh Power Development Board
BPI	Bangladesh Petroleum Institute
BUET	Bangladesh University of Engineering and Technology
CBM	Coal Bed Methane
CNG	Compressed Natural Gas
CUFL	Chittagong Urea Fertilizer Factory, Chittagong

DESA	Dhaka Electricity Authority
DOE	Department of Environment
DOF	Department of Forest
DU	Dhaka University
EA & CEI	Electrical Advisor and Chief Electric Inspector
EIA	Environmental Impact Assessment
ELBP	Eastern Lube Blending Plant
EMCC	Energy Monitoring and Conservation Center
ERC	Energy Regulatory Commission
ERL	Eastern Refinery Ltd.
FBCCI	Federation of Bangladesh Chambers of Commerce and Industries
FO	Furnace Oil
GOB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
GT	Gas Turbine
GTC	Gas Transmission Company
GW	Giga (10^9) Watt
GWh	Giga (10^9) Watt Hour
HHS	Hydrocarbon Habitat Compound
HOBC	High Octane Blending Compound
HSD	High Speed Diesel
HYV	
IMED	Implementation Monitoring and Evaluation Division
JBO	Jute Batching Oil
JFCL	Jamuna Fertilizer Company Ltd.
JGTDSL	Jalalabad Gas Transmission and Distribution Systems Ltd.
JOCL	Jamuna Oil Company Ltd.
JP-1	Jet Petrol-1

KAFCO	Karnafuli Fertilizer Co. Ltd., Chittagong
DFAED	Kuwait Fund for Arab Economic Development
KFW	Kreditsalt Fur Wiederaufbau
KGOE	Lilogram Oil Equivalent
LDO	Light Diesel Oil
LPG	Liquefied Petroleum Gas
LRMC	Long Run Marginal Cost
MCF	Thousand Cubic Feet
MIS	Management Information System
MJ	Mega (10 ⁶) Joule
MMCF	Million Cubic Feet
MMCFD	Million Cubic Feet Per Day
MOA	Ministry of Agriculture
MOEF	Ministry of Environment and Forest
MOEMR	Ministry of Energy and Mineral Resources
MOFL	Ministry of Fisheries and Livestock
MOI	Ministry of Industries
MPL	Meghna Petroleum Ltd.
MS	Motor Spirit
MT	Mineral Turpentine
MW	Mega (10 ⁶) Watt
NEP	National Energy Policy
NEPFC	National Energy Policy Formulation Committee
NGFF	Natural Gas Fertilizer Factory, Fenchuganj
NGL	Natural Gas Liquid
ODA	Overseas Development Agency
OECE	Overseas Economic Co-operation Fund
PBS	Palli Bidyut Samity (Rural Electric Co-operative)

PJ	Peta Joule = 10^{15} Jule
POCL	Padma Oil Company Ltd.
PSC	Production Sharing Contract
PSIG	Pound Per Square Inch Gauge
PSMP	Power System Master Plan
PUFF	Polash Urea Fertilizer Factory, Ghorashal
REB	Rural Electrification Board
REDA	Renewable Energy Development Agency
RPDCL	Rupantarito Prakritik Gas Co. Ltd.
SAOCL	Standard Asiatic Oil Company Ltd.
SGFL	Sylhet Gas Fields Ltd.
SKO	Superior Kerosene Oil
SLA	Side Loan Agreement
ST	Stem Turbine
TCF	Trillion (10^{12}) Cubic Feet
TGTDCL	Titas Gas Transmission and Distribution Company Ltd.
TJ	Tera (10^{12}) Joule
Tonne	Thousand Kilogram
UFFG	Urea Fertilizer Factory Ltd., Ghorashal
WB	World Bank
ZFCL	Zia Fertilizer Co. Ltd, Ashuganj

UNITS AND CONVERSION FACTORS

Units

1 MCF	1000 Cubic Feet (One Thousand Cubic Feet)
1 MMCF	1,000,000 Cubic Feet (one Million Cubic Feet)
1 KW	1 Kilo Watt = 10^3 Watt
1 MW	1 Mega Watt = 10^6 Watt
1 GW	1 Giga Watt = 10^9 Watt
1 GJ	1 Giga Joule = 10^9 Joule
1 PJ	1 Peta Joule = 10^{15} Joule
1 TOE	1 Tonne Oil Equivalent = 42.7 GJ
1 MTOE	1 Million Tonne Oil Equivalent
1 Million	10^6
1 km	1 Kilometer

CONVERSION FACTORS

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

CONCEPTS AND DEFINITIONS

Commercial Energy: Energy sources that pass wholly or almost entirely through the organized market system are defined as commercial energy (e.g. coal, oil, gas electricity etc.) commercial energy sources are considered under national accounting system. Although fuelwood and charcoal are traded and fuelwood extracted from reserve forests are included in national accounting system, they are not consider as commercial energy.

Contingent Resources: Contingent resources are discovered resources but not commercially producible at present time due to economic, political, environmental or other technical reasons.

East Zone: Geographical area on the east side of the rivers Jamuna and Meghna, which means Chittangong, Dhaka and Sylhet divisions excluding greater Faridpur District.

Final Energy : The energy made available to the end-users for final utilization, or energy consumed by the final user for all energy purposes. Final energy excludes all energy lost in the transformation of primary to secondary energy, energy used within the transformation industries, and energy lost in the distribution process.

Hypothetical Resources: Hypothetical resources comprise resources which are mapped in the form of prospects, but which have not been discovered by drilling.

Marginal Gas Field: In Bangladesh 22 gas fields of sizes ranging from 25 to 4000 Bcf have so far been discovered. Fifteen of these gas fields have been brought under production. Some of these fields, which have been in the process of depletion for continued production over time, have become commercially unviable and remained unattended. There are yet other gas fields, which have not been put under operation for want of commercial viability right from the beginning. All these gas fields, which have no apparent prospect for further development under the existing techno-economic considerations, may be termed marginal/abandoned.

Non-Commercial Energy: Energy which is derived from traditional sources such as woodfuels (e.g. fuelwood, other tree Biomass and sawdust), agricultural residues (e.g. husk, straw, jute sticks etc.), animal dung are known as non-commercial energy.

Non-Renewable Resources: A more general term referring to the geological endowment of minerals in the earth's crust in such concentration that commercial extraction is either presently or potentially feasible.

Petroleum Resources originally in-place: Petroleum resources originally in-place comprises the resources, which are mapped/unmapped by geological and geophysical methods and are estimated by geological and petroleum technological methods, to be in place in a defined area/deposit.

Possible Reserves: Possible reserves are those unproved reserves which by analysis of geological and engineering data suggests are less likely to be recoverable than probable reserve.

Primary Energy : The energy available from energy sources extracted from stock of reserves within the country and imported from foreign countries. Some of the primary energy need processing (e.g. crude oil) before its use.

Probable Reserves: Probable reserves are those unproved reserves which by analysis of geological and engineering data suggest are more likely to be recoverable. Producing reserves are expected to be recovered from completion intervals, which are open and producing at the time of the estimate.

Proved Developed Reserves: Developed reserves are expected to be recovered from existing wells including reserves behind pipe. Improved recovery reserves are considered developed only after the necessary equipment has been installed, or when the costs to do so are relatively minor. Developed reserves may be subcategorized as producing or non-producing.

Proved Reserves: Proved reserves are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under current economic conditions, operating methods and government regulations. Proved reserves can be divided into two groups: Developed Reserves and Undeveloped Reserves.

Proved Undeveloped Reserves: Undeveloped reserves are expected to be recovered from new wells on undrilled acreage, or from deepening existing wells to a different reservoir, or where a large expenditure is required to re-complete an existing well or install production or transport facilities for primary or improved recovery.

Renewable Biomass Fuels: Biomass is generally defined as the organic matter produced by photosynthesis process in plant kingdom. Biomass resources which are used as fuel such as woodfuels, agricultural residues, animal dung etc. are termed as Biomass fuels. These fuels are also termed as traditional fuels. Biomass fuels are renewable upto the limit of its sustainable yield.

Renewable Energy: Energy sources which are regenerated after a regular time cycle are commonly known as "renewable sources of energy" e.g. hydro, solar radiation, wind energy, wave power, tidal power and Biomass fuels etc.

Renewable Non-Biomass Energy: Energy sources such as solar radiation, wind energy, wave power, tidal energy etc. are examples of renewable non-Biomass Energy Sources.

Reserves: Reserves are those quantities of petroleum, which are anticipated to be commercially recoverable from known accumulations from a given date forward.

Rural Energy: Types of energy consumed in rural areas, namely commercial energy, biomass fuels and renewable energy sources, which are used to meet the demand of different end use sectors, namely agriculture, domestic, commercial, industrial and transport.

Secondary Energy : The energy available after transformation of a primary energy source (e.g. electricity)

Speculative Resources: Speculative resources is referred to the unmapped prospects that have not been mapped in the basin. The unmapped resources are estimated by play assessment methods.

Sustainable Supply (Biomass Fuels): Sustainable supply would not cause net depletion (i.g. deforestation) of biomass fuels or would not deprive the soil from its availability as recycled natural nutrients.

Useful Energy : The amount of heat, light or work actually made available to a final user of energy (domestic, industry, transport etc.) on the output side or the user's equipment and appliances.

West Zone: Geographical area on the west side of the rivers Jamuna and Meghna, which means Barisal, Khulna, Rajshahi division and greater Faridpur District.

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; establishment of petroleum refining facility and distribution systems; and establishment of power generation plants and networks for transmission and distribution of electricity. During last one decade, 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 2000 were about 200 KGOE / year and 120 kWh / year respectively. Per capita consumption of commercial energy and electricity in Bangladesh is one of the lowest among the developing countries. At present about 65% of total final energy consumption is met by different type of biomass fuels (e.g. agricultural residues, wood fuels, animal dung etc.).

In 2000 only 2.2% of total households (mostly in urban areas) had piped natural gas connections for cooking and 30% 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) Due to shortage of capital it has not been possible to undertake systematic development of Power Generation, Transmission and Distribution projects and rational use of electricity in the country.
- (c) 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.
- (d) Development programmes of energy consuming sectors (e.g. industrial sector) have been constrained due to shortage and unreliable supply of commercial energy.
- (e) Energy agencies have not been operated and managed efficiently.
- (f) Energy prices have not been set on a rational basis.
- (g) Effective measures have not been taken to ensure rational use of energy
- (h) Unplanned and inefficient use of fuels are contributing to environmental degradation.
- (i) Adequate attention has not been given to meet the total energy needs of rural areas.
- (j) Adequate attention has not been given to undertake systematic research programmes to develop indigenous technological capabilities.

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

In the above context the Government formulated and announced the first National Energy Policy (NEP) of the country in 1996 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. With rapid change of global as well as domestic situation it has been decided to update this NEP.

1.2 OBJECTIVES

The objectives of the revised 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.
- (viii) To bring entire country under electrification by the year 2020.
- (ix) To ensure reliable supply of energy to the people at reasonable and affordable price.
- (x) To develop a regional energy market for rational exchange of commercial energy to ensure energy security.

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, and hydro-electricity. Established quantity known and exploitable commercial energy resources are shown in Table 3.1. Existing known reserves of commercial energy sources are modest in comparison to development needs of the country.

In Bangladesh efforts have been continuing to make the exploration for energy resources comprehensive and 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 especially 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 resources base that supports the production of total biomass resources.

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

The Global shortage of non-renewable energy sources presents one of the major concerns of mankind today. Though, energy derived from oil, gas and coal will play a vital role in meeting a growing demand for many years to come, the realization of the exhaustive nature of world's fossil fuels have focused interest and effort on harnessing alternative energy resources. Time has come to exploit full potential of renewable energy resource which is free from environmental pollution, keep control over deforestation and managing atmospheric emission.

3.4.1 Mini-Hydro

Assessment of low head hydro-power potentials in Bangladesh has been undertaken in recent years. Twenty three sites of hydro-power plant ranging in capacity from 10 kw to 5

mw have been located in the flat plains with available capacities for the 6 month, June to October. No plant has yet been installed.

3.4.2 Solar Energy

Solar heat has been used in Bangladesh for centuries in a variety of economic activities such as drying of washed clothes, food-grains, fish, vegetable, raw jute, etc. and evaporation of saline water for salt production. There are various activities in rural Bangladesh which depend totally on the use of solar energy and if these could be performed more quickly and efficiently by using simple devices, it would increase productivity without making and demand on commercial energy sources.

The long-term average sunshine data indicates that the period of bright (i.e. more than 200 watts/sq.m intensity) sunshine hours in the coastal region of Bangladesh varies from 3 to 11 hours daily. The global radiation varies from 3.8 kwh/sq.m/day to 6.4 kwh/sq.m/day. These data indicate that there are good prospects for solar thermal and photovoltaic application in Bangladesh. It was found that during and after a disaster (cyclone) over some islands and coastal belts of Bangladesh in 1991, the photovoltaic generation of Sandwip Island was the only source of energy to provide to communication link between the people of the island with the main land when all other communications were totally disrupted.

With good to excellent solar resource available in the country throughout the year, there is a good potential for PV in unelectrified villages, if affordable products meeting consumer needs can be supplied and supported with dealing cost of solar panel. In this way solar technology can be extremely beneficial for remote areas of Bangladesh.

At the moment total installed capacity is under 100 KWp in applications ranging from lanterns to power for Hospital.

3.4.3 Wind Energy

The long term wind flow of Bangladesh (specifically in islands and the southern coastal belt of the country) indicate that the average wind speed remains between 3 to 4.5 m/s for the months of March to September and 1.7 to 2.3 m/s for remaining period of the year. There is a good opportunity in island and coastal areas for the application of wind mills for pumping and electricity generation. But during the summer and monsoon seasons, (March to October) there can be very low-pressure areas and storm wind speeds of 200 to 300 kmph can be expected. Wind turbines should be strong enough to withstand these high wind speeds.

Local knowledge of wind resources appear to indicate the potential for wind energy use in the coastal areas of Bangladesh for both grid applications and for isolated village electrification. However, measured resource data of adequate quality is lacking. Bangladesh is strongly influenced by the southwest monsoon winds that blow from about March to October. These winds are further strengthened as they pass through the V-shaped coastline of Bangladesh. It is these monsoon winds that have made possible extensive wind farm developments in India, where, for example, more than 200 MW are operating in Tamil Nadu. Wind speeds are expected to be high enough for economic grid power generation to feed the main grid or for isolated grids in wind-diesel hybrid configurations.

Good quality wind data for one year is now available for Patenga, Chittagong, a potential wind farm site, where in 1995 wind speeds ranged from 4.2 to 8.1 m/s and averaged 6.5 m/s at 20 m. Winds are strongest from March to October, which exceed 5 m/s at 20 m for

over 6000 hours per year (cut in speed of large wind turbines is about 4 m/s). Preliminary estimate of net output from a 500 KW wind turbine with a 40 m hub height is 1200 MWh/year at Patenga which seems to be feasible.

There is a number of windy locations along the coast line where land is available and where there is grid and road access. Given the danger from cyclones, it is important that the survivability of wind turbines, be investigated. Wind potential at Patenga along is reportedly about 100 MW. Therefore further investigation of the potential wind power development is warranted.

3.4.4 Tidal Energy

The tides at Chittagong, south east of Bangladesh are predominantly semidiurnal with a large variation in range corresponding to the seasons, the maximum occurring during the south-west monsoon. A strong diurnal influence on the tides results in the day time tides being smaller than the night time.

In the year 1984, an attempt was made from the EEE department of BUET, Dhaka to access the possibility of tidal energy in the coastal region of Bangladesh, specially at Cox's Bazar and at the islands of Moheshkhali and Kutubdia. The average tidal range was found to be within 4-5 meter and the amplitude of the spring tide exceeds even 6 meter. From different calculation it is anticipated that there are a number of suitable sites at Cox's Bazar, Moheshkhali, Kutubdia and other places, where a permanent basin with pumping arrangements might be constructed which would be a double operation scheme. Tidal energy might be a good alternative source for Kutubdia island where about 500 kw power could be obtained. At present there are only 2x73 kva diesel generator sets to supply electricity for 5-6 hours/day for 72,000 people and there is practically no possibility of main grid supply in the future.

3.4.5 Wave Energy

Until to now no attempt has been made by Government of Bangladesh to assess the prospects for harnessing energy from sea waves in the Bay of Bengal. Wave power could be a significant alternative source of energy in Bangladesh with favorable wave conditions specially during the period beginning from late March to early October. Waves are generally prominent and show a distinct relation with the wind. Waves generated in the Bay of Bengal and a result of the south-western wind is significant. Wave heights have been recorded by a wave rider buoy and correlated with wind data. Maximum wave height of over 2 m, with an absolute maximum of 2.4 m, on the 29 July were recorded. The wave period varies between 3 to 4 sec for waves of about 0.5 m, and about 6 sec for waves of 2 m.

In Bangladesh wind speeds of up to 650 kmph (400mph), 221 kmph (138 mph) and 416 kmph (260 mph) have been recorded in the years 1969, 1970 and 1989 respectively. Severe cyclonic storms and storm surge of up to 15 m have been reported. Plant must also be able to survive the exceptional occurrence of very high waves in storm conditions.

3.4.6 Bio-Mass

There are different types of Bio Gas plant in the world. However in Bangladesh the following three types are used:

- (i) Floating dome type

(ii) Fixed dome type

(iii) Bag type

(i) Floating dome type

In this type there is cylinder type tank which is placed under the soil. Above the ground there is an inlet and out let steel pipe for putting the raw materials and letting out the wastes respectively. The dome works as a gas container as well as it maintains the pressure of the produced gas.

(ii) Fixed dome type

In this model a circular type brick made tank is placed under the soil. A steel inlet pipe and a hydraulic chamber is connected with this tank. An outlet pipe is connected with the hydraulic chamber. The tank works as a gas container as well as a digester. Hydraulic chamber maintains the gas pressure.

(iii) Bag type

This is made by polythene and placed over the soil. An inlet and outlet pipe is connected with this. This works as a gas container as well as a digester. This is rarely used in Bangladesh.

3.4.7 River Current

A network of rivers, canals, streams etc. numbering about 230 with a total length of 24140 km covers the whole of Bangladesh flowing down to the Bay of Bengal. Different sizes of boats are the main carriers of people and goods for one place to another. Boatmen usually use the water-sails to run their boasts against the wind direction. But until now no research has been reported to utilize the energy of river current properly.

3.4.8 Waste to Electrical Energy

Dhaka City has been suffering for a long time from a tremendous environmental pollution caused by municipal solid waste, medical waste and various industrial wastes. In order to save the city from environmental pollution the waste management as well as electricity generation from the solid wastes programme is being taken by the Government.

3.5 IMPORTED FUELS

Total yearly (2000-2001) import of petroleum fuels is about 3.44 million tones of which about 1.34 million tones is imported as crude, while the import of refined products like Petrol, Diesel, Kerosene, Jet A-1 & Lubricating Base Oil account for the rest. In comparison to this, indigenous production of liquid fuels (condensate) is only about 2.5% of total annual demand.

4.0. STATUS OF ENERGY CONSUMPTION

4.1 PRIMARY ENERGY SOURCES

4.1.1 Use of Natural gas

Natural gas is currently the only indigenous non-renewable primary energy resource of the country, which is being produced and consumed in significant quantities. Gas, the main source of commercial energy and plays an active role towards economic growth of the country. Natural gas now accounts for about 70% of the country's commercial energy supply. According to the latest study by the Hydrocarbon Unit of the Energy and Mineral Resources Division and Norwegian Petroleum Directorate, the initial gas in place (proven+Probable) reserve of the 22 gas fields of the country is 28.4 TCF out of which 20.5 TCF is considered recoverable. Out of this recoverable reserve, 5.1 TCF has been consumed upto June 2003 leaving remaining recoverable reserve of 15.4 TCF.

United States Geological Survey (USGS) conducted a study for undiscovered gas resource of the country in 2000. According to this study there is a 50% probability of getting another 32 TCF of gas (undiscovered resource). A study jointly conducted by the Hydrocarbon Unit and Norwegian Petroleum Directorate (NPD) in 2001 suggested that there is 50% probability of striking additional 42 TCF of gas (undiscovered resource).

Out of the total 22 gas fields so far discovered, currently gas is being produced from 12 (twelve) gas fields operated by the three public and two private sector international companies. During 2002-2003, average daily gas demand is about 1155 million cubic feet per day. Gas production has been increasing sharply over the last decades. While only 83 bcf (2.3 bcm) gas was produced in 1983-84, production grew to about 265 bcf (7.5 bcm) during 1995-96; gas production reached 421 bcf (11.9 bcm) during FY 2003. Current level of natural gas related liquids production is about 4000 bbl/day.

The major driving force behind the growth of gas production is the power and fertilizer sector. Power sector is the single largest consumer of gas, and at present nearly 90% of the power generated in the country is gas based. Due to the near absence of any other major energy source, dependence on gas for power generation has spiraled and is expected to remain so.

As an agricultural country, use of fertilizer is very important to offset the food grain deficiency. Over the last decade, cultivation of HYV crops has gained popularity and consequently, demand of nitrogenous fertilizer has increased sharply, which is expected to continue.

Gas consumption in major industries like textile, dyeing, paper, pulp, cement etc. and in the commercial sector, including tea gardens is also increasing steadily. With the gradual coverage of major growth centers with gas distribution network, use of gas as domestic fuel is increasing manifold.

During 2001-2002 share of gas consumption is power 48%, fertilizer 24% and non-bulk 28% (industrial, commercial, domestic, tea estate, brick field and CNG).

4.1.2 Oil Potential

Exploration activities carried out so far could not discover any significant oil deposit. The only oil deposits so far discovered in the country is in Haripur, which produced a total of about 650,000 bbls of crude oil till 1994. The oil production has been ceased because of reduction of pressure and influx of water in the oil zone. Comprehensive exploration

efforts need to be mounted in this field for further extraction of oil. Moreover, efforts are required to be given to exploration of the anticipated liquid Hydrocarbon prospects deeper to the sub-surface high pressure zone, which has not yet been penetrated. Confirmation of the liquid Hydrocarbon may bring a revolutionary change in the vision of oil and gas sector.

4.1.3 Coal Prospects

Discovery of coal dates back to the late fifties when an exploratory oil well was drilled through coal beds in Bogra. Subsequent explorations resulted in the discovery of the Jamalgonj coal deposit at a depth of about 1000 meter and having an estimated reserve of more than 1000 million tons of coal. Feasibility studies conducted have indicated that development of this deposit is not yet feasible under the prevailing international market price. However, with increase in gas price, these deposits may become competitive. In 1984-85 Geological Survey of Bangladesh has discovered another coal deposit at Khalaspir (Pirgonj) of Rangpur at a shallower depth (150 m), with an estimated reserve of 450 million tons of coal. This deposit requires to be appraised in respect of its potential. An Australian Company BHP recently discovered another coal deposit in Phulbari with initial deposit of 400 million ton and recoverable reserve of 80 million ton.

Total coal in place in all the 4 fields are around 2527 million tons out of which about 492 million tons is recoverable. This recoverable reserve is equivalent to about 14.00 TCF of gas.

Besides the above, mineable coal deposit was also discovered in Barapukhuria area of Parbatipur, Dinajpur at a reasonably shallow depth (240 m) with an estimated reserve of about 300 million tons. Based on this, a project for construction of an underground mine has been undertaken at an estimated investment of Tk. 887.36 core with expected annual output of 1 million ton commencing from 2004-2005. The extraction of these indigenous coal deposits may be utilized as an alternative of gas fuel source in the installation of power plants similar to that as have already been considered to construct a coal-based Power Plant of capacity 250 MW at Barapukuria.

4.1.4 Peat Prospects

Deposits of peat occur at shallow depths in different low-lying areas of Bangladesh. According to Geological Survey of Bangladesh, the reserve of dry peat is about 170 million tons. The major deposits are in greater districts of Faridpur (150 million tons), Khulna (8 million tons) and Sylhet (13 million tons). Peat requires drying before making briquettes for use as fuel. Petrobangla implemented a pilot project for extraction of peat and making briquettes but the result were discouraging and economically not viable at present. This scenario may however change in future.

4.1.5 Use of Biomass Fuels

Biomass fuels play an important role (about 65% of primary energy) 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 is 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 viable 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.

4.1.6 Use of Renewable Energy Sources

About 65.5% of total primary energy sources are supplied by indigenous renewable energy sources (e.g. biomass fuels 65%, and hydropower 0.5%). 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.

Access to electricity in Bangladesh is one of the lowest in the world, coverage today stands at less than 30% of the total population. However the rural areas of Bangladesh, where 85% of the population live, is deprived of the electricity facility. Larger energy supplies and greater efficiency of energy use are thus necessary to meet the basic needs of a growing population. It will therefore, be necessary to tap different sources of renewable energy and to use them in an efficient manner for the benefit of the people. For this, renewable energy development program needed to be taken in the areas where potential renewable energy resources are available considering economical & technical viability and keeping in view the Environmental Quality Standard (EQS). Plant location, size and design may be considered on the basis of available energy resources of the area and efficient conversion of energy may be given preference. Priority may be given to the rural areas where national grid expansion is expensive. This will reduce the pressure on the demand of commercial power supply and will help to avoid costly grid expansion and will also keep environment pollution free.

Private capital investment for implementing the renewable energy is a major issue to be considered. This policy envisages accomplishment of its objectives by mobilizing a concerted national effort supplemented by co-operation with international organizations, bilateral and multilateral funding institutions, non-government organizations, research organization, universities etc. It has become increasingly clear that for the development of renewable energy, the funding windows of non-government and private sources as well as financial and development institutions should also be augmented. Furthermore, innovative new financing opportunities including micro-financing may be utilized to attract private capital to supplement the energy deficiencies in the rural areas and thus to fulfill the aspiration of the poor people.

Compared with conventional energy it is found that renewable energy is not yet a cost-effective technology. But the technology is advancing rapidly. In consideration of giving benefit to the rural areas as a commitment and social objective, many governments have formulated new policies for renewable energy development.

4.1.7 Use of Imported Fuels

In 2000-2001, total quantity of petroleum fuels consumed in the country was 3.40 million tonnes.

Total amount of coal imported in 1997-98 was about 1,72,900.00 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 4230 MW of which 3475 MW is located in the East Zone and 755 MW in the West Zone. Of the total installed power plants, the effective operational capacity is about 4055 MW against the peak demand of about 3459 MW in 2001. Timely maintenance and replacement of old units have not been possible due to non-availability of funds. The so far maximum generation was 3171 MW (on 06-04-2002). As a result, it is difficult to maintain a reliable supply due to shortage of available generation capacity. In case of emergency outage and or/major overhauling, the supply is managed by load shedding. The situation has improved to some extent with the establishment of some new generating stations by Independent Power Producers (IPPs) and some rehabilitation of some existing power units.

Indigenous energy sources (e.g. natural gas, hydro) are used for the generation of electricity in the East Zone and imported petroleum fuels (e.g. FO, LDO, SKO, HSD) are used to generate electricity in some areas of the West Zone where natural gas supply is not available. In order to minimize the effect of fuel cost on power generation, electricity generated in the East Zone is transferred to the West Zone via East West Electrical Inter-Connector established in 1982. The transfer capacity of the Inter-Connector has almost reached its limit (450 MW). Gas is already available at Baghabari - Seraganj in the West Zone through Jamua Bridge and there is plan to extend gas network all over the West Zone. It is logical and economical to install gas based power plants in the West Zone. Accordingly, gas power plants have been planned to be built gradually in the West Zone for regional generation balance.

In 2001, total electricity generation was 17021 GWh and fuel mix was as follows: hydro (5.71%), natural gas (87.56%) and petroleum fuels (6.74%). Total electricity generation in 1999 was 13638.5 GWh and the fuel mix was as follows: hydro 6.08%, natural gas (84.29%), petroleum fuels (9.63%).

In 2001, the average tariff of BPDB (including bulk sales to REB and DESA) was Tk. 2.25 / kWh against the cost of supply of Tk. 2.51 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 2001 among the three utilities were as follows: BPDB 15,42,650 (28%), DESA 5,89,754 (11%), REB 33,95,721 (62%). Distribution of energy sales by the three utilities were as follows: BPDB 14003 GWh (including bulk sale to DESA and REB), DESA 5381 GWh (including bulk sale to REB) and REB 3131 GWh.

The consumption of electricity in 2001 in different end-user categories were as follows: domestic (41%), commercial (8%), industrial (44%), irrigation (5%) and others (2%). During the period from 1982 to 2001 the share of domestic consumption of electricity has increased from 15.3% to 41%, whereas the productive use (commercial, industrial, agriculture) has decreased from 77.3% to 59%. 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 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 1800 KM² and 6 Upazilas (Upzila headquarters and adjacent rural areas). Total number of PBSs established upto 2000-2001 were 67. Average investment costs of establishing a PBS upto the year 2000 was approximately Tk. 1000 million (Equivalent to 20 million US Dollar).

The total installed transformer capacity of 67 PBSs upto June 2001 was 3000 MVA as against the peak demand of 900 MW (using 0.8 as the factor of coincidence). Thus the capacity utilization of the installed distribution network in terms of peak demand was only 30%.

Total number of consumers connection of REB upto June 2001 were 33,95,721 and the mix of consumers was as follows: domestic 83.5%, commercial 11.6%, irrigation 2.7%, industry 2% and others 0.2%. The total energy consumption in 2000-2001 was 3158 GWh and the shares of different categories of consumers were as follows: domestic 39.30%, irrigation 11.85%, industry 42.81%, commercial 5.77% and other 0.27% in the year 2000-2001.

Based on the REB standard of 4 km per sq-km, the network now covers about 32,500 villages. Thus now about 38% of villages out of 86,000 have electricity network.

4.2.3 Load management

The annual load factor of the national electricity grid is about 60%. 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 rationalize the energy use there is a need to undertake appropriate measures for the management of loads. Decision 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 five years overall transmission and distribution (T&D) losses 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.). In the year 2001, the T&D loss in the country was 30.97% of net generation.

Analysis show that present T&D technical losses should be about 17% of net generation. Thus total loss including station use should not be more than 22%. In BPDB system the T&D loss (including bulk sale to DESA and REB) was 15.40% of net generation in the year 2000 compared to 16.76 loss in 1999.

Reduction of technical losses depends on large investment for up-gradation and reinforcement of transmission and distribution network and retrofitting 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. In a recent calculation technical losses for REB system varied between 8 to 10% at different 33/11 KV substations.

4.3 FINAL ENERGY CONSUMPTION

The total final energy consumption in 1990 was established 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. Energy conservation measures should be implemented more aggressively and effectively. To this end, a draft Act on Energy conservation has been prepared and it is in the process of approval by the government for enactment.

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. 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.

5.1 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 Bangladesh will continue;
- (iii) Development of known oil deposits and use of natural gas liquid will continue;
- (iv) Imported oil meet the major energy needs of liquid fuels;
- (v) Imported coal will meet a part of the energy need mainly for brick industries;
- (vi) Mainly indigenous natural gas, supplemented by coal, hydropower and imported petroleum fuels will be used for power generation;
- (vii) There will be no effective programme on energy conservation;
- (viii) Development and management of biomass fuels will continue without having any linkages with commercial energy development programme.

5.2 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 (iii) Aggressive CNG conversion, (iv) Establishment of uniform gas transmission and distribution network through out the country and (v) integration of commercial energy and biomass fuels program to maintain sustainable supply of biomass fuels.

Specific assumptions for the Reference Option 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) Harnessing of new-renewable sources of energy will be undertaken;
- (vi) Imported oil will meet the major energy demand of liquid fuels;
- (vii) Imported coal and LP gas will meet a part of total energy needs;

- (viii) Mainly indigenous natural gas, supplemented by coal, hydropower and imported coal, petroleum fuels will be used for electricity generation;
- (ix) Effective programme will be undertaken for conservation of commercial energy and biomass fuels;
- (x) Effective program will be undertaken for establishment of gas based value added industries so that the value added items could be exported on fulfillment of national requirements.
- (xi) Programs relating to strengthening of institutional and operational development of exploration and production public companies will be undertaken.
- (xii) Transport vehicles will be converted into CNG fuel base with a strict time bound programme.
- (xiii) Besides public sector efforts, private sector participation will also be encouraged for installation of CNG refueling stations in major cities including Dhaka and along the major highways and conversion of transport vehicles to environment friendly CNG fuel
- (xiv) Program for the establishment of an unified gas transmission and distribution network through out the country (Western zone to be covered) will be undertaken.
- (xv) Efforts will be made to reduce the dependence on external donors gradually by internal financing to the extent possible and new mechanisms of project financing, such as foreign private finance, joint venture, structured loan etc will be expected.
- (xvi) A comprehensive program of recruitment & training linked with career development of human resources/professionals will be implemented.
- (xvii) Research and Development activities will be institutionalized for productivity and cost effective activities in the energy sector.
- xviii. Policy(ies) will be formulated through MOPEMR regarding phase wise private sector participation in the form of joint-venture with public transmission company(ies) in the construction of gas transmission pipelines where it is beyond the funding scope of GOB/Public Companies. GOB/Public retaining major shares and controls over the transmission networks with the government.
- xix. Development of biomass fuels will be considered along with the development of commercial energy sources.

5.3 OBSERVATIONS ON THE SUPPLY OPTIONS

It is felt that implementation of Current Option would create strain on the economy with sharp increase in the demand of energy. It would also require additional fuel due to lack of conservation measures; and would cause severe environmental degradation due to over exploitation of biomass fuels. Therefore, considering the long-term benefit, it is recommended that the country should aim to follow the Reference Option.

5.4 OBSERVATION ON THE USE OF INDIGENOUS NATURAL GAS

Natural gas can be used either as fuel or as raw material for various petrochemical products depending on its composition. Natural gas available in Bangladesh contains

mostly methane; it is not a good raw material 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 three 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 maximizing the use of natural gas for power generation. Moreover, extension of natural gas pipe networks to power generation centres has been helping in improving the financial return on the investment in gas infrastructures.

From the year 2004-5, indigenous coal output is expected to 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 meet domestic demand only.

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, fertilizer, industrial, commercial, domestic etc.

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

6.0. POLICY ISSUES

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 synchronized manner to achieve the stated objectives. Various levels at which there is a need for synchronized decision making are stated as follows:

- (i) At macro level, policy decisions are to be synchronized to ensure that the outputs of the energy sector meets the energy demands of all the end use sectors, zones and socio-economics groups on a sustainable basis.
- (ii) At the sectoral (energy sector) level, policy decisions are to be synchronized 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 synchronized to ensure balanced development of different programmes under a particular sub-sector. As for example, the ultimate outcome of gas-subsector depends on chronological development of exploration, appraisal, development, production, 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.

6.1 DATABASE

A centralised database on different type of energy sources, their conversion, supply, consumption, prices etc. are to be established. These data are to be published on a regular basis to support planned development of energy resources.

6.2 RESOURCES ASSESSMENT

Resources Assessments as have been done and/or being done needs to be institutionalised and the figures updated at regular intervals (annually) by our own experts.

For energy planning purpose assessment of all types 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 areas.

6.3 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.

6.4 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.

Development of gas fields through private sector, as a part of Government's privatization policy will be considered.

Private sector participation in the form of joint ventures may be considered for construction of gas transmission pipelines where it is beyond the funding scope of GoB/Public Companies.

Gas distribution companies may be privatised in phases for better management of the distribution system.

6.5 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 pipelines(s) including carriers, storage and distribution/handling facilities.

6.6 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 Mine. To ensure efficient management the mining activities will be conducted through Barapukuria Coal Mining Company.

6.7 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.

6.8 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 (in the process of approval by the Government for enactment) to provide a legal basis and to decide appropriate strategies for energy conservation.

6.9 ENVIRONMENT 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.

6.10 MINING INSIDE THE FOREST AREAS

There should not be any commercial mining and quarrying inside the forest area (as legally defined in the Forest Act) and within 3 (three) Km from the forest boundary. However between 3 to 10 Km of forest boundary mining and quarrying may be allowed only where EIA shows that there is no negative impact on forest. Transportation of mining and quarrying materials should be controlled under the coverage of Forest Transit Rules.

6.11 PRICING POLICY

Tariffs of different type of final energy such as natural gas, petroleum products & electricity 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 accounts.

6.12 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.

6.13 ZONAL DISTRIBUTION OF ENERGY

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

- (i) Special incentives for the survey; exploration and development of oil and gas.
- (ii) Development of Barapukuria and other coal mine.
- (iii) Implementation of energy conservation projects.
- (iv) Construction of LPG bottling plants at suitable locations with necessary infrastructure development for the assured delivery of LPG in the West-Zone
- (v) Development of coal bed methane.
- (vi) Establishment of coal based power plants.
- (vii) Exploration and development of coal in unexplored areas

- (viii) Establishment of petroleum depots at Mongla port and up country to maintain reliable supply of petroleum fuels.
- (ix) Expansion of electricity & gas transmission and distribution networks to the western zone of the country for effective regional balance in energy supply.
- (x) Special incentive package similar to those offered for oil and gas exploration in off-shore areas to be offered for exploration in the west zone.
- (xi) Implementation of gas based power plants in the west zone considering regional balance in energy supply.
- (xii) Establishment of the second Petroleum Refinery in West Zone of the country.
- (xiii) Augmentation of tree plantation programme (by the Department of Forest)

6.14 AREA-BASED ENERGY PLANING

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 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.

6.15 STRATEGIC / EMERGENCY STOCK

(a) Petroleum Fuels

The strategic stock of petroleum products is to be maintained at 60 days of consumption. Such reserves in storage tanks are to be distributed all over the country and reserve capacities for each location are to be determined by considering extreme natural and other events like cyclone, drought, flood and war.

(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.

6.16 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 projects 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 its completion.

6.17 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 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. Accordingly various R&D institutions will also be established and strengthened (as applicable) under the Ministry of Power, Energy and Mineral Resources.

6.18 HUMAN RESOURCES DEVELOPMENT

Comprehensive programme of human resources development will be undertaken for each type of energy utility.

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

6.19 INSTITUTIONAL ISSUES

Ministry of Power, Energy and Mineral Resources should undertake the tasks of preparing a long-term energy plan (perspective plan). 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 Power, Energy and Mineral Resources) shall sponsor and co-ordinate the entire range of energy related activities.

Appropriate institutional arrangement 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 Power, Energy and Mineral Resources for the development and diffusion (dissemination / extension) of different type of renewable energy technologies. Until REDA is formed Power Cell of the Power Division of the Ministry of Power, Energy and Mineral Resources will carry out all primary and initial works related to development of renewable energy.

An Energy Regulatory Commission (ERC) will be established to carry out the following regulatory functions of electricity and natural gas:

- (a) To determine efficiency and standard of the machinery and appliances of the institutions using energy and to ensure through energy audit the verification, monitoring, analysis of the energy and the economy use and enhancement of the efficiency of the use of energy;
- (b) To ensure efficient use, quality services, determine tariff and safety enhancement of electricity generation and transmission, marketing, supply, storage and distribution of energy;

- (c) To issue, cancel, amend and determine conditions of licences, exemption of licences and to determine the conditions to be followed by such exempted persons;
- (d) To approved schemes on the basis of overall program of the licensee and to take decision in this regard taking into consideration the load forecast and financial status;
- (e) To collect, review, maintain and publish statistics of energy;
- (f) To frame codes and standards and make enforcement of those compulsory with a view to ensuring quality of service;
- (g) To develop uniform methods of accounting for all licensees;
- (h) To encourage to create a congenial atmosphere to promote competition amongst the licensees;
- (i) To extend co-operation and advice to the Government, if necessary, regarding electricity generation, transmission, marketing, supply distribution and storage of energy;
- (j) To resolve disputes between the licensees, and between licensees and consumers and refer those to arbitration if considered necessary;
- (k) To ensure appropriate remedy for consumer disputes, dishonest business practices or monopoly;
- (l) To ensure control of environmental standard of energy under existing laws; and
- (m) To perform any incidental functions if considered appropriate by the Commission for the fulfillment of the objectives of this Act.

6.20 LEGAL ISSUES

- (i) Implementation of National Energy Policy will necessitate introduction of new Acts 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.

6.21 REGIONAL / INTERNATIONAL COOPERATION

Regional / International cooperation on energy may be explored for minimizing the gaps in energy supply of the countries in the region by developing a regional energy market.

6.22 ENERGY ADVISORY COUNCIL

A high power Energy Advisory Council consisting of representatives from politicians, policy makers, professionals and experts of the energy sector may be formed. This council, considering the overall national and international energy situation, may give necessary policy guidelines for the energy sector.

7.0. RECOMMENDED ENERGY POLICY

7.1 NON-RENEWABLE ENERGY POLICY

7.1.1 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 unexplored 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 number of exploration drilling with internal resources is to be increased to at least four wells per year and accordingly BAPEX, the lone public exploration and production company needs to be modernized in harmony with the development of the oil and gas industries.

7.1.2 Supply and Augmentation of Indigenous Resources

A. 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 oil/condensate rich fields are to be given priority.
- c. Efforts are to be made to reduce the abandonment pressure wherever possible to augment the recoverable reserve of natural gas.
- d. Producing 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.
- e. Marginal gas fields are to be developed to augment gas production volume.

- f. Gas fields having higher NGL content are to be given priority for development in order to increase NGL supply.
- g. NGL plants at Ashugonj and Kailashtila are to be commissioned at the earliest.
- h. Development of the national gas grid, inter-connecting the demand centres with it should be completed as soon as possible.

B. COAL

- a. The target of producing one million tonne of coal from Barapukuria by 2004 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 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.

C. 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.

7.1.3 Reduction of Imbalance in Energy Consumption

A. 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

B. EAST ZONE AND WEST ZONE

Considering the importance of equitable development both in East and West Zone of the country the following measures will be considered:

- 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 of ERL for power plants and industries;

- d. Establishment of adequate oil depots at the Mongla port and up country;
- e. Construction of LPG bottling plant at Ashugonj, as well as, any other suitable places in the western zone with necessary infrastructure development for the assured delivery of LPG in the West Zone
- f. Extension of natural gas pipeline;
- g. Development of infrastructure for handling and inland transportation of imported fuels like coal and oil;
- h. Establishment of Petroleum Refinery
- i. Railway should also develop appropriate facilities for POL product transportation and handling.

7.1.4 Fuel Mix

- a. Supply of indigenous fuels is to be maximized to the extent possible in meeting the future demands.
- 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 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 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 establishment 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).

7.1.5 Allocation of Non-Renewable Energy Sources

A. Petroleum Products

- a. Allocation of liquid petroleum products will depend on the dynamics of market economy
- b. In place of Furnace Oil (FO) produced in ERL alternate fuels with low sulfur content should be used for power generation / Industrial units for protection of environment. The FO produced in ERL should be used for production of Bitumen and international Bunkering.
- c. In the event of Compressed Natural Gas being available, it will be possible to replace part of the liquid fuel by CNG.

B. Liquefied Petroleum Gas (LPG)

Most of the LPG is to be allocated for the west zone until the equitable gas distribution system is established, primarily for the domestic sector. LPG may also be imported for meeting the demand of the country.

C. Coal

- a. Major portion of local coal is to be used for Power generation in the west zone. The remaining part of it may be used for other purposes in both zones depending on its demand.
- b. Allocation of imported coal will depend on the dynamics of the market economy.

D. 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.

7.1.6 Pricing Policy

- a. All forms of non-renewable energy are to be priced at their economic cost of supply.
- b. The present price of natural gas is to be raised in phases to reach its economic cost of supply.
- c. The price of PSC gas is to be linked to the price of high sulfur furnace oil as recommended in the Petroleum Policy.
- d. 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 cannot be passed on to the utilities.
- e. 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.
- f. 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.
- g. The price of coal is to be set at its economic cost of production and supply

7.1.7 Conservation

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

A. 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 Cell (EMCC) is to be strengthened.

B. REDUCTION OF WASTAGE

- a. Use of efficient processes in fertilizer production, BMRE, retrofitting 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 efficiency acceptable at the international level.
- 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 the technology. Future power plants must be base plants where natural gas is available and peaking power plants (Gas Turbine) must be highly efficient where natural gas may be or may not be available.

C. 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. Incentives for fuel efficiency for all categories of end-uses may be given.
- d. Fiscal incentives, including reduced taxes and duties may be given to promote the use of Compressed Natural Gas (CNG) in transports.

D. 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 on industries, are to encouraged wherever feasible.

7.1.8 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. Electric and 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 electricity gas consumption in order to estimate specific consumption.

7.1.9 Environment Policy

- a. Carrying out Environmental Impact Assessment (including a consideration of social impact) should be made mandatory and should constitute an integral part of any new energy development project.
- b. Use of economically viable environmental 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. Use of lead free petrol is mandatory.
- g. Use of low sulfur content Diesel will be encouraged.
- h. Production of liquid fuels like Petrol, Kerosene, Diesel Oil from Natural Gas (NG) will be encouraged.
- i. Other technical options such as use of Catalytic Converter and Diesel Particulate Filter will be encouraged to reduce vehicular emissions.
- j. For improving the environment condition in the country, producing energy from wastes will be encouraged.

7.1.10 Emergency Stocks

A. PETROLEUM FUELS

The emergency stock is to be maintained at 60 days of 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 flood and cyclone, as well as drought.

B. COAL

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

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. To materialize the emergency reserve margin of 20% of the producing wells, immediate efforts are to be taken for further drilling of sufficient additional production wells.

7.1.11 Investment and Lending Terms

- a. Dependence on external donors is to be gradually reduced 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. Energy sector projects should be given protection against foreign exchange fluctuations

7.1.12 Project Planning and Implementation

- 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.

7.1.13 Institutional Issues

Though Petrobangla has been organized 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 organizational 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.

An Energy Regulatory Commission (ERC) will be established to carry out the following regulatory functions of electricity and natural gas:

- (a) To determine efficiency and standard of the machinery and appliances of the institutions using energy and to ensure through energy audit the verification, monitoring, analysis of the energy and the economy use and enhancement of the efficiency of the use of energy;
- (b) To ensure efficient use, quality services, determine tariff and safety enhancement of electricity generation and transmission, marketing, supply, storage and distribution of energy;
- (c) To issue, cancel, amend and determine conditions of licences, exemption of licences and to determine the conditions to be followed by such exempted persons;
- (d) To approved schemes on the basis of overall program of the licensee and to take decision in this regard taking into consideration the load forecast and financial status;
- (e) To collect, review, maintain and publish statistics of energy;

- (f) To frame codes and standards and make enforcement of those compulsory with a view to ensuring quality of service;
- (g) To develop uniform methods of accounting for all licencees;
- (h) To encourage to create a congenial atmosphere to promote competition amongst the licencees;
- (i) To extend co-operation and advice to the Government, if necessary, regarding electricity generation, transmission, marketing, supply distribution and storage of energy;
- (j) To resolve disputes between the licencees, and between licencees and consumers and refer those to arbitration if considered necessary;
- (k) To ensure appropriate remedy for consumer disputes, dishonest business practices or monopoly;
- (l) To ensure control of environmental standard of energy under existing laws; and
- (m) To perform any incidental functions if considered appropriate by the Commission for the fulfillment of the objectives of this Act.

7.1.14 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 Energy Regulatory Commission.

7.1.15 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.
- b. A National Data Bank on energy will be established in any suitable location under the direct control of Ministry of Power, Energy and Mineral Resources.

7.1.16 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.

7.1.17 Legal Issues

Appropriate modifications / revisions of the existing laws, 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.

7.2 PETROLEUM POLICY¹

7.2.1 Objective

The basic objectives underlying the policy are to:

- i. Undertake systematic survey, exploration and exploration of petroleum resource 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,
- 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.

7.2.2 Implementation

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

A. LEGAL AND PROCEDURAL

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.

- 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 application will be decided within nine months,
- iii. A comprehensive database necessary for promotion exploration will be developed and made available on payment of necessary fees for the use of exploration companies and 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.

B. 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 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 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.

C. COMMERCIAL

- i. Local private companies will be encouraged to seek joint ventures with foreign companies and /or with BAPEX in exploration,
- ii. The 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 basis of one well,

- iii. The gas production 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 gas fields for maximum recovery.

D. 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).

7.2.3 Oil Refining

- i. Private sector will be free to set up new refineries, with approval from any authority designated by GOB.
- 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 benefit of Foreign Private Investment (Promotion and Protection) Act, 1980.

7.2.4 Lubricating Oil

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

- ii. Permission may be obtained from GoB for import or 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. Unless the regulations are enacted for disposal of used lubricating oil these will exclusively be used as FO (Furnace Oil) and no recycling will be allowed to protect environment.
- v. Quality standards of lube oils will be defined according to the international standards and enforced through checks; each plant will be required to establish adequate testing facilities. Penalty as per "Petroleum Act & BPC Ordinance" for non compliance will be imposed.
- vi. It will be preferable to have a licensing arrangement with internationally reputed oil company(s) or lubricant blending plants for product formulation.
- vii. The minimum standard of lubricating oil will be API-SC/CC for engine oils and for industrial grades as per manufacturer's recommendation. For two stroke engines minimum standard should be API TC or JASO FB level.
- viii. Marketing of Straight mineral oil, mild additive treated lubricating oil and any type of loose lubricating oil is prohibited. Marketing of lubricating oil are to be encouraged in small pack's/sachets.
- ix. All blending plants (including private) should be of international standard and must be upgraded with laboratory facilities.

7.2.5 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, explosive and safety rules,
- iii. The commission of 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 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 & quantity existing laws will be updated.

7.2.6 Liquefied petroleum Gas (LPG)

After meeting the domestic LPG requirement, the surplus may be considered to be used as automotive fuel.

7.2.7 Research and Development

Research and Development measures will be implemented as stipulated in the National Energy Policy. Accordingly to implement this policy, the monitoring, research and development capabilities of Petrobangla, Bangladesh Petroleum Institute, Bangladesh Petroleum Corporation, Geological Survey of Bangladesh, 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.

7.2.8 CNG in Transport

In order to reduce the air pollution in Dhaka and other cities, the Government has given emphasis on the best possible use of environmental friendly fuel CNG in transport sectors. As such government has liberalised and opened the sector for private participation to supplement the activities of the public sectors. The use of CNG in all types of road and riverine transports replacing motor spirit and diesel will be commercialized. No duty, sales tax or surcharge will be levied on equipment imported for compression and refuelling 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.

The strategy for the development of CNG as transportation fuels are:

- (i) Banning of diesel buses and trucks in cities roads with a rigid cut off date
- (ii) To convert existing petrol vehicles to CNG by establishment of sufficient number of conversion workshop by Public/Private Sector in all the major cities
- (iii) To install and operate adequate number of CNG refueling station by Public and Private Sector in the major cities and the connecting highways
- (iv) Set up emission standard for CNG vehicles
- (v) Elimination of two-stroke baby taxi
- (vi) Encourage introduction of CNG dedicated buses and four-stroke Baby Taxis through reduction of duty.
- (vii) Monitor CNG converted vehicles closely to ensure quality of emission and to ensure pollution control
- (viii) To introduce appropriate regulatory frame-work for more systematic monitoring, closer control and regulation. (Meanwhile, GOB has already introduced gazetted the guideline and procedure for establishment of CNG refueling station and conversion workshop).

7.2.9 Safety and Environmental Protection

Laws, Rules and Policies formulated by the Government in this regard will be followed. The following 3 (three) new rules are being framed which will provide safety and efficiency in the respective field.

- (i) The CNG (automotive fuel) Rules

- (ii) The Liquefied Petroleum Gas Rules
- (iii) The Oil & Gas Exploration Safety Rules.

7.3 MARGINAL GAS FIELD DEVELOPMENT POLICY

In Bangladesh 22 gas fields of sizes ranging from 25 to 4000 Bcf have so far been discovered. Fifteen of these gas fields have been brought under production. Some of these fields, which have been in the process of depletion for continued production over time, have become commercially unviable and remained unattended. There are yet other gas fields, which have not been put under operation for want of commercial viability right from the beginning. All these gas fields, which have no apparent prospect for further development under the existing techno-economic considerations, may be termed marginal/abandoned. Development of marginal gas fields requires investment with significant risks. In order to provide a transparent mechanism to deal with such marginal/abandoned gas fields, a set of procedural guidelines is deemed necessary.

7.3.1 A. OBJECTIVES

The objectives if this procedure are to :

- i. Facilitate development of gas resources of marginal/abandoned gas fields;
- ii. Introduce the state-of-the-art technology for development of marginal/abandoned gas fields;
- iii. Maximize ultimate recovery of gas from marginal/abandoned gas fields; and
- iv. Attract private investment (domestic and foreign direct) in the development of marginal/abandoned gas fields.

7.3.2 B. DETERMINATION OF MARGINAL GAS FIELDS

Petrobangla from time to time, with the approval of the Government, may declare certain gas fields as marginal/abandoned on the basis of the following procedure:

- i. Petrobangla shall constitute a technical committee, which will evaluate the status of all gas fields on the basis of geological, geophysical and engineering data, production history, cost effectiveness, size of the fields, remaining recoverable reserve, well deliverability, cost of production, access to pipeline and market etc. and determine which gas fields may be considered as marginal/abandoned.
- ii. The recommendations of the technical committee will be reviewed by Petrobangla and after review Petrobangla shall prepare and forward for consideration and approval of the Government the list of gas fields to be declared as marginal/abandoned.

c. Processing

1. Available data for the respective marginal/abandoned gas fields will be provided to the investors on payment of necessary fees. The confidentiality agreement will be signed in line with the international practice.

2. GOB/Petrobangla may invite proposals for private investment for the development of marginal/abandoned gas fields. The offers received will be evaluated on declared criteria and the best offer will be selected for negotiation and finalization of the contract.
3. The model production sharing contract 1997 as it relates only to gas and its associate products and as may be modified from time to time by the government shall be used as far as practicable as guidelines for negotiation. However, established norms and procedures will be taken into consideration while finalizing the contract between the parties.
4. Offers received prior to the adoption of these procedures will be appraised by a technical committee appointed by Petrobangla. After appraisal a joint venture agreement (jva) will be concluded between the selected investor and petrobangla/ company(ies) and forwarded to government for approval.
5. In line with the general GoB policy of diversification and wider participation of investors in order to minimize risks and encourage competition, foreign companies already engaged in exploration and/or production shall not be eligible for participation in the development of marginal/abandoned gas fields except specifically allowed by the government.

d. Fiscal Incentives

- i. Repatriation of dividends, capitals, repayment of loans etc. shall be in accordance with the policy of the Government/Bangladesh Bank.
- ii. Payment and exemptions of import duty shall be in accordance with SRO-202, issued on 28.11.95 by the National Board of Revenue.
- iii. The investors will be encouraged to use locally produced equipment and services.
- iv. Except as provided for in d(II) above, existing GOB rules shall apply for payment of corporate tax and all other taxes as applicable for such investment.

e. Commercial Aspects

- i. The investors shall conduct all operations at their sole risks and expenses. If there is no commercially viable production in the marginal/abandoned gas field, or if the production achieved by the investors under the contract is insufficient to reimburse the costs, the investors shall bear the losses.
- ii. The investors will be required to undertake optimal development of marginal/ abandoned gas fields for maximum recovery.
- iii. If an indication of a market outlet is not given by Petrobangla within 6 (six) months after a request is made by the investors, they will be free to find the market outlet within the country.
- iv. The investors will be entitled to recover investment within an agreed period of time under the terms of the contract. Investment recovery shall be limited only to the respective field.

- v. The investors will have the right to produce annually an agreed volume of gas following good reservoir management practices.
- vi. The investors will indemnify GOB/Petrobangla against any damage to resources and third parties.
- vii. The investors will be required to pay annually to Petrobangla a contract administration fee and a training grant, which will not be included as recoverable cost.

f. Pricing

Price of natural gas and associate products to be produced and delivered will be determined through negotiation.

g. Safety and Environmental Protection

Laws, rules and policies formulated by the Government of Bangladesh from time to time in this regard shall be followed.

h. Right Of Interpretation

In case of any ambiguity with regard to interpretation of any provision of these procedures, the GOB's interpretation shall be final.

i. Explanatory Note:

- For the purposes of these procedures, Chhatak, Kamta and Feni gas fields shall be deemed to have been declared marginal/abandoned gas fields, and, the negotiations/ discussions conducted so far with the approval accorded by the government in 1999, shall be deemed to have been in compliance with the above procedures.

7.3.1 Welfare

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

1. Development of roads, water supply, health and education facilities in the areas of their operation and towards any such other activities to be undertaken,
2. Undertake programs to improve the state of environment in their areas of operation.

7.4 RENEWABLE AND RURAL ENERGY POLICY

7.4.1 General Policy Issues

A. SUSTAINABLE ENERGY DEVELOPMENT

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

B. 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.

C. 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.

D. 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 program for development of the commercial fuels are drawn up.

E. ENERGY-MIX

Demand of 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.

7.4.2 RENEWABLE ENERGY POLICY

A. INTRODUCTION

A.1 Energy is one of the most important ingredients required to alleviate poverty, realize socio-economic and human development. The energy prospect is generally assessed on the basis of available commercial sources i.e., fossil fuel like gas, coal, oil etc. In Bangladesh efficient utilization of renewable energy resources is yet to assume commercial dimensions and hence a rational policy dissemination on renewable energy usage is essential. The renewable energy covers solar, wind, biomass, small hydro, geo-thermal, tidal, wave etc. in different form.

A.2 The frightening prospect of scarce non-renewable energy sources in a strife torn world presents one of the major concerns of mankind today. Though, energy derived from oil, gas and coal will play a vital role in meeting a growing demand for many years to come, the realization of the exhaustive nature of world's fossil fuels have focused interest and effort on harnessing alternative energy resources. Time has come to give recognition to the use of renewable energy resource which is free from environmental pollution, keep control over deforestation and abating atmospheric emissions.

A.3 At present the organizations/utilities under the following ministries are responsible for taking care of the various types of energy in Bangladesh

- Ministry of Power, Energy & Mineral Resources

- Ministry of Science, Information & Communication Technology
- Local Government Engineering Department

B. GOVERNMENT POLICY

Government of Bangladesh has adopted a National Energy Policy (NEP) in the year 1996 giving emphasis for the development of Renewable Energy.

The major objectives of the NEP are:

- To provide energy for sustainable economic growth so that the economic development activities of different sectors are not constrained due to shortage of energy.
- To meet the energy needs of different zones of the country and of different socio-economic groups.
- To ensure optimum development of all the indigenous energy sources (e.g. commercial fuels, biomass fuels, and other renewable energy sources).
- To ensure sustainable operation of the energy utilities.
- To ensure rational use of total energy sources.
- To ensure environmentally sound sustainable energy development programs causing minimum damage to environment.
- To encourage public and private sector participation in the development and management of the energy sector.

In order to translate these policy objectives into actual investment projects government has taken keen interest to formulate and adopt a Renewable Energy Policy. To accelerate the growth of renewable energy sector of the country, NEP has recommended establishing Renewable Energy Development Agency (REDA).

C. IMPORTANCE OF RENEWABLE ENERGY RESOURCES DEVELOPMENT

C.1 Fossil energy resources in Bangladesh consist primarily of natural gas. Domestic oil reserve is considered negligible. Bangladesh has also some deposits of peat in the south-western region of the country which have low calorific value. However, the country has substantial bituminous coal deposits in the north western region at Barapukuria and also more coal fields bear potential for large scale mining of them are under active consideration of Government for exploration.

C.2 Access to electricity in Bangladesh is one of the lowest in the world; coverage today stands around 32% of the total population. However the rural areas of Bangladesh, where 76% of the population live, is seriously deprived of the electricity facility. Larger energy supplies and greater efficiency of energy use are thus necessary to alleviate poverty and to meet the basic needs of a growing population. But it is difficult and expensive only utilizing commercial energy. It is therefore, necessary to tap different sources of renewable energy and to use them efficiently for the benefit of the people. For this, renewable energy development program will be taken in the areas where potential renewable energy resources are available considering financial, economical & technical viability and keeping in view the Environmental Quality Standard (EQS). Plant location, size and design will be considered on the basis of available energy resources of the area and efficient conversion of energy will be given preference. Priority will be given to the rural areas where national grid expansion is expensive. This will reduce the pressure on the demand of commercial power supply and will help to avoid costly grid expansion and will also keep environment pollution free.

C.3 GOB has declared its vision to provide electricity for all by the year 2020. Major electrification through grid expansion is not a viable option mainly due to inaccessibility and low consumer density. Renewable energy is environmentally sustainable, socially acceptable and economically viable option in the off-grid locations. To fulfil the GOB's objectives of electrification, development of renewable energy resources will play a vital role for off-grid electrification.

D. RENEWABLE ENERGY POLICY REQUIREMENT

D.1 Prior attempts to develop renewable energy in Bangladesh have met with limited success due to policy, institutional, financing, market, information, technical and human resource barriers. This policy intends to reduce these barriers and provide a sound and sustainable implementation framework to tap the renewable energy potential of Bangladesh.

D.2 Private capital investment for implementing the renewable energy is a major issue to be considered. This policy envisages accomplishment of its objectives by mobilizing a concerted national effort with the continued co-operation and commitment of government, international organizations, bilateral and multilateral funding institutions, Civil Society Organizations (CSOs), Community Based Organizations (CBOs), Non-government Organizations (NGOs), research organizations, universities and private sector etc. It has become increasingly clear that for the development of renewable energy, a favorable atmosphere is to be established to attract private investment as well

as cheaper sources of funding need to be exploited. Furthermore, innovative new financing opportunities including micro financing may be utilized to attract private capital to supplement the energy deficiencies in the rural areas and thus to fulfill the aspiration of the poor people.

D.3 To encourage private sector participation for the development of renewable energy resources through establishment a institutional framework, formulation of Renewable Energy Policy is essential.

E. OBJECTIVES OF RENEWABLE ENERGY POLICY

The major objectives of the renewable energy policy are:

- Promotion of renewable energy attracting private capital investment
- To accelerate electrification program using renewable energy resources
- To reduce pressure on commercial fuels
- Generation of power utilizing renewable energy to share at least 5% of total demand by 2010 and 10% by 2020.
- To ensure optimum development of all renewable energy sources
- To ensure environmentally sound sustainable energy development programs causing minimum damage to environment.
- To encourage public and private sector participation in the development renewable energy
- To promote competition among the entrepreneurs

F. MODALITY FOR IMPLEMENTATION OF RENEWABLE ENERGY PROJECTS

6.1 Renewable Energy Development Agency (REDA) will be established under the Power Division, Ministry of Power, Energy and Mineral for promotion and development of different type of renewable energy technologies (RETs). REDA will start functioning with GOB fund and subsequently devise its business plan for long-term sustainability. REDA will look after government interest in renewable energy projects. Until REDA is formed Power Division of the Ministry of Power, Energy and Mineral Resources or its assignee will facilitate the development of renewable energy.

G. FINANCING ARRANGEMENTS

- GOB may allocate funds for financing the capital investment required for renewable energy projects.

- A revolving Renewable Energy Trust Fund may be created with grants from Global Environmental Facility (GEF) and other climate change abatement funds to support renewable energy projects in Bangladesh.
- Government of Bangladesh (GOB) may establish renewable energy projects considering carbon emission trading as a signatory of Kyoto Protocol.
- GOB may secure funds from International Donors by implementing Clean Development Mechanism (CDM).
- Funds may be raised for the development of renewable energy projects issuing Corporate Bonds with the consent of the Securities and Exchange Commission (SEC).
- Foreign banks may be allowed to underwrite the issue of shares and bonds by the private power companies with the recognition by SEC of such underwriting.
- Tax facilities for private sector instruments as available to Non-Banking Financial Institutions.

H. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

It is stipulated that the project proponent must follow “Bangladesh Environmental Conservation Act’ 1995” and “Environmental Conservation Rules’ 1997” at the time of establishing renewable energy project and clearance from the Department of Environment would also be needed in this regard.

I. TARIFF FOR SALE OF POWER

I.1 POWER OFF TAKE

It will be the responsibility of the renewable energy entrepreneurs or sponsors to find customers for electricity. Sponsor will have direct contract with the customers for the sale of electricity on terms mutually agreed upon. The distribution system required for the supply of electricity to the contracted customers may be built by the Sponsors themselves or they can use the existing transmission and distribution systems, if there is adequate capacity. The sponsor will require to pay a wheeling charge to the owner of transmission/distribution facilities. The wheeling charges and other terms and conditions will be mutually agreed upon between the sponsor and the owner of the transmission/distribution facilities. Utilities (BPDB, DESA, DESCO, REB) may buy electricity generated from grid-connected renewable energy projects through mutually agreed “Power Purchase Agreement (PPA)”

I.2 PRICE REGULATION

GOB will not regulate the price of electricity generated from renewable energy source which shall be the contracted price between the sponsor and the consumers. After establishment of ERC, it will decide about future price regulation based on GOB policies.

J. FISCAL INCENTIVES

The following Fiscal Incentives would be provided to renewable energy projects sponsors:

- J.1 Renewable energy project sponsors whether public or private shall be exempted from corporate income tax for a period of 15 years.
- J.2 100% depreciation in the first year for solar photovoltaic, solar thermal projects and 100% depreciation in five (5) years for wind, biomass, geothermal, tidal and small hydro projects.
- J.3 The sponsors will be allowed to import plant and equipment directly related to renewable energy projects without payment of customs duties, VAT (Value Added Tax) and any other surcharges as well as import permit fee provided that the equipment is not manufactured or produced locally.
- J.4 Repatriation of equity along with dividends will be allowed freely in case of foreign investors.
- J.5 Exemption from income tax in Bangladesh for foreign lenders to such companies.
- J.6 The foreign investors will be free to enter into joint ventures.
- J.7 The companies will be exempted from the requirements of obtaining insurance/reinsurance only from the National Insurance Company, namely Sadharan Bima Corporation (SBC). Private power companies will be allowed to buy insurance of their choice as per requirements of the lenders and the utilities.
- J.8 The Instruments and Deeds required to be registered under local regulations will be exempted from stamp duty payment.
- J.9 Power generation has been declared as an industry and the companies are eligible for all other concessions, which are available to industrial projects.
- J.10 The private parties may raise local and foreign finance in accordance with regulations applicable to industrial projects as defined by the Board of Investment (BOI).
- J.11 Local engineering and manufacturing companies will be encouraged to provide indigenously manufactured equipment of international standard to renewable energy project sponsors.

K. OTHER FACILITIES AND INCENTIVES FOR FOREIGN INVESTORS

The following other facilities and incentives would be provided to renewable energy projects sponsors:

- K.1 Tax exemption on royalties, technical know how and technical assistance fees and facilities for their repatriation.
- K.2 Tax exemption on interest on foreign loans.
- K.3 Tax exemption on capital gains from transfer of shares by the investing company.
- K.4 Avoidance of double taxation in case of foreign investors on the basis of bilateral agreements.
- K.5 Exemption of income tax for upto three years for the expatriate personnel employed under the approved industry.
- K.6 Remittance of upto 50% of salary of the foreigners employed in Bangladesh and facilities for repatriation of their savings and retirement benefits at the time of their return.
- K.7 No restrictions on issuance of work permits to project related foreign nationals and employees.
- K.8 Facilities for repatriation of invested capital, profits and dividends.
- K.9 TAKA, the national currency, would be convertible for international payments in current account.
- K.10 Re-investment of remittable dividend to be treated as new foreign investment.
- K.11 Foreign owned companies duly registered in Bangladesh would be on the same footing as locally owned companies with regard to borrowing facilities.
- K.13 All the fiscal incentives listed in section J (Fiscal Incentives) & K (Other Facilities and Incentives for Foreign Investors) will also be applicable for renewable energy based captive generation having separate accounts and inventory statement.

L. RIGHT OF INTERPRETATION

In case of any ambiguity with regard to interpretation of any provision of this policy document, the GOB interpretation shall be final.

7.5 POWER POLICY

7.5.1 Demand forecast

- a. The methodology of forecasting linking electricity with socio-economic goals of the country is to be used for projecting demand 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 database on the power sector is to be developed which shall be continuously updated.

7.5.2 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 constrain like transportation and logistic of fuel supply, energy security, maximum unit size, project management and environment 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 programs 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 socioeconomic 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.

7.5.3 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 financing 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 Bangladeshi, 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.

7.5.4 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.

7.5.5 Power Supply to the West Zone

- a. Efforts are to be made to gradually bridge the gap in electricity supply between the west and east zone.
- b. Gradually a regional load generation balance is to be established in the West Zone. The inter-connector should not be loaded beyond 50% of its capacity so that outage of one circuit will not overload the other circuit. The second East West inter-connector may be taken up in future for reliability and stability of the power system.
- c. More Gas based power plants should be planned and implemented in the West Zone. The first coal-fired plant in the west zone is to be taken up for implementation urgently.
- d. Effort are to be made to implement the Ruppoor 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.

7.5.6 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 fuels and technology options relevant to such areas
- b. Transmission and distribution plans for similar load centres are to be developed on an area basis.

7.5.7 Tariff

- a. The tariff setting will be consistent with the financial requirements of the power sector institution.
 - Meets operating expenses
 - Earns adequate return for self investment in future expansion

- b. The tariffs will take into account
 - Load management and energy conservation
 - Efficiency improvement
- c. The GOB's policy objectives will be addressed in tariff setting and recommendations especially on social commitments.
 - Tariff to each consumer class reflects the cost of supply
 - BPDBs be subsidised by direct transfer from the GOB with the aim of promoting rural development
 - Gradual withdraw of subsidy for agriculture consumers
 - Gradual withdraw of subsidy for domestic consumers except those fall in the life line slab (0-100) units presently).
 - In the interim subsidies to domestic and agriculture consumers be supported through the national budget.
- d. Automatic price adjustment due to change of the following using a well specified formula:
 - Exchange rate
 - Consumer / industrial price index
 - Fuel price

7.5.8 Captive and Stand-by Generation

- a. Permission to install captive generation facilities is to be accorded by the regulatory authority.
- b. Categories of activities where captive generation may be allowed shall include the following:
 - Process industries, where loss of power may cause loss of a batch of production.
 - Co-generation by industries.
 - Industrial activities like fertilizer, paper and rayon where fluctuations in frequency may cause the loss of a batch of production.
 - 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. Price of gas used as fuel for captive generation (including stand-by) shall be fixed from time to time as done for other gas consumers.

7.5.9 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 retrofitting 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:
 - Bulk commercial and industrial consumers : at least twice every years
 - Domestic consumers : at least once every 5 years
 - System meters : at least once a year
- 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.

7.5.10 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 centers and malls 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.
 - (v) The use of Fluorescent tube lights / compact fluorescent tubelights (CFL) and energy saving bulbs are to be encouraged in place of incandescent lamps resulting in drastic reduction in system demand.
- b. Following measures are to be taken for conservation of energy.
- (i) Use of Power Factor Improvement plants are to be made 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 install 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 appliance 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.

7.5.11 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, retrofitting 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 appropriate 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 co-ordination, reliability and availability of protection systems.
- h. Maintenance of distribution system is to be separated from functions of commercial operations. Maintenance personal are to be dedicated exclusively for operation and maintenance works.

7.5.12 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 re-closing 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.

7.5.13 load Dispatching

- a. Load dispatching center is to ensure co-ordination among the power stations and load centers 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 dispatch center of the concerned utility is to be equipped with state of the art technology for ensuring the above objectives.

7.5.14 Institutional Issues

Power Sector is to be restructured along functional lines. The functions of generation transmission and distribution of electricity are to be separated.

A. GENERATION

Measures to improve efficiency and operations in the existing generation stations should be pursued along with the addition of more capacity in the private and public sectors. All existing power generation units are to be separated through a

corporatized national power generation entity which will pave the way for restructuring power generation on commercial lines. Individual power stations may be incorporated as independent power generation companies in future, if deemed appropriate and necessary. In case of new generation, projects would be selected to enable the desired security of supply at generation level to be met at least cost. The new generation capacity would be sought through a mix of sources i.e. both public and private.

Private sector power generation policy of Bangladesh has been announced to facilitate private sector participation in the power generation.

B. TRANSMISSION

Efficient network development, expansion and management capable of accessing the most efficient supply of power and transport it to customers should be designed and implemented. Resources, domestic and foreign have to be arranged for these purposes. The transmission network will be owned, operated, planned and developed by a corporatized entity in the public sector.

C. DISTRIBUTION

Commercial and financial performances of the distribution entities are to be improved in order to reduce system loss. Moreover projects and programs should be put in place to expand the scope for demand management and explore the possibilities of innovative solutions like remote reading, computer networking, dividing BPDB and DESA's distribution system into a number of profit center based on commercial lines etc. These steps would ensure the viability of the industry, increase its attractiveness for investment and serve more customers within any given supply of electricity. In this context the specific measures to be considered to strengthen the distribution segment are as follows:

- Introduction of consumer voice and organisational accountability in the form of citizen/client charter.
- The existing distribution system of BPDB and DESA is to be transformed into a number of new corporatized entities to be incorporated under the Companies Act. 1994. A new distribution company named Dhaka Electric Supply Company Ltd. (DESCO) has been created in November 1996
- Introduction of private capital and management participation in distribution companies
- The rural Electric co-operatives (PBSs) under the overall assistance, co-ordination, advice, supervision and monitoring of REB to continue functioning and additional PBSs to be formed as and when required.
- Remote Area Power Supply System (RAPSS): Introduction of distributed generation along with distribution area franchise for a certain period for rapid coverage of off-grid remote areas. Adequate government support including fiscal incentives is to be provided to private entrepreneurs to attract private investment.
- Frontier application of technologies such as remote reading, monitoring and control including accessing intranet network

D. REMOTE AREA POWER SUPPLY SYSTEM (RAPSS)

An approach of off-grid distribution

Access to electricity by the majority people by 2020 is a befitting national goal. But it is not possible only through national grid system. To increase the electricity penetration special effort need to be given on remote area electrification programme. To this end, Government is considering "Remote Area Power Supply System (RAPSS)" programme. It will be implemented in the private sector. Such off-grid area will be given to the entrepreneurs/investors by allowing distributed generation and providing distribution area franchise for a certain period. Adequate government support including fiscal incentives is to be provided to the sponsors promote RAPSS programme and to make electricity available to the consumers at reasonable and affordable price.

E. POLICY GUIDELINES FOR SMALL POWER PLANTS (SPP) IN PRIVATE SECTOR:

Policy Guidelines for Small Power Plants (SPP) in Private Sector has been approved in 1998 to serve non-grid areas and provide opportunity for sale of excess power from captive generators to consumers in the neighbouring area. SPPs have given similar fiscal and other incentives as provided in "Private Sector Power Generation Policy of Bangladesh.

Single Buyer

A single buyer model may be adopted where the buyer purchases all the required power from the generators based on economic load dispatch and sells to different distribution companies. The Single Buyer shall be a public sector company.

- a. There may be a board of Directors, to be appointed by the Government for each of the companies as mentioned above, for directing and monitoring the performance of the company. Majority of 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.
- b. 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. The Government shall ensure that the interests of the employees of the existing utilities are protected during the restructuring process.

7.5.15 Private Sector Participation

- a. Local and expatriate entrepreneurs are to be allowed to participate in development of the power sector.

In order to create appropriate and enabling conditions for improved public sector performance, attracting private and multilateral capital flows on a sustained basis and giving value for money to customers, a series of reform measures have been undertaken which would be continued and to be updated/revised as and when necessary.

- i. **Generation:** To introduce competition, induct foreign private capital and more importantly, to increase power supply to alleviate the acute shortage, 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. For existing old Power Plants, Rehabilitate, Operate & Maintain (ROM) project may be considered as & where appropriate.
 - ii. **Distribution:** To encourage and attract local entrepreneurs in distributed generation and supply in remote off grid areas, Remote Area Power Supply System (RAPSS) policy may be adopted providing similar fiscal and other incentives as provided in the "Policy Guideline for Small Power Generation (SPP) in Private Sector.
 - iii. **Contracting of Services:** Contracting out some of the commercial functions currently performed by BPDB and DESA may be considered particularly meter reading, billing and/or collections.
 - iv. **Wheeling Arrangement:** The electricity generated by private generators may be supplied to grid system as per agreement with the power purchaser/single buyer and Transmission Company. The private / public generators may also sell directly to large consumers through 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 commission, entrepreneur and the concerned utility companies.

7.5.16 Organizational and Human Resource Development

- a. Organization charts for operation and maintenance of new corporatized entities are to be designed in such a way that total manpower does not exceed the optimum level.
- b. Present manpower of the utility are to be reviewed to identify excess manpower. Such excess manpower may be utilized for future projects and expansion.
- c. Distribution utility boundaries are to be rationalized in order to avoid parallel operation and to optimize human resource utilization.
- d. Employment opportunities or labour intensiveness should never be a criterion for acceptance of projects of power sub-sector.
- e. A comprehensive training program 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.
- f. Training is to be linked to career planning of professionals of the utilities.
- g. The Government and/ or the utilities are to provide adequate funds for implementation of the training program.

- h. Training facilities available in other local institution are to be utilized.
- i. Local training facilities are to be strengthened. Professionals receiving training abroad are to participate in local training as resource personnel in specific training program for ensuring smooth dissemination of technology and knowledge.
- j. Local training facilities are to be made available to the future entrepreneurs of the private sector on payment of prescribed charges.
- k. Inter-utility linkage in the field of human resource development is to be strengthened.

7.5.17 Regional / International Co-operation

- a. Possibility of Cross Border electricity trade among neighbouring countries may be examined.
- b. 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.

7.5.18 Technology Transfer and Research Program

- a. Transfer of technology is to be given due consideration in development of the power sector.
- b. 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.
- c. 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.
- d. 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.
- e. A comprehensive Research and development program 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 program.

7.5.19 Environmental Policy

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

- d. 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.
- e. 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.
- f. 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.
- g. 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.

7.5.20 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.

7.6 RURAL ELECTRIFICATION POLICY

7.6.1 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 program.

7.6.2 Specific Policy Issues

F. 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 program on bringing all the rural areas of the country under electrification in phases. Such a Master Plan, delineating load center 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.

G. 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).

H. PALLI BIDYUT SAMITY (PBS)

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

I. 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 with some relaxation for financially weaker PBSs (having low load density and low utilization factor), especially during the initial years of their commercial operation.

J. 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.

K. 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 1,800 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 electrifications district. In this case the overhead of maintaining district offices is to be optimized.
- d. If an 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.

L. 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.

M. 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.

N. DOMESTIC USE OF ELECTRICITY

- c. Domestic connections to as many households in an electrified area as possible is to be aimed so that an average household can have two incandescent lamps of 100 W each or 3x60 Watt bulbs and one fan (70 W).
- d. Domestic consumers are to be encouraged to avoid wasteful use of energy.

O. INDUSTRIAL DEMAND

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

- f. A congenial astrosphere and incentive packages are to be developed and offered to the private sector for establishing industrial units in the rural areas.
- g. 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.
- h. 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.
- i. 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.
- j. 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 would help restriction of migration and unplanned urbanization.

P. 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 would 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.

Q. POWER GENERATION

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.

R. 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.

S. TARIFF STRUCTURES

- a. Tariff structure for rural consumers is to be developed in such a way that the PBS is 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.
- f. Any concession allowed to the agriculture, industries etc. due to tariff setting below cost of service may be compensated by the Government.

T. RATIONALIZATION OF UTILITY AREAS

- a. The supply areas are to be such that the network can be efficiently planned, implemented and managed. If needed a 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 50,000 with a good mix of consumer types.
- d. The demarcation between adjacent operational units is to be such that efficient network configurations can be attained.
- e. The supply area is to be contiguous and one utility should not have pockets of supply areas within another utility.

U. INSTITUTIONAL ISSUES

- a. Scopes of REB activities may be widened for rapid rural electrification by incorporating activities related to stimulation of demands for electricity; especially in the industrial sector.
- b. Advisory roles of external agencies (BPDB, 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 20,000 Km per year in place of present 12,000 km/year to electrify the rural areas of the whole country by the year 2020.

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 Power, Energy & Mineral Resources and concerned agencies
Biomass Fuels	Agriculture and Rural Institution	Forestry Wing	Ministry of Environment & Forests and concerned agencies
Animal Draft Power	Agriculture and Rural Institution		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 Power, Energy & Mineral Resources
1.1 Indigenous Fuels	
a. Survey, geological mapping, Exploration minerals	a. Geological Survey of Bangladesh, IOCs
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 & gas	c1. BAPEX, IOCs
c2. Operation of gas fields	c2. BGFCL, SGFL, BAPEX, IOCs
c3. Transmission & distribution of gas within franchise areas	c3. BGSL, GTC, JGTDSL, TGTDC, WESGAS
c4. Marketing of CNG	c4. RPGCL, Private Company
d. Research, Training on Oil & Gas	d. Bangladesh Petroleum Institute
1.2 Import of crude & petroleum product processing, distribution & marketing of petroleum products	1.2 Bangladesh Petroleum Corporation & 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

Functions	Ministry / Agency
d. LPG Botting	d. LPGL, Private Company
e. Blending of Lube Oil	e. ELBL, SAOCL and private Company
f. Distribution & marketing of petroleum products	f. PADMA, MEGHNA AND JAMUNA OIL COMPANY
1.3 Electricity	
a. Regulatory functions	a. Energy Regulatory Commission (ERC) and chief Electric Inspector
b. Generation	b. BPDB, RPC, IPP
c. Transmission & distribution	c. BPDB, DESA, REB, PGCB
d. Distribution	
d1. In rural areas	d1. REB
d2. In metropolitan area of Dhaka	d2. DESA, DESCO
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 & 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 & Development on New-renewable Energy Technologies	3.2 BAEC, BAU, BCSIR, BUET, DU, REB and Private Sector.

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	64 Million tonnes	310,000 tons/yr (trial production)	1 Million tonnes/year from 2004	Reserve 300 Million tonnes in place
	Khalaspir	137 Million tonnes	-	-	-
	Phulbari	80 Million tonnes	-	-	-
Crude Oil (East Zone)	Haripur	5.5 Million barrels (June'93)	0	Not yet ascertained	Appraisal of the field needed
Natural Gas (East Zone)	22 gas fields	15.4 TCF (June 2001)	1250 MMCFD (April 2004)		
Natural Gas Liquid (East Zone)	Producing gas Fields	45.4 Million barrels (June 2003)	532 tonnes/day (June 2003)		After Commissioning of Kailastila & Beanibazar fields
Hydropower (East Zone)	Kaptai	N/A	1000 GWh/year	1000 GWh/year	Only kaptai site being exploited

