POLITICS OF NATURAL GAS IN BANGLADESH

Dissertation Submitted to Jawaharlal Nehru University in Partial Fulfillment of the requirements for the award of the Degree of

MASTER OF PHILOSOPHY

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DECLARATION

Certified that the dissertation entitled "**POLITICS OF NATURAL GAS IN BANGLADESH**", submitted by me in partial fulfillment of the requirement for the award of the degree of **MASTER OF PHILOSOPHY**, has not been previously submitted for any other degree of this or any other university and is my own work.

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CERTIFICATE

We recommend that this dissertation may be placed before the examiners for evaluation.

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Supervisor

DEDICATED TO

My Parents

For Being My Pillar of Support

CONTENTS

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Tables

ABRIVATION

WEIGHTS AND MEASURES

BCF = billion cubic feet

GWh = Gigawatt-hour

KGOE = kilogram of oil equivalent

KV = kilovolt

KW = kilowatt

KWh = kilowatt-hour

Mbd = Million barrels a day

MCF = thousand standard cubic feet

MMCFD = million standard cubic feet per day

MW = megawatt (one thousand kilowatts)

TCF = Trillion cubic feet (1,000 billion) cubic feet

GLOSSARY OF ABBREVIATIONS/ ACRONYMS/ TERMS

ADB = Asian Development Bank

ADP = Annual Development Programme

BAPEX = Bangladesh Petroleum Exploration Company

BGFCL = Bangladesh Gas Fields Company Ltd

BIDS = Bangladesh Institute for Development Studies

BOI = Board of Investment

BPC = Bangladesh Petrobangla Corporation
BPDB = Bangladesh Power Development Board

CC = Combined Cycle

CPD = Centre for Policy Dialogue

CT = Combustion Turbines

DESA = Dhaka Electricity Supply Authority

DESCO = Dhaka Electricity Supply Company

EIA = Environmental Impact Assessment

EQS = Environmental Quality Standard

ERC = Energy Regulatory Commission

GDP = Gross domestic product

GIIP = Gas initially in Place

GNP = Gross National Product

GoB = Government of Bangladesh

GTCL = Gas Transmission Company Ltd.

HCU = Hydrocarbon Unit

ICT =Information and Communication Technology

IOC = International Oil Company

IPP = Independent Power Producer

LGED = Local Government Engineering Department

LNG = Liquefied Natural Gas

LPG = Liquified Nitrogen Gas

LRMC = Long-run Marginal Cost

MEMR = Ministry of Energy and Mineral Resources

NCG = Nordic Consulting Group

NEP = National Energy Policy

NGOs = Non-governmental Organizations

NR = National Resources

OPEC = Organisation of Petroleum Exporting Country

PBS = Palli Bidyut Samity (Rural Electrification Cooperative)

PC = Power Cell

PGCB = Power Grid Company of Bangladesh

Plan = Fifth Five Year Plan 1997-2002

PPA = Power Purchase Agreement

PSA = Production Sharing Agreement

R&D = Research and Development

RE = Renewable Energies

RE = Rural electrification

REB = Rural Electrification Board

REDA = Renewable Energy Development Agency

RETs = Renewable Energy Technologies

ROM = Rehabilitate Operate Maintenance

RPC = Regional Power Companies

RPC = Rural Power Company.

SAARC = South Asian Association for Regional Co-operation

SGFL = Sylhet Gas Fields Ltd

TOR = Terms of Reference

UAE = United Arab Emirates

UEG = Utility Electric Generation

USGS = US Geological Survey

VAT = Value Added Tax

WB = World Bank

Preface

Human condition is inextricably linked to natural resources. Energy is the lifeblood of modern economies. It is an essential input for sustaining and enlarging economic development of a country and for enhancing the quality of the life of the people. The long-term energy demand forecast that, overall, the current trend of worldwide rising demand will continue. However, energy consumption in developing and emerging economies may soon become the largest market for energy. These countries will need more energy to achieve sustainable development for their populations. The poverty-ridden country of Bangladesh, which is still struggling hard with its development, cannot afford to make mistakes regarding the utilization of natural gas. Natural gas is the only significant commercial energy sources for the Bangladesh. The consumption of natural gas has been increasing and it has contributed to the national development significantly, though the level of achievement is not satisfactory. Inspite of controversy in the volume of gas reserves, energy decision making has been influenced in Bangladesh by powerful external and internal factors, both from within and outside Bangladesh. Within Bangladesh, corporate interests have tried to influence decision to their advantage and the outside influencing factor has been the IOCs. At present the whole country is intensely involved in gas export debate. But the solution to its long- term energy security does not depend only on the question of export. It also depends upon the involvement of the government and its policies. Apart from the debate on gas export, the Bangladesh government has to take care about consumption power of local people, uninterrupted gas supply. The main scope of the study is to identify the problems, which interrupted the economic development through energy development and future prospects of energy development in Bangladesh. Change is needed if energy systems are to promote sustainable development. Healthy politics and the government's adequate Policies only can support sustainable development in Bangladesh. This study will focus on the following major issues: (a) gas reserves-present and its potential; (b) supply-demand scenario; (c) domestic price structure in Bangladesh; (d) gas distribution pattern; (e) impact of gas contracts with IOCs; (f) the issue of gas export; (g) and domestic politics

It is imperative to analyze and study the problems and prospects of natural gas for Bangladesh given the importance that it carries for the development of the country. A research initiated in this area would facilitate to establish the political dynamics behind the debate over the export of natural gas in the country. The study would also contribute in understanding the problems that developing and fragile economies face in establishing sovereign control over their natural gas reserves in a globalized economy. The proposed study start with the assumptions that, lack of national consensus over the distribution and utilization pattern of gas has led to inefficiency in its development and the decision to export gas from Bangladesh is under the External as well as Internal pressure.

The proposed topic, Politics of Natural Gas in Bangladesh will discuss in the following subsequent chapters. The first chapter is deals about overview of the study - Energy in world, uses and importance of energy, Demand and supply of energy in the world and in Bangladesh.

Second chapter will discuss the importance of Gas, estimates of gas reserves, its exploration, domestic demand and supply, consumption power etc., in Bangladesh.

Third chapter will analyze the Domestic Politics towards energy decision making-utilization and distribution pattern of gas in Bangladesh. The shortcomings and government's response towards it.

Fourth chapter deals the External dynamics on Natural gas in Bangladesh. It will also discuss the government's dilemma in gas export, External pressure and domestic pressure. Also the advantage and disadvantages of gas export.

The concluding chapter includes main findings & carries discussion about present problem & future possibilities.

CHAPTER I

INTRODUCTION

INTRODUCTION

Human condition is inextricably linked to natural resources. Energy is stable and rich resources of the lifeblood of thriving economies. Energy plays an essential role in economic and social development. It provides opportunities for nations to reach their goal of better standard of living. The long-term energy demand forecast that, overall, the current trend of worldwide rising demand will continue. However, energy consumption in developing and emerging economies may soon become the largest market for energy. These countries will need more energy to achieve sustainable development for their populations. (B.K.Chatturvedi 2006: 45)

Energy has played a pivotal role in the evolution of society. Humanity's earliest energy source was animal power-the human animal first. However, the domestication of animal to serve as external energy sources probably came much later in prehistory than the domestication of fire. The first external energy source was firewood. Firewood and domestic animal power were the dominant energy sources for humanity for hundreds of millennia. Only as wood became scarce did a search for new energy alternatives begin. The loss of forests in northern Europe is generally believed to have driven a shift to coal in the few centuries immediately preceding the Industrial Revolution. Coal was able to provide immensely more energy than firewood, literally fueling industrialization. (Ebenhack 1995: xvii)

By 1990, energy was impinging on the world's consciousness for another reason: rising environmental awareness. Attention focused heavily on carbon dioxide emission and acid rain, which can result from the use of fossil fuel. But what are the alternatives? Traditional biomass combustion (i.e., firewood or charcoal) actually has all of the disadvantages of most fossil fuels, and newer biomass technologies have their own problem, including present day emissions of carbon dioxide and other pollutants.

The importance of energy security has become essential part of economic growth and national security. The "developed" world's concept of "energy security" has evolved in the context of its excessive dependence on imported energy and the localization of supplies in the unstable regions of the world. The focus of policies till the oil shock of the 1970's was mainly on supply management, on its widest sense. After the oil shocks, the concept of energy security was widened to include demand management and investment in energy saving technology as well as alternative sources of energy. (Panwar 1995: 112)

The current situation of world energy resources available to meet this growing demand revealed the importance of oil and gas in the world energy market. Coal, the oldest known fossil source of energy, contributes about 27 percent of today's world primary energy consumption. Nuclear energy accounts for 7 percent, and hydroelectric and renewable resources contribute 3 percent of total energy consumption worldwide.

Oil and gas are and will remain by far, the principal sources of energy for the foreseeable future. Together, they supply about 63 percent of the world consumption of primary energy. (Banbj 1992: 269) Aside from their use as fuel sources, oil and gas have wider application as in petrochemicals and directly impact on daily life-styles as well as economic growth.

The day may come when other energy resources could replace oil in such applications as power generation, but there is no replacement for oil and gas in their very specialized applications. Such as lubricants, cleansers, petrochemicals, fertilizers, cosmetics, pharmaceuticals, synthetic rubber, road paving, and the like oil and gas derivatives and products will continue to enjoy a prominent role in our daily life.

Over the past two decades, we have begun to think of energy as a problem and we tend to see that problem in various, sometimes conflicting, ways: there is too little of it; increasing energy production injures our environment; the by-products of its use add insult to the injury; we ought to conserve; we require more energy to provide the benefits of modern society; energy prices are too low, or too high; and so on.

DEFINITIONS

Even though man has used energy for over centuries, it is only in the last two centuries that the concept of energy gradually became crystallized. One simple way of defining it is: 'Energy is the capacity to do work.' Energy can exist in many forms and can be converted from one form to another. One of the most important laws of nature states that energy can neither be created, nor destroyed-it is simply transformed. The well known equation, E=mc2, represents the interchangeability of energy and matter. (Ebenhack 1995: xxx)

Energy is that which empowers matter. Energy is such a fundamental aspect of nature that it permeates all that we perceive, so, in a sense, it is difficult to say what is not energy or an energy source. Before the middle of the present century, most scientists held the principle that energy, like matter, could neither be created nor destroyed. Einstein's Special Theory of Relativity (demonstrated emphatically by the Manhattan project's atom bombs in 1945 quoted in the *Non Technical Guide to Energy Resources: Availability Use & impact* by Ben W. Ebenhack) caused this principle to be revised, acknowledging that matter (or mass) can be destroyed with the released of tremendous amounts of energy. The law is now expressed as the conservation of mass and energy, which can be converted from one to the other. In essence then, everything is energy. (Ebenhack 1995: xxx)

ENERGY RESOURCES

Natural resources may be in two categories: depletable and renewable. Depletable resources are those that are used up at a faster rate than nature can replenish them. Our major fuel resources today are fossil fuels, particularly coal, oil, and natural gas. These resources effectively can never be replaced since immense amounts of time were required to create them.

Other resources can either be replaced or are not depletable; water power and plant materials (called "biomass") do indeed replenish themselves if they are allowed to and therefore are truly renewable. Others, such as solar energy and wind power are not depletable; they are "inexhaustible," but are commonly also included as renewable. In the pre-industrial world, people used these renewable resources primarily. Wood, for example, was the fuel for heating and cooking, wind powered sailing vessels and waterpower turned the wheels that ground grain.

But since the beginning of the industrial age, we have relied increasingly on fossil fuels. Today, 89 percent of the United States' and 80 percent of the world's energy comes from fossil fuels. In recent years, scientist and businesses have given increasing consideration to renewable energy resources. In spite of, or more probably because of, our reliance on fossil fuels, the use of these resources has caused controversy since the industrials revolution in the nineteenth century. (Cassedy and Grossman 1998: 9)

ENERGY SECURITY

Energy security has been defined in various ways. In the IEA's (1985)-publication *Energy Technology policy*, energy security was defined as "an adequate supply of energy at reasonable cost". The European commission (1990) provide a somewhat fuller definition: "security of supply means the ability to ensure that future essential energy needs can be met, both by means of adequate domestic resources worked under economically acceptable conditions or maintained as strategic reserves, and by strategic stocks". (IEA Study 1995: 23)

The definition of "energy security" has been subject to wide range of interpretations. Free market advocates saw energy security as a matter of reducing the national economy's vulnerability to oil market disruptions and price shocks. Environmentalists saw it as reduced consumption of oil. Producers saw it as higher domestic production of fossil fuels. The US Energy Policy during 1970s reveals it as

reduced reliance on Persian Gulf oil suppliers. Some came to understand energy security as lower intensity of oil use in the economy and reduced reliance on oil imports. (Stagliano 2001: 160)

Energy security is the theory and practice of securing energy for the nation-state. According to a report by the Trilateral Commission (North America, Western Europe and Japan), energy security is maintained by utilizing national power to secure a steady supply of affordable energy for the purposes of economic growth. (Stagliano 2001: 34-35) Energy security requires a reliable availability of energy in quantities and at prices that help to sustain the economic growth. This involves:

- Physical resources of raw materials, and production, transportation, processing and distribution facilities, sufficient to meet demand;
- Absence of political factors that restrict or prevent these resources from being made available or used when they are available, such as foreign policy developments and limitations of international trade;
- A balance between energy security and other policies, such as fiscal and environmental policies.

Energy security can be endangered in the short and medium term when specific energy supply flows may be disrupted and in the long term when a balance between energy supply and demand, consistent with the goal of economic growth, may not be achieved. History has shown that significant supply disruptions have contributed considerably to world recessions and that allowing serious imbalances to develop between long-term supply and demand can have long and deep effects on the economy and upon society. Energy security, therefore, also requires the ability to reduce the vulnerability of energy systems in a cost-effective manner over the long term, and ability to respond to specific short or medium-term supplies disruptions. (IEA Study 1991: 13)

ENERGY DEMAND IN WORLD

Before addressing the issue of opportunities in the development of the energy sector particularly Gas sector in the South Asian region, it is important to look at the world energy outlook over the next thirty years. If one looks into the future over the next thirty years, it depicts a future in which energy use continue to grow inexorably, fossil fuels continue to dominate the energy mix. The developing countries fast approach consumption levels of OECD countries, becoming possibly as the largest consumers of commercial energy. Whilst the earth resources have adequate reserves to meet rising demands for at least the next three decades, but beyond that time frame there are serious concerns about the availability and security of energy supplies, the huge investments in energy infrastructure and the threat of environmental damage caused by energy production.

The world will require large energy quantities in the coming two decades. Economic development will create new, growing energy markets in the developing world, especially the emerging economies. Economic growth is considered the driving force of energy demand. It is worth mentioning that the world gross domestic product (GDP) valued at $12 trillion (1990 U.S.$) in 1970 has almost doubled to $23 trillion in 1993. By the year 2015, it is expected to almost double again, reaching $45 trillion. (Banbj 1992: 270)

Energy trade is expected to expand rapidly in the coming years and, in particular, the major oil and gas consuming regions will see their imports grow substantially. This trade will increase mutual dependence among nations. But it will also intensify concerns about the world's vulnerability to energy supply disruption, as production is increasingly concentrated in a small number of producer countries. As such, supply and price security has moved to the top of the energy policy agenda. The governments of oil and gas importing countries will need to take a more proactive role in dealing with the energy security risks inherent in fossil fuel trade. They will need to pay more attention in

maintaining the security of international sea-lanes and pipelines, and they will have to look a new at ways of diversifying their sources of fuels as well as the geographic resources of those fuels. (Islamabad paper No.21, 2004: 7)

Demand for energy at large is expected to grow at a rate around 2 percent per year through the year 2015. Total consumption will reach 13.5 billion tons of oil equivalents (toe), i.e., 67-percent increase from today's (1996) figures. This growing demand makes it essential to recognize all the related factors affecting energy growth (Banbj 1992: 270).

According to the International Energy Agency (IEA), the total investment requirement for energy-supply infrastructure worldwide over the period 2001-2030 is US$ 16 trillion. It is needed to expand supply capacity and to replace existing and future supply facilities that will be exhausted or become obsolete during the projection period. World consumption of oil is 76 million barrels a day (mbd); and demand is projected to go up to 119 mbd in 2025. Supply figures do not tally with the projected demand. World oil production is expected to peak between 2010 and 2020 at 80 mbd and the production from all sources (coal, shale, and synthetics, extra-heavy and deep-water, polar as well as gas) will peak in 2015 at 90 mbd. The organisation of petroleum exporting countries (OPEC) production will peak in 2020 at 40 mbd. With half the world's remaining conventional oil reserves, west Asia is projected to meet almost two-third of the increase in global oil demand between now and 2030 (Dietl 2004: 375). Non-conventional oil (including gas to liquid) will garner a significant and growing share of the market over that period, largely from Canada and Venezuela.

Oil remains the world's major source of energy, accounting for almost 40% of primary energy demand. Coal accounts for 27%, natural gas for 21% and the remainder is supplied mainly by nuclear energy and hydropower. Oil is the main commercial fuel in North America, Australia, and Western Europe and also in developing countries, more than half of which depends on oil imports for more than three- quarters of their commercial energy needs. Since 1973, the year of the first 'oil shock', demand has increased faster for natural gas than for other fossil fuels: in 1990, demand was 35.2

million bdoe, a 72% increase compared to 1973. Demand for coal has increased 50% and demand for oil 14% over the same period. (Shell briefing Service Study, 1991:1)

ENERGY POLITICS IN WORLD

World demand for energy continues to grow propelled in part by the booming economies of Asia. As geological exploration and new extraction technologies become more sophisticated, it is clear the world is well endowed with fossil fuels -- coal, oil and natural gas. The problems of getting new energy to market are primarily economic and political. Coming from the liberal end of the political spectrum, there is a belief that the central imperative of energy security is having a vigorous domestic and international market place in which prices and allocation are determined by market forces rather than government dictate (Sharp 1995: 11). For the foreseeable future, the importance of greater Middle East oil and natural gas supplies will increase, and the Persian Gulf will continue to be the most significant repository for reasonably priced energy. One of the most promising alternative energy sources is the adjacent Caspian Basin.

Both the Gulf and the Caspian remain areas of unresolved and dangerous conflict involving the external powers, arms proliferation, and ethnic and religious hatreds that go back centuries. From the American point of view, the most important unresolved conflicts concern Iran and Iraq. However, the countries to the north, from Turkey through the Caucasus and into Central Asia, are also potential powder kegs. The wars in the Caucasus, including continued instability in Chechnya, the confrontation over Nagorno-Karabakh between Azerbaijan and Armenia, the unresolved conflicts in Georgia with the Abkhaz separatist region and continued fighting between warring factions in Afghanistan, indicate the insecurity of the region and the dangers of depending on any one country for energy supplies.

Yet because of the expected untapped energy resources of the region, the local players and the key external powers realize that if political conflicts can be resolved, an economic bonanza could transform the region. Investment opportunities in Iraq and Iran would run into billions of dollars and Azerbaijan, Kazakstan and Turkmenistan could, in different ways, become new Kuwaits. (Geoffrey Kem 1997: online web). How this wealth will be spent and whether it will lead to parallel easing of tensions with neighbors remains uncertain.

For Ukraine and other former Soviet republics, Russia's crude use of energy for political ends is an old story. For years Moscow has been using its control over natural gas to reward neighbours who submit to its political diktat, such as Belarus, and punish those who seek greater independence, such as Georgia and Moldova. It has also been trying to gain control over pipelines carrying gas and oil, as well as electricity networks, by using gas as a lever. That leverage is considerable: Russia holds more than a quarter of the worlds gas supplies and is a major supplier to virtually every country in Europe. (Geoffrey Kem 1997: online web)

The world therefore faces the coincidence of increasing demand for energy and growing dependency on dangerous, unstable regions. Furthermore, the new patterns of Asian demand will invariably mean that different Asian countries will establish their own political and economic ties with the Persian Gulf and Caspian Basin countries.

NATURAL GAS

Natural gas is a mixture of hydrocarbons, principally methane (CH4), found trapped in the earth's crust, where it can be produced from well for use as fuel and as raw material for making chemicals. For distribution and sale, raw natural gas is processed to remove liquid hydrocarbons and poisonous, corrosive, or otherwise troublesome impurities such as hydrogen sulfide, carbon dioxide, and water. The residue gas-a mixture of methane plus heavier hydrocarbon gases such as ethane (C2H6) and propane

(C3H8) with inert gases such as nitrogen-is then typically adjusted in composition so as to bring its heating value within about 5 percent of the heating value of pure methane, 1010 British thermal units (Btu) per cubic foot under standard atmospheric conditions. (Survey of Energy Resources 1995). The industry sometimes refers to gas with a heating value in this range as pipeline-quality gas.

Until quite recently, the abundance of natural gas resources in the world largely justified the general optimism of forecasts for its growth. This assessment has lost nothing in importance. Quite the opposite is true, however the demand parameters have gradually moved to the front of the scene under the pressure of recent economic, political and environmental developments.

The past two decades have been the scene of political, economic and energy events and upheavals. However, the gas industry has succeeded in avoiding most of the turbulence, instability and climate of uncertainty that have beset the oil industry, and it has not really undergone any worldwide recession. For a time its development was held back by the general economic situation before recovering its progression on all markets, and its prospects for the coming years are favorable. Its very long-term future also seems extremely promising if the size of its resources in considered.

In recent years, just like in recent decades, there has been no slowing down in the increase in proven reserves of natural gas in the world. With this survey identifying over 128000 (10) 9 (m)3 of reserves in 1990, compared with 109000 (10)9 (m)3 in 1987 in the previous survey by the WEC, they still represent 60 years of production at the current rate, now involving more than 85 countries. Th most recent discoveries and reassessment could effectively raise proved world discoveries to slightly more than 140000 (10)9 (m)3 in 1992 (Survey of Energy Resources 1992: 67).

USES OF NATURAL GAS

When natural gas became available in larger portions of the US, as a consequence of construction of a pipeline network for distribution, it rapidly became the most desired energy source for heating residences, schools, stores, and indeed for all other heating requirements.

Advantages of natural gas:

Natural Gas enjoys several advantages that place it in a position as the premium fuel:

- During most of that period of price control, natural gas was the least expensive fuel as discussed above.
- Natural gas is the cleanest of fuels, producing only carbon dioxide and water upon combustion. Because the small molecule methane is its principal component, combustion is complete in essentially every type of burner, unless a serious defect exists in the burner. Hence, carbon monoxide or unburned hydrocarbons are not produced, as is common with combustion of gasoline, fuel oil, or other hydrocarbon fuels. Likewise, solid particles such as soot are not produced if the system is properly maintained.
- Because the fuel is in the end use of the fuel, even to the actual burner, without any handling required en-route. It is thus the most convenient of primary fuels for use.
- Natural gas is not toxic to the human body, and its use does not produce any compound, which is toxic. Because natural gas is essentially odorless, a small amount of a sulfur compound is added to make its presence known in case of a leak. This precaution is taken not because of any health hazard in the use of natural gas, but rather because of the potential for explosion and fire. (Wisker 2000: 98)

Statistics on the marketed consumption of natural gas are compiled in terms of the following end-use or user categories:

- Field uses of gas are composed of extraction losses (the reduction of natural gas volumes resulting from the extraction of hydrocarbon liquids such as propane and butane from the gas stream) plant and lease fuel (energy used in processing, conditioning, and compressing the gas in the producing area to make it suitable for pipeline transmission), and reinjection into the same or a nearby reservoir in order to assist or prolong production of crude oil.
- Transport use is mainly composed of fuel for gas-pipeline compressors, but also includes a small but increasing volume of compressed natural gas (CNG) and liquefied natural gas (LNG) used as fuel for motor vehicles and railway locomotives. Potentially, LNG might also serve as an aircraft turbine fuel, an application to which Russia has devoted some research. In 1992, however, natural gas accounted for only 2.7 percent of transport energy used in the United States.
- Residential use is consumption by private households for space heating, cooling, cooking, water heating, washing and drying, and other domestic purposes. Natural gas accounted directly for 26.3 percent of the total energy consumed in residential and commercial uses.
- Commercial use is gas consumption by businesses such as stores, offices, hotels, and restaurants in applications similar to residential uses. Institutions, such as schools, hospitals, prisons, and multifamily housing not billed individually, are usually, but not consistently, and classified as commercial gas consumers.
- Utility electric generation (UEG) is the use of gas as fuel to generate electricity in combustion turbines (CTs), stream generators, and combined-cycle (CC) plants owned by private authorities. In 1992, electric utilities in the United States got 9.5 percent of their primary energy from natural gas.

Industrial use is consumption by manufacturing establishments, mines, and the like as boiler fuel, i.e., generation of steam; other purely heating function such as melting, cooking, distillation or drying of materials; and process applications, including use as feedstocks for chemical manufacturing. The generation of electricity by business other than electric utilities, including cogeneration (the simultaneous or sequential use of heat fed to boilers or CTs for electrical generation and an additional industrial application) is usually classified as an industrial use. Natural gas accounted directly for 29.4 percent of U.S. industrial energy consumption in 1992. (Tussing and Tipper 1995: 20)

WORLD NATURAL GAS

Natural gas resources comprise about one-third of the world's conventional fossil fuels. Even more than coal, it is well suited for use in the country or region where it is produced. While it can be transmitted economically through overland pipelines, overseas export requires liquefaction (creating liquefied natural gas or LNG). This process is not only expensive; it requires special ships and creates new safety concern. LNG is so flammable and explosive that an accident can literally level a harbor area.

Yet natural gas is probably the most desirable fossil fuel. It is cleaner burning than oil or coal and has wide applications-from space heating to industrial heat to electric generation and is the lowest emitter of greenhouse CO2 when burned. It also can be used in the petrochemical industries for the creation of organic compounds, including fertilizers (Cassedy and Grossman 1998: 111). The world's natural gas resources are much smaller in terms of equivalent thermal energy value than coal. Still, at present rates of consumption, the remaining resources are likely to last well into the twenty-first century, but may start to become scarce later in the century.

Table 1.1

World Natural Gas resources (trillion of cubic feet)

	Reserves		Undiscovered	Total
	1978	1995	1988	1988
United States	211	166	364	530
Canada	95	97	399	496
Other western Hemisphere	121	260	367	627
Western Europe	140	205	193	398
Eastern Europe	---------	17	----------	----------
Iran	500	600	214	814
Other Middle East	198	755	911	1666
Africa	183	306	445	751
Asia/Pacific	123	276	361	637
USSR	875	1889	1582	3471
China	28	35	260	295
Total	2473	4606	5096	9685

Sources: Adapted from Petroleum Economist. 1979; IEA. 1991 and USEIA, 1995.

Natural gas is expected to gain more ground in the world energy balance. Rapid growth in natural gas demand is attributed to its advantage in promoting cleaner air, its abundant reserves, and the rapidly expanding infrastructure. Over the coming 20 years consumption is expected to rise by 69 percent from 78.8 trillion cubic feet (tcf) to reach 133.3 tcf in 2015. The share of natural gas in total energy consumption will rise from 23 to 25 percent. (Banbj 1992: 272)

The rapid expansion of the natural gas industry has been one of the most dramatic developments of the world energy market in the last 15 years. From less than 5% in the 1980s, the share of gas in the energy basket has risen to more than 23% now. There are a variety of reasons for this, the foremost being the environmental friendliness and price competitiveness of natural gas vis-a-vis crude oil and coal.

Forecasts reveal that there world be a shortfall of eight trillion cubic feet per year of gas by 2015 in the US alone. According to International energy Agency (IEA), production of natural gas will need to rise from 2.5 trillion cubic meters (tcm) a year in 2000 to 5.3 tcm/year in 2030 (Sharma 2005:1). This will mean adding a cumulative total of 9 tcm capacity over the period. Much of this will be needed to replace the existing and future wells that will be depleted during the next decades, and only a third will be for meeting the rising demand. IEA forecasts that a total investment of $3.1 trillion, of $105 billion a year, will be needed in the gas sector to achieve the additional capacity. Exploration and development spending will account for 55%, or $1.7 trillion. (Sharma 2005:1)

Total world natural gas reserves are estimated at 119340 milliard (m)3. More than two- thirds are concentrated in the Soviet Union and the Middle East. The Soviet Union has the world's largest natural gas reserves-estimated at around 43000 milliard (m)3 or 36% of the total- followed by Iran with 18000 milliard (m)3 or 15% of the total. Only four percent of reserves are located in the USA. More than a third of total reserves are located in just ten giant fields, six of which are in the Soviet Union and the remainder in Qatar, Iran, Algeria and the Netherlands. Natural gas reserves are abundant: as a result of increased exploration, estimates have doubled every ten years since the 1960s. The number of countries with known gas reserves is also increasing: from about 40 in 1960 to around 95 today. (Shell briefing Service Study 1991)

ENERGY SCENARIO IN SOUTH ASIA

South Asia is the one of the two most populated regions in the world. Its population will double between 1978 to 2020, that is it will increase from 850 million (20% of world population) to 650 million (21%). But this region will represent only 2% of world gross national product (GNP) over the whole forecasting period. Its GNP per capita will also remain the lowest in the world up to 2020 ($310-440), versus less than $ 180 in 1978 (Frisch 1983:27).

Major South Asian countries use a variety of energy sources, both commercial and non-commercial. Fuel wood, animal waste and agricultural residue are the traditional or 'non-commercial' sources of energy that continue to meet the bulk of the rural energy requirements in South Asia even today. However, the share of these fuels in the primary energy supply has declined. The 'commercial fuels' such as coal, lignite, petroleum products, natural gas and electricity are gradually replacing the traditional fuels. The south Asia region possesses vast stores of clean and renewable energy. A high rainfall and mountainous terrain in the Himalayan regions of India, Bhutan, Nepal and Pakistan and in the southwest part of Sri Lanka have provided these countries with excellent hydropower potentials. Economic and population growth in South Asia has resulted in rapid increases in energy demand. The region's energy demand as a percentage of the world's energy demand increased from 2.4% in 1987 to 4% in 1998. The US Energy Information Administration (EIA) estimated a 50% growth in the primary energy demand in the period 1990-98. (Ali 2005: 16). This figure however excludes the traditional energy form that account for more than half of the energy demand in the region.

These Countries have been importing a significant portion of their commercial energy requirements mainly the hydrocarbon. In fact the dependence on import has in most of the countries gone up. Petroleum related import still constitutes as high as 20 percent of India's and 19 percent of Pakistan's total imports. This has been a major reason for their adverse balance of payments. This is going to be more critical as the projected demand for petroleum products in India alone is likely to go up from 79 metric

tonnes in 1996-97 to 119 metric tonnes in 2001-02 and 197 metric tonnes in 2010-11. (TERI 1995: 2)

The South Asian region has one of the richest sources of hydel power in the world. It has been the most vital source of total installed capacity in Bhutan (100%), Nepal (90%) and Sri Lanka (69%). In some countries of South Asia, the composition of installed capacity has been changing. For example in India, hydro sources constituted as high as 43 percent of the total installed power capacity in 1970-71 which steadily went down to present level of 25 percent. This is despite the fact that the installed capacity of hydel power increased from a mere 575 MW in 1951 to almost 22,000 MW today. In Pakistan also the share of hydel power in the total installed capacity has gone down from 44 percent in 1980-81 to 30 percent in 1997-98. (Lama 1999: 2)

Natural gas is the most efficient and environmentally friendly non-renewable commercial energy resources. It can be used either as fuel or as raw material for various petro-chemical products including chemical fertilisers. The recoverable reserves of natural gas in Bangladesh (13.6TCF), India (707 BCM) and Pakistan (17.39TCF), if systematically harnessed, may change the entire energy map of South Asia (Lama 1999). In order to, gainfully exploit the natural gas reserves without disturbing the fabric of national sovereignty of the endowed member country; one has to take an integrated view of markets cutting across national boundaries.

Table 1.2

REGIONAL ENERGY OVERVIEW: (Figures in percentage)

	Pakistan	India	Bangladesh	Sri Lanka
Proven Oil Reserves	33.9	62.9	7.6	--
Oil Production	2.7	37.7	0.1	--
Oil Consumption	18.8	97.8	2.9	3.4
Net Oil Import	16.1	68.5	2.9	3.4
Crude Oil Refining Capacity	10.8	102.7	1.6	2.4
Natural gas reserves	461.8	533.3	247.9	--
Natural gas Production	17.5	17.6	7.5	--
Natural gas Consumption	17.5	17.6	7.5	--
Coal Reserves	1790.2	36832.8	--	--
Coal production	1.4	146.2	--	--
Coal Consumption	2.0	155.5	--	--
Coal Import	0.5	12.5	--	--
Thermal power Generation capacity (GW)	12	78	3.1	0.5
Thermal power Generation (B.KW-hr)	44	36.9	11.3	1.8
Hydro power Generation Capacity (GW)	5	24	0.2	1.1
Hydro power Generation (B.KW-hr)	18	96	0.8	4.2
Total Energy Consumption	43.5	312.5	11.0	4.9

Source: http://www.issi.org.pk/islamabad_papers_htm/no_21/islamabad_paper.htm, accessed on 26 May 2005. (Ali 2005: 47)

The per capita energy consumption in the region continues to be quite low and its persistent shortage has been a major factor in keeping the region at low growth equilibrium. The poor quality of energy infrastructure continues to be another major obstacle for the region's economic development. Equally critical has been the skewed distribution of the available energy both within a country and across the region. A significant portion of the society still does not have accessed the region. A Significant portion of the society still does not have access to modern sources of energy on grounds of both physical inaccessibility and affordability.

Though the South Asian countries particularly India and Pakistan, India and Bangladesh have been envisaging both on-shore (Iran-Pakistan, Turkemensitan-Pakistan) (Myanmar-Bangladesh-India) respectively, and off-shore (Quatar-Pakistan, Iran-India and Oman-India) pipelines, nothing concrete has emerged because of (i) the financial implications, (ii) geo-political considerations, (iii) confirmation of reserves of natural gas, (iv) pricing of supplied gas, (v) third country approval of transits and (vi)environmental fall outs.

ENERGY PROFILE IN BANGLADESH

Bangladesh is the eighth populous country in the world with the highest population density in the world. Bangladesh has not been blessed with abundant energy resource endowed country. The known energy resources of Bangladesh are natural gas, oil, coal, peat, hydropower, animal power and biomass fuels. Conventional, commercial sources of energy include fossil fuels (coal, oil and natural gas) as well as hydropower and nuclear power. Non-conventional, commercial sources of energy are generally thought of as new, commercial technologies based directly or indirectly on solar power. Bangladesh use very little energy from these sources. Seven tenths of its needs are met by traditional energy sources, and three tenths by commercial sources. Of the three tenths of Bangladesh energy derived from commercial sources, about 60 percent of that are Natural gas; the remainder oil and coal. Of the total natural gas use (about 1000 mmcfd or 67 kgoe/capita), more than one third is used as feedstock for fertilizer production and

nearly one half for electricity generation. (Jaccard, et al. 2001: 13)

Bangladesh has one of the lowest rates of per capita energy consumption in the world. As is evident from Table 1.3, the 1997 Bangladeshi per capita energy consumption (197kgoe) was less than the average per capita energy consumption of South Asia for the same period (443 kgoe), and far less than the averages for low income (563 kgoe) and lower middle income (1,178 kgoe) countries. It is also evident that during the 1990s, the energy consumption of Bangladesh grew at a slower pace (1-% per annum) than the South Asian average (1.9% per annum).

Table 1.3: **Comparison of Energy Use**

Economy	Commercial energy use					Net energy imports	
	Thousand metric tons of oil Equivalent		Per capita			% of commercial energy use	
			Kg of oil equivalent		Avg. annual % growth		
	1990	1997	1990	1997	1990-97	1990	1997
Bangladesh	20,936	24,327	190	197	1.0	10	10
Low income (average)	1,122,683	1,194,696	607	563	-1.2	-17	-9
Lower middle income (average)	2,426,917	2,384,856	1,302	1,178	-1.2	-18	-20
South Asia (average)	435,330	556,496	394	443	1.9	9	15
World	8,608,414	9,431,190	1,705	1,692	0.0	--	--

Source: World Bank, "World Development Report 2000/2001: Attacking Poverty," Selected World Development Indicators, Table 1.3, Energy Use and Emissions (New York: Oxford University Press,

2001), quoted in http://www.worldbank.org/poverty/wdrpoverty/report/index.html .

The share of traditional energy derived from crop residues such as scrub wood, rice stalks, rice husks and animal wastes is estimated to be about 70% of the total energy use in Bangladesh. These are mainly used for cooking and sometimes, for heating and drying of agriculture products in rural areas. The remainder 30% comes from commercial sources such as coal, oil and natural gas. Natural gas accounts for 70% of the commercial source and the balance coal and mostly imported oil. About one third of the natural gas used is in the form of feed stock in fertilizer production (67 KGOE/capita) which strictly sspeaking is not be confused as a energy source. About half is accounted for by electricity generation. And industrial and domestic cooking fuel account for the balance. Petroleum products mainly diesel and gasoline are imported for use in motorized vehicles; a small amount of kerosene is used as lighting fuel is rural areas where electricity is not available (Jaccard, et al. 2001: 13).

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ENERGY RESOURCES IN BANGLADESH

Oil:

A small deposit of oil has been discovered at Haripur (sylhet) with an estimated reserve of 1.6 million tonnes. The test well is producing at the rate of about 15000 tonnes of crude oil per year (300 barrels per day) in comparison with the total consumption of 1.7 million tonnes per year. Sudden rise in price of oil in the international market on one hand, causes severs strain on the national economy. On the other hand, it causes environmental degradation due to accelerated consumption of biomass fuel (to meet the unfulfilled demand of kerosene) beyond their sustainable limits. In order to reduce the adverse impact on national economy, the government policy has been to substitute indigenous natural gas for imported petroleum. As a result, the contribution of imported petroleum fuels to total primary commercial fuels decreased from 58.6 percent in 1973 to 34.5 percent in 1987. Correspondingly, the contribution of indigenous natural gas to total primary commercial fuels increased from 30.7 percent in 1973 to 61.4 percent in 1987

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(Islam 1994: 265). However, the environmental consequences of increase in price of petrileum fuels have remained unattended. Because of non-commercial nature of transactions of the bulk of biomass fuels, the problem of its scarce supply has not been considered an integral part of the energy development programs.

Coal:

In Bangladesh, coal deposits have been discovered in three locations; Jamalganj (Bogra), Barapukuria (Dinajpur) and Khalaspir (Rangpur). Extraction of Jamalganj coal has not yet been found to be economically viable. A feasibility study for the development of Barapukuria coal is continuing and there is possibility of undertaking a coal mine development project during the Fourth Five Year Plan along with the development of a coal fired power plant. Feasibility study for the development of Khalaspir coal is yet to be undertaken. Bangladesh being a late starter in the field of coal development has the good opportunity to learn from others mistakes about environmental consequences of development and use of coal. Development of coal deposits would help in solving the commercial energy problem in the western zone of the country.

At present, about 2,50,000 tonnes of coal is imported per year mainly for brick burning. Since 1988, the government has restricted the supply of natural gas to seasonal brick kilns. When there is scarcity of foreign currency to implement development programs, it is not logical to restrict the use of indigenous natural gas for brick burning at the cost of imported coal. Considering the negative impact of fuel wood use on brick burning, the government has banned the use of fuel wood for brick burning from July 1989 (Islam 1994: 266). In order to support sustainable supply of fuel wood, the government should allow the use of natural gas for brick burning (it will save some imported coal) and should encourage further use of coal in fuel wood consuming industries and in domestic cooking.

Peat:

Total peat deposit in Bangladesh has been reported as 600 million tonnes. Of which 125 million tonnes are located in Faridpur and Khulna districts. In some rural areas, locally extracted peat is used for domestic cooking.

Hydropower:

Total hydropower resources of Bangladesh are limited to around 1,500 GWh per annum. So far, about 1000 GWh potential have been utilized at Kaptai. There is prospect of developing 300 GWh and 200 GWh at Sangu and Matamuhari. Environmental impact on local population should be given due consideration in undertaking any hydropower development project in Bangladesh.

Biomass Fuels:

Land based biomass fuels obtained from trees, field crops and livestock play an important role in meeting the total energy demand. In Bangladesh, due to scarcity of fuel wood, agricultural residues and animal dung supply high proportion (70 to 80 per cent) of biomass fuels. Moreover, at present all the three types of biomass fuels are consumed beyond sustainable limits causing adverse effect on the productive environment.

Commercial Energy:

Natural gas is given the most importance of all the commercial energy resources in Bangladesh. In the last two decades this sector has expanded significantly. The total reserves (proven and probable) of natural gas in the country is estimated at 23.099 trillion cubic feet of which 13.790 trillion cubic feet is feasible to extract. However, there is a debate about the gas reserves. The foreign companies apprehend that the gas reserves are much higher than the estimate given by the government.

Natural gas is used for production electricity and fertilizer, running other industries and cooking. Its demand is increasing rapidly. By the financial year 2002-2003 the demand is estimated to rise at 423 billion cubic feet. The rapid rise in the demand for natural gas signifies its crucial role in the energy sector and also in the economic development of the country. Presently, 90% of the total electricity id produced from the low cost natural gas. Besides, it is important in the production of chemical fertilizer.

Natural gas

Natural gas today is recognized as an important indigenous hydrocarbon resource in Bangladesh. For Bangladesh, natural gas has played a pivotal role in the country's economic development. There is no doubt whatever that without an ever-increasing supply of natural gas from the very beginning, both the fertilizer industry and the power sector (apart from other minor sectors) would have never reached the level of growth they have achieved today. The total recoverable reserve of natural gas from 20 gas fields has been reported as 13.74 trillion cubic feet (TCF), out of which 2.86 TCF has been extracted up to December 1996. The net recoverable reserve for the future use was estimated to be 10.88 TCF in January 1997. Based on Petrobangla's own statistics, Bangladesh has already discovered about 21 TCF of natural gas, of which roughly 12.6 TCF can be produced, and used for the country's benefit. So far, Bangladesh has consumed roughly 3 TCF of this amount leaving about 10 TCF. (Jaccard, et al.2001: 15)

Table 1.4

BANGLADESH'S PRIMARY ENERGY CONSUMPTION

Energy source	1987		1990		1993		Growth Per annum
	'000 TOE	%	'000 TOE	%	'000 TOE	%	1987-1993
Oil	1672	2.8	1925	8.4	1927	27.3	2.4
Coal	162	.2	388	.7	39	0.5	-21.1
Gas	3095	0.7	4176	1.6	4904	69.4	8
Hydel power	168	.3	288	.3	198	2.8	2.8
Total	5097	100	6777	100	7068	100	S5.6

Source: Electric Utilities Data Book for the Asian and pacific region, ADB, Manila, 1996, p.56

In Bangladesh, energy resources are neither adequate nor varied. Biomass, natural Gas, petroleum products and used to meet the demand of different end use sectors, such as, domestic, commercial, industrial, transport, agriculture and non-energy use. The basic principle of energy availability is to ensure the supply of appropriate sources of energy to meet the demand of different end-use sectors. In a particular situation if supply of energy is less than the demand an insecure situation arises. Energy insecurity may also occur due to lack or purchasing power of the people. An imbalance between supply and demand of energy may take place at different levels (household, individuals, community, district or division in region level such as eastern and western region across river Jamuna in Bangladesh). Nevertheless, energy insecurity is a multidimensional problem.

CHAPTER II

NATURAL GAS IN BANGLADESH: SUPPLY AND DEMAND

NATURAL GAS IN BANGLADESH: SUPPLY AND DEMAND

There was a question about long-term economic prospects and viability of Bangladesh when it gained its independence in 1971. With one of the lowest per capita incomes and one of the highest population densities in the world, the country appeared to have become permanently locked in poverty. At the turn of the new century, however, it has began a progression from its former status as poorest of the poor to lead performer among the least-developed countries, it began to appear that not all was lost in Bangladesh's developmental efforts, and that there was plausible reason for hope. Unfortunately, chronic energy shortages threaten to thwart the country's progress.

Bangladesh faced two-energy crises, one involving commercial and the other traditional fuels (agricultural waste, firewood and cow dung). Although it has one of the worlds lowest per capita energy consumption levels (100-130 kg. Of oil equivalent, of which over two-thirds is traditional), its net oil imports of around 1.6 million tons in 1980-81 cost about US$460 million, using about 60% of its total foreign exchange earnings (UNDP/WB No.5230: 2). At the same time, the country's forest reserves are being rapidly depleted and the availability of other traditional fuels is declining. Fuel wood prices have increased dramatically over the last 10 years. If present trends continue, a fuel wood crisis in many areas is likely in the near future.

The country has no known oil reserves, no economically exploitable coal, and limited hydropower potential. However, it has substantial economically recoverable natural gas reserves (about 10 trillion cubic feet) which at present consumption levels would last for several decades. Although low energy consumption is, in itself, not a cause of poverty, multiple links exist between energy availability and consumption, poverty, and development. One indicator of a country's level of development is per capita energy consumption. For Bangladesh, that consumption has been recorded at approximately 197 kgoe (Kilograms of oil equivalent) in 1997. Additionally, there is a positive correlation between per capita energy consumption and per capita gross national product (GNP): countries having higher per capita GNP also have higher per capita energy. Examined

from the perspective of energy use, Bangladesh is one of the least developed countries of the world. Worse still is that there are no firm statistics available to illustrate the country's demand, supply, and capability of power and gas generation.

In the past, energy development programmes in Bangladesh suffered from a lack of long-term planning. Foreign investors and political party agendas influenced decisions made about energy sector projects, in particular. There are substantial losses in the conversion, transmission and distribution of power as well as frequent and costly power outages; the security of supply of natural gas is inadequate; production from oil refinery does not match domestic demand, and there is considerable scope for improving industrial energy efficiency. In some cases, projects have remained heavily underutilized due to lack of implementation schedule synchronization, with the result that the nation entered into a state of energy crisis. All developmental activities of the west zone (across the river Jamuna) have been severely affected due to serious shortages in the supply of primary (gas and coal, for example) and secondary (electricity) energy resources. The great majority of rural people have not been supplied with modern sources of energy such as electricity, gas, and petroleum products. Even worse, for the Chittagong Hill Tract area, habitation has become untenable due to the kaptai hydropower plant, which has resulted in the submersion of 40 percent of the area's arable land. More people will be made landless if an addition in hydro-generation capacity is planned at this site. (Samrina, ACDIS occasional paper: 1)

Therefore, there is a great necessity to implement optimum usage of the available energy sources to ensure energy security for sustainable human development, particularly in the case of natural gas reserves, which are the only significant commercial energy sources for the country.

NATURAL GAS IN BANGLADESH

Bangladesh is situated at the confluence of three major rivers- the Padma, the Jamuna, and the Meghna- that form one of the largest deltas in the world. The ongoing pressure of the Indian subcontinent plate against the Asian landmass over the millennia has created a north-south sedimentary fold-belt running the length of the eastern half of the country. This is a prime location for hydrocarbon resources.

Hydrocarbon exploration activity in this area has been ongoing since the beginning of the twentieth century has led to the drilling of sixty-four wells and discovery of twenty-two gas fields and one oil field. For Bangladesh, natural gas has played a pivotal role in the country's economic development. Natural gas is a more versatile product than oil. Apart from being used as a source of energy, it can be used very profitably as feedstock, as in case of fertilizer (Ahmed 2001: 144). Its most profitable use is in petrochemicals. The composition of natural gas is important here. For example, the natural gas found in Bangladesh is very pure in quality, but being more than 98 percent Methane, it is not suitable for petrochemicals. Both gas and oil are non-renewable natural resources so that its optimal exploitation poses a challenge for any country having this finite resource.

There is no doubt whatever that without an ever-increasing supply of natural gas from the very beginning, both the fertilizer industry and the power sector (apart from other minor sectors) would have never reached the level of growth they have achieved today. Natural gas has basically two values:

Its export values i.e. the return to the country from its sale to a third part (the importer); Its domestic value, which is more than its domestic price. The economic return to the country accruing from gas is linked to its uses as final output as well as an intermediate input to other industries and the benefits accruing from its end use (Ahmed 2001: 144). For example, the benefits from its use as feedstock for fertilizer are more

than from its use for, say, fuel in the tea industry or as cooking gas. Variable domestic pricing has its own logic in the sense that it aims to take the principle of greater common good into consideration.

GAS EXPLORATION IN BANGLADESH

Bangladesh has a long history of oil and gas exploration. The exploration for oil and gas in the areas what constitute now Bangladesh was initiated by finding oil in 1908 and the first exploratory well was drilled at Sitakundu. This was followed by three more exploratory wells by 1914. The exploration activities since 1908 can be broadly divided into five distinct phases as listed in Table

Table 2.1

Gas exploration in Bangladesh

Phase	Period	Number of Exploratory wells	Discovery
I	1908-33 British India	6	None Minor oil field
II	1951-71 Pakistan	22	8 Gas field
III	1972-78	9	2 Gas field (one offshore)
IV	1979-92	16	7 Gas field, 1 oil field
V	1993-2000	13	5 Gas field (one offshore)

Source: CPD Occasional Paper series, No.17. Quoted in http://www.cpd-bangladesh.org

After the emergence of Bangladesh the exploration by International Oil Company (IOCs) under production sharing contract was initiated. The country was divided into 23 blocks for PSC. Six IOCs were awarded 7 blocks under PSC in the early seventies. During the period of 1974-77, seven offshore exploratory wells were drilled with only one gas field discovery. In 1988, under a new PSC, 4 blocks were awarded to two IOCs who drilled 4 exploratory wells leading to the discovery of one gas field. In the early nineties, the model PSC of 1988 was revised and 8 blocks have been awarded to four IOCs. Two of these IOCs have so far drilled 14 exploratory wells since 1994 resulting in the discovery of 3 gas fields including one offshore field; and there was one gas well blowout. (Quader and Gomes CPD No.17: 8). During the period 1972-2000, Petrobangla drilled 16 exploratory wells and discovered 9 gas fields and one oil field. Below Table lists the exploration activities since 1972.

Table 2.2

Exploration activities since 1972

Period	Number of Exploratory wells drilled	Discovery	Remarks
Petrobangla			
1972-1990	13	7 Gas field, 1 Oil field	
1991-2000	3	2 Gas field	
International Oil companies			
1974-78	7	1 Gas field	PSCs cancelled
1988-1991	4	1 Gasfield	PSCs cancelled
1994-2000	14	3 Gas field	

Source: CPD Occasional Paper series, No.17. Quoted in http://www.cpd-bangladesh.org

In terms of gas reserves, IOCs under a wide range of PSCs have made major gas discoveries in Bangladesh. These IOCs including those operating during pre-1972 era have discovered total recoverable gas reserves of 14.19 TCF from 12 fields while Petrobangla has discovered a total recoverable gas reserve of 1.47 TCF from 10 fields (Quader and Gomes CPD No.17: 8). Since the emergence of Bangladesh, the IOCs' exploration has contributed 4.46 TCF to recoverable gas reserves and Petrobangla's discoveries have contributed 1.24 TCF to recoverable gas reserves. The six plan periods consisting of five 5-year plans and one 2-year plan since 1974 envisaged over 40 exploratory wells to be drilled in the public sector; but in reality only 16 exploratory wells were drilled. Non-availability of funds was the main constraint in some plan periods. During 1990s the exploratory drilling programme did not gather the desired momentum in spite of the presence of IOCs. Only 13 exploratory wells were drilled which means about 1.3 wells per year. Since 1997 Bangladesh Petroleum Exploration Company (BAPEX), the Exploration Company of Petrobangla has not undertaken any exploratory drilling (Quader and Gomes CPD No.17: 8). Of late IOCs have also slowed down their exploration drilling programs.

PRODUCTION OF NATURAL GAS

The production of natural gas in Bangladesh commenced in 1961, when Chatak Field started production to supply Chatak Cement Factory. This was followed by similar gas production from Sylhet Field in 1962, supplying Fenchuganj Fertilizer Factory with natural gas. In 1968 Titas Field started production, supplying gas to the Siddhirganj Power Station. (Rahman et al: online web)During the period from 1961-70, only 67 BCF of gas were produced, but during the next ten years with an annual production increase of 18 per cent it reached a total of 279 BCF by 1980. This again increased to 1088 BCF in

the 1980s with an annual average growth of 14 per cent, and further to 2492 BCF by 1990 with an annual growth of 7 per cent. The total production of natural gas in Bangladesh during the last 40 years is 4.3 TCF by June 2001 (Rahman et al: online web).

The official information stated that during the 1950-70 only 63 BCF of gas was consumed. During the 70s and the 80s this increased 280 BCF and 1068 BCF, respectively. The gas consumption became about 2000 BCF in the 90s; fiscal year alone the total consumption was about 308 BCF. (Billah and Khan 2001: 2). The 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 as domestic fuel is increasing manifold.

Petrobangla, a fully state owned corporation and its subsidiary companies, such as BAPEX, BGFCL and Titas gas, are responsible for the exploration, production, transmission, distribution, and development of oil, gas, and other mineral resources of the country. Bangladesh Petrobangla Corporation (BPC), another State-owned corporation, is responsible for the import of crude oil and other petroleum products, refining, and marketing of liquid petroleum products, including Liquefied Petroleum Gas (LPG). Recently, some private companies have been allowed to import bottles and market LPG for domestic consumption in areas where pipeline gas is not available.

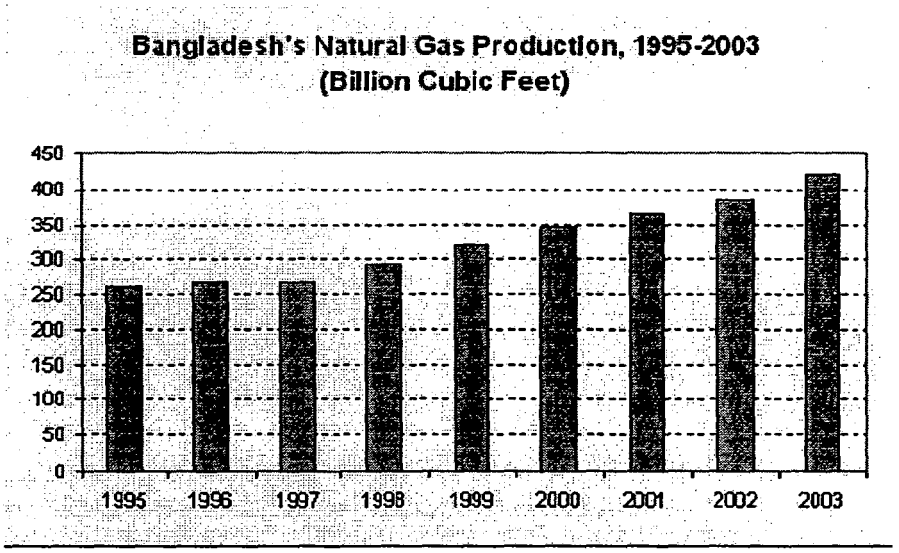
BAPEX, a subsidiary organization of Petrobangla, is involved with gas exploration, although its financial resources are limited. Private sector interest and foreign direct investment in the gas sector became dramatically visible in the 1990s. At that time, the government of Bangladesh divided the country twenty-three exploration blocks and offered them for private investment by IOCs under Product Sharing Contracts (PSCs). The following five companies are producing gas:

- Bangladesh Gas Fields Company Ltd. (BGFCL).
- Sylhet Gas Fields Ltd. (SGFL)

- Bangladesh Petroleum Exploration and Production Company Ltd. (BAPEX)
- Shell Bangladesh Exploration and Development B.V. (SHELL)
- UNOCAL Bangladesh Ltd. (UNOCAL)

Of these companies, the first three are state owned companies and the last two are IOCs involved in exploration and production of natural gas through PSCs with Petrobangla.

In the thirty-plus years since 1972, Bangladesh's natural gas industry has received government funding of approximately TK.60 billion. The bulk of funding has been allocated to transmission and distribution, with only 16 percent, or around Tk.9 billion (equivalent to about US$ 300 million), expended upon exploration and development. (Samrina, ACDIS Occasional paper: 7). The bulk of funding has been allocated to transmission and distribution, while the development and exploration activity are greatly underfunded for companies such as Petrobangla/BAPEX despite the discovery by Petrobangla of ten gas field and one oil field. But the reserves of these fields are much smaller than those discovered by the IOCs. No discoveries took place after 1996 by Petrobangla. It is worth mentioning that the cessations of discoveries by Petrobangla coincide with cessation of exploration funding by the government to Petrobangla, which to some extent shows that available local expertise is not being used.



Source: Bangladesh Country Analysis Brief August 2005 – http://www.eia.doe.govt.

ESTIMATED GAS RESERVES

The total GIIP and initial recoverable reserves of Bangladesh are 24.745 TCF and 15.51 TCF respectively. Out of this reserve, 4.07 TCF has been produced already (up to February 2001), and the remaining reserve is 11.42 TCF. (Hossain 2005: 61). Assessing the gas reserves is the highly complicated exercise, Bangladesh is not an exception. Gas export decision is mainly interrelated to the Gas reserves, which is varied from Petrobangla (government owned company) to others. Various studies have been conducted regarding gas reserves with differing results. These are:

Petrobangla Study

Petrobangla engages consultants from time to time to perform specific jobs and to undertake studies on their behalf for the development of different gas fields. On the exploration and production side, Petrobangla usually engages consultants to conduct and interpret seismic surveys, perform drilling, completion, work over, pressure survey,

reserve estimation, etc. Some of these consulting firms carried out studies to estimate and update the gas in place and reserves on behalf of Petrobangla. Welldrill (UK) Ltd., Hydrocarbon Habitat Study, IKM Study, and BCIF study conducted some of the important ones. Based on the findings of these studies, Reservoir Study Cell of Petrobangla has estimated/updated the gas initially in place (GIIP) and reserve of different gas fields. It shows that the total GIIP and initial recoverable reserve of Bangladesh are 24.745 TCF and 15.51 TCF, respectively. Out of this reserve, 4.07 TCF has been produced already (up to February 2001), and the remaining reserve is 11.42 TCF. (Petrobangla study online web)

BUET Study

Petroleum and Mineral Resources Engineering Department (PMRE) of Bangladesh University of Engineering and Technology (BUET) has conducted a gas in place estimation study. In this study gas in place values of all the fields under Petrobangla have been estimated using flowing material balance and volumetric estimation methods. Since sufficient pressure survey data are not available for most of the fields operated by Petrobangla, flowing well material balance method in which flowing well pressure data instead of the static reservoir pressure data have been used in this study. The results have been compared with those of Petrobangla. The comparison shows that for a number of reservoirs estimation of this study is significantly higher than, those of Petrobangla study. Data from these recent development wells such as Titas field have shown that some of the reservoirs are much larger than expected. If all the gas fields are systematically developed, it is highly likely that the natural gas reserve of the country would increase from the present value. Summary of BUET Study provided that the GIIP of the material balance and volumetric study are 28.49 TCF and 24.401 TCF, respectively. (Petrobangla study online web) The difference may be due to under estimation of the reservoir bulk volume or presence of water drive.

Study by Shell

In 1998, Shell Bangladesh Exploration and Development B.V. carried out a study on the gas reserve base in all regions of Bangladesh. In this study five categories of resource base have been considered. These are, cumulative production; mature reserves (discovered and developed); immature reserves (discovered but not developed); identified potential; and unidentified potential. In this study, each prospect/field has been assigned a probabilistic volume range based on uncertainties in the input parameters. The risked volume is an assessment of the expected success volume, which is likely to be obtained from the undiscovered potential of a basin.

This study by Shell estimated the total resource base of the country as 38 TCF. This includes the total reserves of the discovered fields and undiscovered resource potential based on geological evaluation and exploration history of the country. Later in a presentation and in the light of the USGS-Petrobangla study Shell estimated the total resource base between 43 to 64 TCF, in which existing reserve 18.0 TCF, field growth 5-6 TCF, and the undiscovered resource potential 20-40 TCF. (Quader and Gomes CPD No.17: 13).

UNOCAL Study

Unocal Bangladesh Ltd. conducted a study on *Hydrocarbon Resource Base of Bangladesh.* This study has estimated the existing recoverable reserve, field growth potential and further resource potential of six blocks. In this study existing reserve has been taken as 16.1 TCF including Bibiyana but excepting Moulavibazar. The second category of their reserve is the field growth, which includes additional probable reserve as a result of new technology and enhanced recovery technique applied to the existing fields. The field growth components considered in the study are:

3-D Seismic surveys, 2) Petrophysical thin bed analysis, 3) Compression, and 4) Reservoir management. This study estimated a probable reserve addition of 12.8 TCF of field growth (1.6 TCF from reservoir management, 3.2 TCF from 3-D seismic, 4.8 TCF from thin bed and 3.2 TCF from compression) from existing fields (Petrobangla study online web). The third category that the study considered is the potential of new field discovery.

The study considered 30 selected prospects from 6 PSC blocks of the country and estimated a mean probability of finding new discoveries to be 13.2 TCF (5.3 TCF for P90 and 22.6 TCF for P10). In the light of the USGS-Petrobangla study Unocal concluded the total hydrocarbon resource base of the country as 61 TCF, in which discovered reserve 16.1 TCF, field growth potential 12.8 TCF and undiscovered resource potential 32.1 TCF.

USGS- Petrobangla Joint Study on Natural Gas Resources of Bangladesh

A joint team of the *United States Geological Survey (USGS)* and Petrobangla conducted a study on natural gas resource assessment of Bangladesh. This study, which was funded by the U.S. Agency for International Development (USAID), estimated the natural gas resource potential of the undiscovered gas fields of Bangladesh. The assessment team consisted of six geologists from the USGS's World Energy Resources Assessment Team and seven geologists, geophysicists, geochemists, and petroleum engineer from Petrobangla constituted it. The objective of the study was to assess the technically recoverable undiscovered gas resource potential of Bangladesh that might be found in a 30-year period (2000-2030) through a properly conducted exploration program.

The study divided the country into six AUs (Assessment Unit) based on their geological attributes. These are Bang0101-Surma Basin Assessment Unit; Bang0102-Easternmost Extremely Folded Assessment Unit; Bang0103-High Amplitude Faulted

Anticlines Assessment Unit; Bang0104- Moderately Folded Anticlines Assessment Unit; Bang0105-Western Slope Assessment Unit; and Bang0106-Western Platform Assessment Unit. (Ahmed 2001:144).

The assessment units result for the onshore region, offshore region, and the grand total for all of Bangladesh, is a natural gas resource potential of 8.43 TCF with 95% probability, 65.7 TCF with 5% probability, with a mean potential of 32.12 TCF. The onshore area is more promising and has a potential of finding natural gas of 5.99 TCF with a 95% probability and of 48.33 TCF with 5% probability with a mean potential of 23.34TCF. The offshore has a potential of 2.44 TCF with a 95% probability and 17.37 TCF with 5% probability with a mean potential of 8.05 TCF. (Ahmed 2001:141). The resource number's calculations indicate the range of probable resources that may be discovered if Bangladesh were actively explored during a 30-year time frame. In places, where detailed geologic information is lacking in Bangladesh, the assessment team used geological play types that occur in similar geological provinces elsewhere in the world. In addition to the fairly well understood structural anticlines, which have thus far constituted the main play in Bangladesh, the assessment team recognised the potential offered by stratigraphic traps, plays at depth within the high-pressure zone and other possible plays. The study also considered the possible technological advances in the fields of exploration and production that may occur within the next 30-year time frame.

Hydrocarbon Unit and Norwegian Petroleum Directorate Joint Study

A joint team of Hydrocarbon Unit (HCU) of Energy and Mineral Resources Division and Norwegian Petroleum Directorate (NPD) conducted the latest study to estimate the reserve of the discovered fields and undiscovered resource potential of the country. Experts of NPD on Norwegian side and those of Petrobangla, BAPEX, BGFCL, SGFL, and GSB conducted this joint study on HCU side. This study re-estimated the reserve of four major gas fields, namely- Titas, Habiganj, Rashidpur and Kailashtilla, by material balance and volumetric methods utilizing latest available data and reviewed the

gas reserves of other discovered fields. For estimation of the resource potential, this study divided the country into two petroleum provinces comprising of six petroleum systems. This study identified the prospects, leads, plays, and selected reservoir parameters utilising latest information and available geological, exploration, reservoir and production data. This study estimated the proven and probable gas initially in place (GIIP) of the discovered fields as 28.79 TCF and recoverable reserve as 20.44 TCF. Based on recent information, this study showed an increase in GIIP in Titas and Habiganj fields and a decrease in GIIP in Kailashtilla and Rashidpur fields. The study contended that using modern technologies and good reservoir management practices, it is possible to achieve a recovery factor of 70-75% in different gas fields compared to 52-70% used by Petrobangla. The study estimated the undiscovered resource potential of the country between 18.5TCF (90% probability) and 63.7 TCF (10%) with a mean of 41.6 TCF. (Ahmed 2001:15).

Below table summarizes the GIIP, reserve, field growth, and resources potential of various studies conducted so far. It should be observed that the scope as well as the result of various studies is quite different.

Table 2.3

Summary of GIIP, Reserve and Resource Potential of Different Studies

Name of the study	GIIP (TCF)	Reserve (TCF)	Field Growth (TCF)	Resource Potential (TCF)
IKMa	15.65	9.04	--	--
Petrobangla	24.4	15.51	--	--
BUETb	--	--	--	--
Shell	--	18	5-6	20-40
Unocal	--	16.1	12.8c	13.2d (50%)
Petrobangla-USGS	--	--	--	32.1 (50%)
HCU-NPD	28.79e	20.44	2.03f	41.6 (50%)

Source: Petrobangla & Bangladesh Economic Survey, 2000.

Table 2.4

Gas fields and gas reserves (Billion cft) in Bangladesh

Gas field	Year of discovery	Company	Reserves (proven probable)	Reserves (recoverable)	Cumulative production (up to Dec.98)	Balance reserve (Dec.98)
Under production						
Bakharabad	1969	Shell oil	1432	867	573.973	293.027
Habiganj	1963	Shell oil	3669	1895	751.595	1143.405
Jalalabad	1989	Semitar	1500	900	21.659	878.341
Kailashtila	1962	Shell oil	3657	2529	199.111	2329.889
Maghna	1990	Petrobangla	159	104	16.942	87.058
Narsigndi	1990	Petrobangla	94	126	23.753	102.247
Rashidpur	1960	Shell oil	2242	1309	165.343	1143.657
Sylhet	1955	Barma oil	444	266	164.270	101.730
Sangu*	1996	Cairn Energy	1031	848	49.801	789.199
Salda Nadi	1996	BAPEX	200	140	9.794	130.206
Titas	1962	Shell oil	4138	2100	1668.219	431.206
Biani Bazar	1981	Petrobangla	243	167	3.355	163.645
Not yet in Production						
Begumganj	1977	Petrobangla	25	15	---	15.000
Fenchuganj	1988	Petrobangla	350	210	---	210.000
Kutubadia*	1977	Union oil	780	468	---	468.000
Semutang	1969	OGDC	164	98	---	98.000
Shahbajpur	1995	BAPEX	514	333	---	333.000
Suspended						
Chhatak	1959	Barma oil	1900	1140	26.500	1113.5000
Kama	1982	Petrobangla	325	195	21.100	173.900
Feni	1981	Petrobangla	132	80	39.510	40.490
Total			23099	13790	3734.925	10055.75

*Offshore field

Source: Petrobangla & Bangladesh Economic Survey, 2000

The reserve estimation has to be updated regularly on the basis of new approaches and technologies involved in the process. Some of the technologies currently used in measuring the size and potential of the gas including 3-Dimentional seismic surveys, identification of 'thin bed pay Zones', gas compression and reservoir management. (Muni and Pant 2005). All these methods require investments and also continuous reassessment of recoverable reserves as well as ultimate potential. A great deal of debate and the resulting confusion about the dependable assessments of gas reserves has been generated due to the awareness or lack of it of these technologies and methods. While IOC's make their projections on the basis of these new techniques, the Bangladesh national assessments remain conservative and cautious as they are less convinced of the credibility of upgraded methodologies of estimation.

From this above all studies we could understand that the different studies giving the different result about the Gas reserves in Bangladesh. These varied estimation leads to difficulty to take the decision on gas export. Politics of the reserves will be discussed in the next chapter.

A HISTORY OF NATURAL GAS CONSUMPTION IN BANGLADESH

The production of natural gas began in 1960, after its initial discovery in 1957. At that time, the annual consumption of natural gas in the country was 1 Bcf, but this figure has risen so that natural gas is now the major fuel for power generation in the country. From only 67 Bcf in the first decade, the consumption of natural gas rose to 279 Bcf in the following decade and thereafter to 1067 Bcf during 1981-90. During the last decade (1991-2000), Bangladesh's natural gas consumption reached 2490 Bcf (Samrina ACDIS Occasional Paper 2004).

Until 1970, Bangladesh relied predominantly on oil for its energy needs. Beginning in the mid-1970s the country increasingly adapted to the use of gas. The increasingly high demand for natural gas during the 1980s. There are currently no exports or imports of natural gas, so the growth of domestic consumption tracks the growth of domestic production, demonstrating an overall growth rate of 7 percent per year over the last several decades. The initial level of consumption was so low that even with the rapid growth of demand; the total cumulative consumption of natural gas has only been 3.9 Tcf (trillion cubic feet).

In Bangladesh, natural gas played a vital role in the development of both the power and fertilizer sectors, which consume almost 80 percent of total gas production. In the last decade (1991-2000), gas consumption for power was 1103 Bcf, while the consumption for fertilizer production was 756 Bcf, out of a total consumption of 2490 Bcf. (Samrina ACDIS Occasional Paper 2004). Thus, the country's annual fertilizer production of more than two million tons, and annual power generation of 3500 MW (megawatts) would have been very difficult and expensive without natural gas. Other consumers for natural gas have been industry, commercial concerns and households (mainly for cooking).

During 2001-02, the average gas consumption of Bangladesh was 1054 million cubic feet per day (MMcfd). Belo table shows the sectoral distribution of daily average gas consumption of the country for the year 2001-02.

Table 2.5

Sectoral Breakdown of Average Gas Consumption of 2001-02

Sectors	Gas consumption in MMcfd (million cubic feet per day)
Power	475
Fertilizer	250
Domestic and commercial	130
Industry	129
Others plus loss	70
Total Daily average	1054

Source: Committee Report on Utilization of Natural Gas in Bangladesh, prepared for the Ministry of Energy and Mineral Resources, Government of Bangladesh, August 2002. Available from Government of Bangladesh, Energy and Mineral Resources Division, http://www.emrd-gob.org/

Table 2.6

Production and Consumption of Natural Gas in Bangladesh 1972-2000

Fiscal Year	Gas Production	Consumption by Sector							Total Consumption
		Power	Fertilizer	Industry	Domestic	Commercial	Tea Estates	B. Fields	
1972	11511	5480	4978	610	36	33	0	0	11137
1973	23578	7960	14075	1295	87	66	0	0	23483
1974	28291	10136	15558	2054	146	115	0	0	28009
1975	18900	8446	7109	2742	277	181	0	0	18755
1976	28821	8704	15787	3523	489	266	0	0	28769
1977	32240	10785	15919	4261	766	370	0	0	32101
1978	34294	13181	13958	5288	1116	548	0	0	34091
1979	39289	14806	15444	6336	1809	805	0	0	39200
1980	45658	15855	18587	6972	2685	1021	0	0	45050
1981	49946	18515	17609	7747	3589	1289	0	0	48749
1982	64847	22246	26112	8682	4546	1591	0	0	63177
1983	72159	27706	25240	9426	5611	1816	0	0	69799
1984	83292	30164	31834	10053	5918	1965	0	0	79934
1985	94592	38293	30962	8643	6275	2271	0	1481	87925
1986	105082	39778	35401	11747	6797	2456	304	2295	98778
1987	120858	51912	31618	13527	6841	2731	576	2612	109817
1988	147379	62072	50979	13775	7588	2930	641	2500	140485
1989	162044	66106	53407	13500	9261	3127	628	0	146029
1990	167657	75558	55909	13310	10172	3098	677	0	158724
1991	172708	82556	54173	12651	10529	2931	750	3	163593
1992	188362	88105	61642	12670	11646	2939	678	604	178284
1993	210885	93212	69202	14228	13496	2395	660	740	193933
1994	223765	97491	74435	17975	15628	2710	689	1043	209971
1995	247191	107453	80456	22532	18918	2877	621	1139	233996
1996	265664	110976	90978	25583	20709	2996	727	994	252954
1997	260916	10864	77848	28827	22770	3287	712	91	244399
1998	281946	123451	80002	32475	25201	3462	743	30	265364
1999	307881	140837	82730	35779	27183	3652	710	347	291238
2000	331247	148865	84900	41978	28945	3827	671	347	309533

Note: Gas in Million Cubic Feet (MMCF)

Source: Government of Bangladesh, *Committee Report on Utilization of Natural Gas in Bangladesh*, (Dhaka: Ministry of Energy and Mineral Resources, August 2002) as in http://www.emrd-gob.org/

GAS CONSUMPTION BY VARIOUS SECTORS

The current utilization pattern shows that the ammonia-urea fertilizer sector consumes approximately 35%, power 45% and other sectors (industry, domestic, commercial and seasonal) 20% of the gas consumption. (Jaccard et al. 2001: 30) Here the utilization of gas in the future by these sectors is to be examining one by one.

Fertilizer Sector

The growth of the ammonia-urea fertilizer sector in the future will be limited. A 500,000-ton/year capacity urea plant to be located at Fenchugonj to replace the existing 39-year-old NGFF is a likely possibility by 2005. (Petrobangla survey online web). It would mean an additional demand of about 25 MMSCFD gas if NGFF is shut down.

Nitrogen and phosphate are the main chemical fertilizers exported from the country. While animal /vegetable fertilizers, nitrogen, phosphate and potasseo are basic imports. During 1991-2000 gas consumption for fertilizer sector was 756 BCF out of total 2490 BCF. The natural gas for fertilizer production is being supplied at a price cheaper than its economic price. (Ministry of Energy 2002 online web) The revised NEP of 2004 suggested to limit the production of natural gas based fertilizer to meet domestic demand only.

By 2005, another 500,000-ton per/year urea complex is likely to be built on the western bank of the river Jamuna. This will create an additional demand of 40 MMSCFD gas. With these two plants on-stream the country in 2010 will have a total urea

production capacity close to 4 million ton per year including KAFCO against the current urea consumption of about 2.2 million-ton per year.

If the two proposed 800 ton/day DAP plants to be built nearby CUFL come on-stream by 2005, these would further augment urea availability by about 200,000 ton/year. (Gain 2002: 176). However, these two plants would create a demand for gas of 1.65 MMSCFD for steam and power generation. If the 500,000-ton/year ammonia-urea complex at Fenchugonj and two DAP plants come on-stream by 2005, the gas demand would be increased by about 27 MMSCFD. (Gain 2002: 176).

It is evident that demand or consumption of gas by this sector does not increase without the commissioning of new plants. For example, since 1994 (after the commissioning of JFCL) the connected load for this sector has remained stagnant at 289 MMSCFD. (Gain 2002: 168).

Table 2.7

Consumption of Gas by Fertilizer Sector during 1991-2000

(Served by 3 Gas Companies)

YEAR	Gas Consumption Served by Companies, MMCM		
	TGTDCL	BGSL	
1990-91	904	454	
1991-92	1074	507	
1992-93	1341	461	
1993-94	1451	491	
1994-95	1370	745	
1995-96	1515	904	157
1996-97	1331	703	170
1997-98	1300	809	157

1998-99	1257	919	167
1999-2000			166

Source:http://www.nbr.org/regional_studies/Bangladesh/bangladesh_initial-study_VIII.html.

Power Sector:

The current development in the power sector suggests that Power Development Board (PDB) on its own will not build new power plants after the on-going plants, namely, 210 MW gas based Siddirgonj plant and 300 MW coal based Barapukuria plant. (CPD No.24 2000: 154). It is likely that PDB will not build any more power plants beyond 2005.

Independent Power Producers (IPPs) are replacing PDB's role as a power plant builder. The much talked about WRIP has been shelved. IPPs have planned to produce 1260 Mega Whatt (MW) power by 2005 (Meghnaghat-1 and 2 of 450 MW each and Haripur 360 MW); and would require about 150 MMSCFD gas at the peak and 120 MMSCFD on the average. (CPD No.24, 2000).

By 2005, if things proceed as planned; the gas based generation capacity would be increased by 1400 MW (PDB: 210 MW and IPPs: 1260 MW). 1700 MW would augment the total generation capacity if the Barapukuria plant comes on stream. (Petrobangla study online web) This will certainly improve the availability of power. Moreover, the installation of the captive and stand-by gas engine generators by the industries will further improve the power supply and its reliability.

It is evident that the demand or consumption of gas in the power sector does not also increase without the commissioning of new plants. During the plan period 1995-2000, the additional gas fuelled power generation capacity added was 580 MW against the envisaged projection of about 1800 MW. (Petrobangla study online web). In the

1990's the gas based generation capacity added was 1090 MW in spite of the participation by IPPs and Rural Power Company (RPC).

Table 2.8

Consumption of Gas by Power Sector during 1991-2000

(Served by 3 Gas Companies)

Year	Gas Consumption Served by Companies, MMCM		
	TGTDCL	BGSL	JGTDCL
1990-91	2026	240	
1991-92	2220	220	
1992-93	2361	152	
1993-94	2125	479	
1994-95	2222	544	
1995-96	2367	450	321
1996-97	2507	242	390
1997-98	2500	550	445
1998-99	2916	720	353
1999-2000			289

Source:http://www.nbr.org/regional_studies/Bangladesh/bangladesh_initial-study_VIII.html

Domestic Sector (Cooking Fuel)

The consumption of gas in the domestic sector as a cooking fuel will continue to rise. Basically domestic gas supplies are made through pipelines. However, the four transmission and distribution companies including the newly formed company the Pashchimanchal Gas Company Ltd. (WES GAS) would be able to provide gas connection to about 70,000-75,000 households per year provided the funds for the expansion of pipeline network are available. This additional connection means additional gas demand of about 6.4 MMSCFD based on daily consumption of 82 SCF per connection. (CPD No.24 2000: 153). This will give rise to an annual increase of gas consumption by this sector by 2.33 BCF. The trend is not going to change overnight just because the gas is available on the western bank of the river Jamuna. When the demand of the larger metropolitan areas like Dhaka and Chittagong will be fully served the sector will find the growth diminishing. The current growth has little bearing on the growth of economy or GDP. Because having a gas connection is an option for replacing the existing fuel type in use leading to convenience and comfort of cooking.

Industry Sector

The consumption of gas in the industry sector will continue to rise in the franchise areas of TGTDCL. The franchise areas under WES GAS will show some initial growth like that shown by BGSL and JGTDCL. Adding the system loss of 55 MMSCFD to this sector is a distortion. This has not led to additional sale revenue not to speak of proportional increase. The consumption in the franchise areas served by BGSL and JGTDCL has remained static during the decade 1991-2000. No growth is noticeable; probably the potential industries were served as soon as the gas had become available.

Commercial Sector and Seasonal Users

In 1998, the commercial sector used about 1.62% of the total gas consumption. (CPD No.24 2000:153). The growth of this sector will remain slow. Similarly, the growths for the seasonal users will also remain slow. Then, at the prevailing extremely low average consumption level, there is glaring disparity in Bangladesh in access to energy. Piped natural gas and electricity are accessible only to four per cent and 20 per cent of the country's total households respectively; moreover, most of these households are located in urban areas. The disparity is thus both between rich and poor and between urban and rural population. Almost four/fifths of the total population of Bangladesh are rural and a substantial proportion of the urban population is slum dwellers. Poverty is pervasive in both rural and urban areas. In the urban areas, the disparity is much more visible.

GAS DEMAND IN BANGLADESH

The use of natural gas in different sectors of Bangladesh can be broadly divided into following categories: power, fertilizer, industrial, commercial, domestic and seasonal (e.g. brickfield. The consumption pattern during the past decade shows that power sector consumes approximately 45 per cent, fertilizer 35 per cent, and the others 20 per cent. In domestic fuel use, only 4 per cent people have access to the piped gas. Most people still depend on other traditional fuel sources, like wood and kerosene, which have an adverse effect on the environment. The demand for gas is rapidly rising in the country as it moves towards industrialization.

Since the creation of Bangladesh, there have been several projections of natural gas demand. These are reported in the planning documents of various plans (five 5 year plans and one 2 year plan), ADB studies, Task Force Report, National Energy Policy Report and Petrobangla's Own reports/studies (Hossain 2005: 62). These documents have envisaged considerable annual growth of the power and fertilizer sectors. 7-10% increase in gas demand for fertilizer yearly, 10-13% growth of natural gas fuelled power

generation yearly, industrial growth in excess of 7% requiring 7% rise in gas demand yearly, growth of gas demand to exceed the growth in GDP. Newspapers predict approximately 10% annual growth of gas demand in Bangladesh. (Hossain 2005: 62). Forecasts of future natural gas use vary widely, depending on the assumptions made key among these assumptions are:

- The rate of growth of electricity production
- The rate of extension of the natural gas transmission and distribution network
- The price of natural gas for domestic consumers
- Industrial demands for natural gas
- Continued support for compressed natural gas for vehicles
- Decision on natural gas exports, and
- Encouragement of domestic uses of natural gas, especially for cooking.

Some analysts have pointed out that a continued domestic growth rate of even 10 percent will be difficult to achieve because of the slow pace of investment in sectors that use gas. With a careful analysis of electricity, fertilizer, other industry uses, commercial and household uses, Quadar (1999) projects that Bangladesh demand for natural gas will increase by about 50 per cent by the year2010 from 1999 levels. (Jaccaed et al. 2001: 30)

In contrast, the 5th five-year plan calls for average demand to reach Quader's 2010 projection by 2002. Clearly, the growth rate of natural gas use will depend on the success of several related policies, among them market reform in the natural gas sector, market reform in the electric sector, industrial policy, and policies to encourage foreign investment in serving domestic gas and electric markets.

Table 2.9

Forecast of Natural Gas Consumption, by Abdul Quader

Units=MMCFD

Sector	1999	2005	2010
Peak demand			
Power	430	580	655
Fertilizer (urea)	289	339	339
Industrial and Commercial	124	190	250
Domestic	75	100	125
Total	918	1209	1369
Average Demand			
Power	330	450	515
Fertilizer (urea)	250	290	290
Industrial and Commercial	100	155	200
Domestic	55	72	90
Total	735	967	1095

Source: A.K.M.A Quader (1999). (Jaccaed et al. 2001: 30)

DEMAND-SUPPLY SCENARIOS

The demand-supply issue lies at the heat of the complex situation that has emerged since the adoption of a new gas policy in 1993. It started with the award of the Jalalabad field to Occidental and the offshore Sangu field to Cairn PLC Ltd. Arguments in favour of this policy were basically two fold: firstly, supply would fall critically short of demand, thus necessitating rapid expansion of gas exploration activities, requiring considerable investments; and secondly, it was of vital importance for the country to have an accurate and dependable information about its gas reserves. (Ahmed 2001: 150).

A number of demand scenarios, based on different demand projections for the two major consumers, power and fertilizer, are available. Other yardsticks, of a more indirect nature, which may be less accurate guides for arriving at a workable figure for demand are also available. All demand and supply estimates are based on certain assumption and are likely to be inaccurate if any of the components or variables constituting demand or supply doesn't perform as expected. This proposition also holds true for the projections that have been made with regard to Bangladesh's gas sector. A comparison of two approaches will prove the point. Petrobangla experts made projections of gas demand and supply (including peak) up to the year 2005 and arrived at a surplus/deficit figure. An examination of the following tables and their juxtaposition against projections by another expert's assessment will be quite revealing in showing how vastly conflicting these projections can be.

Table 2.10

Daily Average Gas Demand by Sector (MMCFD)

Sector	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05
Power	400	452	493	522	556	578
Fertilizer	260	260	287	353	392	471
Non-Bulk	248	272	304	325	344	365
Others*	40	40	40	40	40	40
Total	948	1124	1124	1240	1332	1454

*Others mean system loss and own use.

Source: Petrobangla, as in *Changes and Challenges: A Review of Bangladesh's Development 2000*, (Dhaka: University Press Limited, 2001), p 151.

Table 2.11

Daily Maximum Gas Demand by Sector (MMCFD)

Sector	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05
Power	488	534	590	634	687	706
Fertilizer	287	287	317	390	433	521
Non-Bulk	97	326	360	387	411	436
Others*	40	40	40	40	40	40
Total	1112	1187	1307	1451	1571	1703

* Others mean system loss and own use.

Source: Petrobangla, as in *Changes and Challenges: A Review of Bangladesh's Development 2000*, (Dhaka: University Press Limited, 2001), p 151.

Table 2.12

Demand – Supply Balance 2000 – 2005 (MMCFD)

	2000	2001	2002	2003	2004	2005
Average System Demand	948	1024	1124	1240	1332	1454
Maximum Demand	1112	1187	1307	1451	1571	1703
Standby Capacity	225	235	260	290	315	340
Maximum Demand + Supply	1337	1422	1567	1741	1886	2043
Production	1311	1303	1296	1296	1284	1284
Balance with Standby	- 26	- 119	- 271	- 445	- 602	- 759
Balance without Standby	+ 199	+ 116	- 11	- 155	- 287	- 419

Note: MMCFD=Million Metric Feet per Day

Source: Petrobangla, as in *Changes and Challenges: A Review of Bangladesh's Development 2000*, (Dhaka: University Press Limited, 2001), p 151.

The table shows a deficit balance from the year 1999 allowing for the standby factor and a deficit balance even without the standby factor from the year 2001 onward. (Ahmed 2001: 151). It appears that this projection (keeping a supply of 230 MMCFD from ex-Sangu and Jalalabad unchanged), points to a growing deficit for two reasons:

first, the steady decline in Petrobangla production and secondly, the increasing demand, leading to a substantial deficit of minus 418 MMCFD of average demand and minus 759 MMCFD with the standby.

Under this supply option the policy clearly suggested that indigenous natural gas would continue to play a dominating role in meeting the non-renewable energy needs of the country. It was mentioned that by the year 2000 the daily supply of natural gas would reach its maximum level at 1000 MMCFD and it would remain so till 2020. Similarly it was hoped that development of indigenous coal from Barapukuria mines would ensure supply of 1 million tons since the year 2000 and continue well beyond the policy time frame. The Current Option also anticipated that the dependence on imported liquid fuel would increase, even under the Low Scenario, and the gap between supply and demand would increase significantly past 2000. In order to reduce the gap between the projected demands and indigenous supply the NEP suggested that the country would have to implement a serious exploration programme and it mentioned that without this possibility it would be very difficult to meet the huge gap from imported sources.

This chapter discussed about the reserves of the gas in the Bangladesh, gas consumption, demand and supply scenario etc., the proposed research work on politics of natural gas in Bangladesh is interrelated with all these issues. In brief, the politics of gas export is directly or indirectly linked with gas reserves and demand, which is says to be limited reserves and high demand in domestic level. From the above analyses, we could see the demand and supply level, where the demand for gas in Bangladesh will be increase in near future. The supply pattern is inadequate to meet the demand, due to improper management at the administrative level. Further the details of the mismanagement of government and politics on these issues will see in the next chapter.

CHAPTER III

NATURAL GAS AND DOMESTIC POLITICS IN BANGLADESH

NATURAL GAS AND DOMESTIC POLITICS IN BANGLADESH

Ever since the initiation of the democratic process in 1991, people have witnessed politics of confrontation as the most dominating element in governance. Bangladesh Nationalist Party (BNP) and Bangladesh Awami League (AL) are the two main political parties in Bangladesh. Both the parties enjoy equally strong popular support but neither party has strong organizational structure or discipline. Freedom of dissent on policy matters within both parties is absent. Party committees are constituted or dissolved at the will of the supreme leaders, who depend on leaders with personal loyalty to her only. Democratic practice or attitudes are hardly present within both parties. Understandably, there is no transparency in the collection and use of party fund. "Bangladesh's biggest policy problem lies in politics, not economics, and the politicians are not channeling energy and resources to the rural economy", Washington based development thinker Dr.Nancy Birdsall told a conference on Globalisation in Dhaka (POT no.156 2004: 891). She also saying that '90-95 percent of development is at the hands of the Bangladeshis, not the donors', she stressed that it required political decision to implement a pro-poor policy.

The rate at which energy price in the world is increasing is alarming. Gas might be an alternative energy might save the country on day in future from energy crisis. The number of machinery like generators, chillers, boilers electricity plants are being run by gas and it also going up every day because of cheaper gas compared to diesel. Gas is the only natural and commercial energy for Bangladesh. It should be called gaseous gold. Still it has good quantity of gas reserves, it couldn't utilize properly for its development, and the political weakness is the main constrains for the development.

Bangladesh needs to overcome political deadlock and the culture of blaming each other in politics and to ensure accountability of the government to sustain democracy. This chapter will draw the attention of the Domestic politics on Natural Gas. In details, how the energy sectors development impinge due to domestic politics.

ENERGY INSECURITY IN BANGLADESH

Availability is to ensure the supply of appropriate sources of energy to meet the demand of different end-use sectors. In a particular situation if supply of energy is less than the demand an insecure situation arises. Energy insecurity may also occur due to lack or purchasing power of the people. An imbalance between demand and supply of energy (usually known as energy insecurity) may take place at different levels (household, individual, community, district or division level or even in regional level such as eastern and western region across river Jamuna in Bangladesh). Energy insecurity may take place at a particular time of day (peak hours in electricity), during certain period of the year (electricity in summer months), for some years (as happened in 1997 and 1998 in Bangladesh). Nevertheless, energy insecurity is a multidimensional problem.

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

i. Political insensitivity to long-term energy planning;

ii. Irrational national energy pricing policy;

iii. Lack of good governance;

iv. Weak institutional capabilities at planning and implementation levels;

v. Lack of financial capability and technological capability; and

vi. Lack of management capabilities.

During the 1980s the nation faced a power crisis and consequent load shedding hurting public life and industrial activities. The so-called system loss crossed 42 per cent mark in the late eighties. Situation however, improved due to enhanced supply through new installed capacity, but the huge system loss remained a pain in the neck of the government. The first five years in the 1990s did not face serious power supply problems due to addition in generation in the late 1980s. But serious non-attention on the subject

and inadequate development of power and gas during that period (1991-96) led to severe crisis in the second half of the 1990s (Murshid and Wiig 2001: 8).

Beneath the apparent political turmoil's in mid nineties, and non-availability of fund for rehabilitation of plants, and transmission components, in particular, the demand for power continued to grow and finally in 1997 it out strips the supply. The nation was plunged into darkness with frequent and prolonged load shedding and even occasional power disruption. Although donor's assistance and financing for some important projects were at hand, clear negligence in undertaking gas well development (for production) and inordinate delay in critical high pressure gas pipeline construction, the supply of gas became acute, even uncertain for a long time. It transpired that the country needed a clearly defined and doable energy policy (although the *National Energy Policy* was formulated in September 1995) to meet the future demand for power and gas, a firm resolve and a sincere endeavor to carry out that policy. An *excess of bureaucracy*, coupled with a general failure among politicians to grasp the realities and principles of administration in the energy sector has contributed to the making of conditions where public sector reforms, among a host of other things, became critically important.

The power sector is one vital area where the *need for reforms* has over the years assumed serious and critical dimensions. There are witnessing that a country struggling to enter the truly developmental process, Bangladesh has a compelling need to provide energy to a population which, for lack of clear *political leadership*, grows increasingly disillusioned with the government. The state of things in the power sector reveals that even the very conservative estimates put the system loss in the sector anywhere between 30 to 35 per cent. Add to that the sad truth is that hardly more than 65 per cent of the electricity generated in the country is paid for. The degree to which theft and other corrupt practices pervade the power sector has created conditions where the power sector is in danger of falling apart unless *political commitment* towards a resolution of the problem is brought in.

The financial aspects of the losses incurred in the utilities sector makes staggering observations. As much as US$ 100 million are lost annually. Altogether, power outages and the general weaknesses of the power sector lead to some very dangerous consequences: a total of US$ 1 billion 51 is lost in terms of industrial output that is simply not there (Murshid and Wiig 2001: 8). The case, therefore, for adequate and all encompassing reforms in the power sector can hardly be overemphasized. And once the facts are taken into account, the pictures, which emerge, is one *bad management* going into the sector over the years and hitting below the belt of the goal of development.

Compounding the problems of management has been the existence of powerful *pressure groups* in the sector. The failure of the management and the labor unions to work out a modus operandi towards a smooth operation of a power sector is yet another telling story. The fact that there has been an absence of *incentives* for good performance. To make a bad situation worse, a woeful lack of accountability has characterized the sector. Most important, the power sector, which in the industrial world is privy to autonomy, in Bangladesh has been constrained by its dependence on *bureaucratic control* leading to a terrible arbitrariness in billing and poor collection. In the very road sense, the performance of the power sector leaves little room for hope that improvement can be expected on a sustained basis. The reform of the power sector necessitated as much by experience as by prevailing global trends, calls for serious attention in Bangladesh. If good, governance is the underlying principle of politics in this country today, a review of conditions in the power sector is only a logical move.

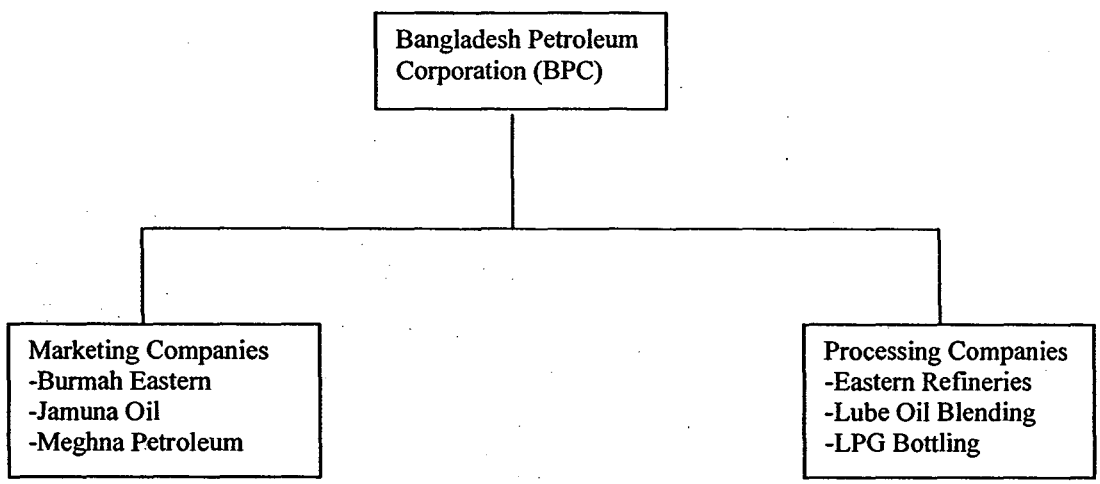
ENERGY SECTOR-INSTITUTIONAL STRUCTURE

In Bangladesh the energy sector is the responsibility of the government-controlled organisation, which regulates import, production and distribution of energy products. The Bangladesh Petroleum Corporation (BPC) and Bangladesh Oil, Gas and Minerals Corporation (BOGMC) dominate the petroleum and natural gas sub-sectors of the economy. The Burmah Oil Company and Burmah Shell introduced petroleum production to Bangladesh early this century. In the 1950s and 1960s the petroleum sub-sector

expanded rapidly with caltex, Esso, Pakistan National Oils and Dawood Petroleum operating and most of the natural gas reserves being discovered. Over the last fifteen years these companies have undergone changes in name and character, with the government progressively taking over ownership. Until 1984, Burmah Oil Company had equity holdings in some of the oil companies, but by 1985 all companies operating in the petroleum sub-sector were nationalized and the management in Bangladeshi hands (Lucas et.al, 1985: 91).

The structure of the petroleum sub-sector, shown in below chart, is an outcome of reorganization in 1977, when the control of operations was divested from the former Bangladesh Oil & Gas Corporation (Petrobangla) to a new corporation-the Bangladesh Petroleum Corporation (BPC). The structure of BPC includes one set of companies for marketing and another for petroleum processing. BPC is directly responsible for the import of crude and refined products.

Structure of the petroleum sub-sector



The marketing companies have their own storage, transport and distribution networks and compete among themselves for market shares. Profit margins are fixed by the government pricing formula (Lucas et.al, 1985: 91).

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

DOMESTIC NATURAL GAS INDUSTRY

Petrobangla, being a statutory body of the government, continued to be governed by a 1985 ordinance under the purview of the Ministry of Energy and Mineral Resources. However, Petrobangla is not active operationally. Instead, it conducts its activities through eight operating companies, which it controls on behalf of the government. The operating companies (OCs), some of which originated with the nationalization of foreign oil companies, are now incorporated under the Companies Act as public limited companies. In principle their boards of directors govern them. But both Petrobangla and the Ministry of Energy usurp the board's powers. The board's decisions are subject to ratification by Petrobangla's board, a major decisions relating to pricing, operating and development budgets, organizational setup and staffing, and the award of contracts exceeding Taka 10 crore subject to government approval (CPD Task force Report 2001:15). The directors of the OCs are either also director of Petrobangla or government officials appointed by the MPEMR. The operations of BPC are subject to lesser torture.

Petrobangla comprises five groups of companies:

- An exploration company- Bangladesh Petroleum Exploration Company;
- Production companies-Bangladesh Gas Fields company, sylhet Gas Fields company;
- Transmission and distribution companies- Titas Gas Transmission and Distribution company, Bakhrabad Gas system, Jalalabad Gas Transmission and Distribution System, Western Zone Gas supply Co. (Poschim Anchal Gas Bitaran Company, WESGAS, a new company for distribution of gas in the western part of Bangladesh);

A compressed natural gas company- Rupantarita Prakritik Gas Company; and Mining companies-Barapukuria Coal mining Company, Maddhapara Hard Rock Company.

ENERGY POLICY AND POOR MANAGEMENT

The National Energy Policy of the Government of Bangladesh was adopted in 1995 for the overall development of the Energy Sector. To set out the overall framework for the improved performance of this sector, the National Energy Policy was prepared and adopted by the government under the leadership of Prime Minister Begum Khaleda Zia in 1996. The policy, among others, provides the broad guidelines for power sector reform and restructuring, corporatization, private sector participation and enabling framework for establishment of Energy Regulatory Commission. To introduce competition, attract foreign direct investment and, more importantly, to increase power supply to alleviate the acute shortage, Private Sector Power Generation Policy of Bangladesh was formulated and adopted in 1996.

During 1997/98 and 1998/99

The fifth plan aimed at ensuring availability of a higher amount of commercial energy from indigenous sources and also optimizing its utilization. Expansion of energy sector, since 1980, is mainly attributed to increased natural gas production. At present, natural gas accounts for 70 percent of commercial energy consumption, while it accounted for only 35 percent in 1980. Between 1985 and 1996, gas production increased at an average annual rate of 10 percent (UNDP/WB Joint program Report no.5230: 18). Considering the vital role of the sector in the over all economic development, the plan spelt out important policy reforms and measures, a total amount of TK 26,039.60 million was allocated for this sector, which accounts for percent of the public sector outlay. In addition, TK 8.73 billion expected to be invested by the private sector.

The current national energy policy in Bangladesh is obtainable in GoB (1995). This document also incorporates the petroleum policy as regulated by the Bangladesh Petroleum Act, 1974 (UNDP/WB Joint program Report no.5230: 18). The NEP outlines the magnitude of the problems that current trends, unmediated by change in consumption patterns, will cause, and suggest methods of reducing their severity.

The NEP outlines for itself the following objectives

- To provide sufficient energy for sustainable economic growth so that no sector of the economy is constrained by shortage of energy;
- To satisfy the energy needs of different geographic zones of the country and of different socioeconomic groups;
- To ensure optimum development of indigenous energy sources;
- To ensure sustainable operation of energy utilities;
- To ensure rational use of all energy sources;
- To ensure environmentally sound energy development programs minimizing environmental damage;

➢ To encourage both public and private sector in the development and management of the energy sector (CPD Task force Report 2001: 6).

To improve management efficiency in public utilities, the policy document argues that production, transmission and distribution systems for gaseous fuels and power should be managed as separate cost and profit centres where each of the units would be corporatised. Separate profit centres are seen as prerequisites for unbundling functional activities such as production, transmission and distribution (Murshid and Wiig 2001). The document encourages private sector investment in the power sector as well as in the petroleum industry. It supports incentives for tax exemption, including no duty levied on machinery and equipment for energy-related projects. Regarding prices, the policy document claims that energy prices will be based on economic costs, while potential subsidies will be transparent. The introduction of an independent regulator (or a National Energy Authority) with the primary objectives of setting standards and tariffs, reviewing energy demand and allocating the use of primary energy for different end-users is strongly advocated in the policy paper (Murshid and Wiig 2001). Both the Electricity Act and the Gas Act, which are currently under preparation, seek a clearer specification of the role of the independent regulator, one of whose main functions is to separate operating and regulating activities.

"Shortcomings" identified by the National Energy Plan

These are the "shortcomings of past energy development programmes and management practices" as summarized in the draft National Energy Plan (GOB 2004, 1-2). Due to shortage of capital it has not been possible to undertake systematic survey, exploration and exploitation of energy resources throughout the country (National Energy policy online web). 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. 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. Necessary attention has not been given to formulating appropriate policies to encourage private sector participation in the energy sector development program to meet the shortage of [public investment] funds. Development programs of energy consuming sectors (e.g., industrial sector) have been constrained due to shortage and unreliable supply of commercial energy. Energy agencies have not been operated and managed efficiently. Energy prices have not been set on a rational basis. Effective measures have not been taken to ensure rational use of energy. Unplanned and inefficient use of fuels is contributing to environmental degradation. Adequate attention has not been given to meet the total energy needs of rural areas. Adequate attention has not been given to undertake systematic research programs to develop indigenous technological capabilities. Adequate attention has not been given to develop trained manpower for the efficient management of the sector.

POOR MANAGEMENT- POLITICS BEHIND IT

The production of gas from Sangu point is going down by one million cubic feet per week. Though cairn, the official operator of Sangu field has started the digging programme (three new wells) in offshore areas, it needed another one month to complete the task. However, it was not very sure whether it would yield the fruits or not, sources claimed (POT no.2 2005: 33). NIKO the operator did not cite any cause for the delay to Petrobangla. It was observed that poor sectoral governance and the lengthy process of planning, as well as the fact that politically motivated projects get preference over priority-based once, were the main causes of the decline in production.

Energy Ministry sources said that the country's overall gas production scenario became this bleak due to the decay of Rashidpur and Feni gas field and failure to implement some crucial projects in proper tome (POT no.2 2005: 34). Owing to this cause the country is in the throes of a severe gas crisis, and power shortage was an inevitable corollary to the crisis. The declining gas production hits power generation, fertilizer production and industrial, commercial and domestic consumers.

Due to inadequate gas supply, petrobangla suddenly cut gas supply to the Rawzan-1, 2 (210*2), Ghorashal and Shikalbaha 60 MW power plants keeping the power Development Board in the dark (POT no.2 2005: 34). The Petrobangla is now producing 1350 to 1370 mmcf of gas per day. At the same time, systems loss alone accounts for 70-75 mmcf daily. About 58 per cent of the gas production is used for power generation, 24 per cent for fertilizer production and the remainder for small industrial, commercial and domestic consumers. Though the Energy Mineral Resources Ministers and Petrobangla organize coordination meetings every month and the ministry organizes steering committee meeting regularly to monitor the ongoing and planned development projects, they yield little fruit.

The country's gas companies are in disarray due to absence of a proper guideline on establishing interrelationships with their regulatory authorities after those gained autonomy a few months back, (2004, March 4) (The Financial Express 2004). Following repeated instructions from the donor agencies, the Ministry of Energy and Mineral Resources (MEMR) provided full autonomy to nine gas companies with independent purchasing powers liberating those from supervision of Petrobangla.

Though these companies were to enjoy autonomy much before under the Company Act 1994, they could not practice their rightful independence due to government interventions and the country's contemporary energy sector situation. The Bangladesh Oil, Gas and Mineral Corporation (Petrobangla), the parent organisation of country's energy sector, has almost become inactive since the autonomy of these companies came into effect, a senior Petrobangla official told the FINANCIAL EXPRESS (POT no.54 2004: 280).

The government has dissolved the National Council for Energy and Mineral Resources as it appeared inoperative three years after it was reconstituted (NEW NATION 2000). Entrusted with a huge task of supervising the energy sector and making necessary recommendation the council headed by Prime Minister could not meet even on a single occasion since it was reconstituted in 1997.

During 2000 Awami League Government decide to raise gas prices by 15 per cent, while it has raised the price of all kinds of fuel oil, barring jet fuel, by 9-20 per cent. Jet fuel prices were lashed to 31 cents per litre from 48 cents (POT no.212 2000: 1115). The domestic consumers would now have to pay Taka 333.50 as against Taka 290 for a double burner and Taka 212.75 as against Taka 185 for a single burner. This was the second price hike since the Awami league came to power in June 1996, gas prices were last increased on December 1998 by 15 per cent. The price was raised considering the devaluation of the Taka against the US dollar, international oil price spiral and the difference between the purchase and selling prices of gas. Different political parties and transport owner's organisations protested the price hike of petroleum products.

Institutional structure of the both Awami league and BNP is very poor. They usually blame each other government's function while they are in opposition. At the same time they failed to make an effort of adequate measures, once they get into the power.

RESERVES OF GAS IN BANGLADESH- POLITICS BEHIND IT

Apart from political and bureaucracy weakness, another main constrain for energy sector is adequate investment. Investment from private parties in late 90's some how helped the energy sector in Bangladesh. Now the IOCs afraid about the future investment in Bangladesh because the low markets in local at the same time gas export is strictly restricted. The advantage from the gas export and other details will see in the next chapter. The controversial decision on gas export mainly focused on two issues, one is insufficient gas reserve for next 50 years, and another one is increasing domestic demand. These are the Bangladesh government's perception, where IOCs totally disagree with this. The details of the gas reserves, demand and supply in the Bangladesh we already seen in the second chapter. Here we will see the politics of gas reserve in Bangladesh.

There is some difference of opinion about the volume of gas reserves in the country. The Fourth Five Year Plan 1990-95 (FFYP) states that the country has fifteen gas fields with a total estimated reserve of about 13 trillion cubic feet (Tcf). Of this, 1.35

tcf had already been extracted by June 1990. The annual output in June 1990 was 165 billion cubic feet from 21 gas wells in operation. Hydrocarbon unit & Norwegian petroleum Directorate joint study estimated the proven and probable gas initially in place (GIIP) of the discovered field as 28.79 Tcf and recoverable reserves as 20.44 Tcf. It also estimated the undiscovered resource potential of the country between 18.5 Tcf (90% probability) and 63.7 Tcf (12%) with a mean of 41.6 Tcf. United States Geological Survey (USGS) and Petrobangla joint study divided the country into six Assassment Unit's (AU) based on their geological attributes. This study estimated the Gas reserves from Onshore 23.34 Tcf and from Offshore 8.78 Tcf, totally 32.12 Tcf. Details of the various studies on gas reserves discussed in the second chapter.

According to an estimate by Petrobangla (a state enterprise), the present gas reserve is likely to deplete within about two decades. Almost 85 per cent of the country's electricity generation and one hundred per cent of urea fertilizer production depends on indigenous natural gas. Besides the plants under production, new power and fertilizer plants are expected to begin operation in 2005 or later. Moreover the demand for natural gas from competing consumers (particularly electricity) would grow at a much faster rate in the future decades. Thus the demand forecast has put the gas sector in a challenging situation.

The current two million tons of urea produced in the country annually is entirely dependent on natural gas. Apart from multiple impact this has had been on the country's economic growth, the saving gas production has brought about in the country's oil imports, without which it would have been almost four times higher, resulting in serious depletion of foreign exchange reserves. Related to this issue, there is another important factor namely, the country's sovereign right over its own resources. Since all blocks (including gas-prone as well as discovered) are being placed under internationally *enforceable contracts*, one may question whether at the end of the day the country would at all have any control or even say over the disposal of its only valuable resource. There is another clear possibility emerging out of the current policy. It wouldn't require a

geologist to comment that all the 23 blocks are not gas rich, yet the government is *giving away* all the *potential blocks* to foreign oil companies through a peculiar dilatory tactics on the advice of the bureaucrats. On the recommendation of the bureaucracy the government was even about to sign on unusual contract in the name of *marginal fields* (Chatak, for example with about 1.9 TCF of gas discovered in 1959 and suspended production on technical grounds in 1969). Earlier 8 attractive blocks were allotted in the first half of the 1990s. In the past two years (2000-2001) almost all-remaining gas prone blocks have been awarded to foreign operators.

According to government officials, there has been no discovery of new gas fields in Bangladesh in the past seven years and the existing gas reserves from active gas fields, unless supplemented by new extractions, are likely to be exhausted by 2020. Terming the future of the energy sector "bleak unless there is new gas discovery", they said the country would need fresh investment worth TK 92,000 crore –TK 17,000 crore for gas sector-to meet the rising demand for energy by 2020. According to Petrobangla chairman, the demand for gas has already exceeded the maximum supply capacity (POT no.119, 2004: 625). The present gas reserve of 15.3 TCF will practically be exhausted by 2020, if not replenished by new discoveries, he cautioned.

The Petrobangla has contradicted American Oil Company Unocal's technical report on gas reserve in Bibiyana gasfeild saying that the actual recoverable gas there might be around 1.8 trillion cubic feet (TCF) (report). Bibiyana gas field might have three TCF of gas of which 60 to 70 percent could be actually extracted. Unocal, in its report had said that Bibiyana had a reserve of 5 to 6 TCF of gas of which 60 to 70 per was recoverable (The Daily Star 2004). Unocal assessed the reserve on the basis of a 3D seismic survey and geological data after drilling one well in the gas field. It reiterated that the country's gas market was too small to justify development of Bibiyana field. Petrobangla must ensure a "bigger market" for that.

In this regard, both the governments stand in the same foot because the estimation of gas and the any other energy related issues are highly sensitive in the country. Since the 1991, there is no much development made by both the governments in their tenure.

DOMESTIC MARKET AND DEMAND -POLITICS BEHIND IT:

The government has asked US firm UNOCAL to develop Bibiyana gas field for supply of gas to domestic market by the end of 2006. Until the 2004, Unocal was treating the Bibiyana gas reserves for export. But the scenario slowly started to change recently as Bangladesh's domestic market is moving fast towards supply shortfall that may really lead to a big crisis in the couple of years. Bangladesh need big discovery to meet demand in the mid-term by 2015 and Bibiyana is a readily available source to meet the immediate shortfall only (POT no.24 2004).

The country may face a serious shortage of gas when the Karnaphuli Fertilizer Company (KAFCO) resumes operation from March 15. At present, about 100 mmcf gas is now surplus in the chittagong region due to the shutdown of the KAFCO and one unit of the Raozan power plant, but when both KAFKO and Raozan go into operation from the middle of April month (2002), the demand for gas in the Chittagong area alone will be around 200 mmcf. (POT no.83 2002). Worse still is that there are no firm statistics available to illustrate the country's demand, supply, and capability of power and gas generation.

GAS EXPORT- POLITICS BEHIND IT

Bangladesh's gas reserve or the question of laying a gas pipeline has become a constant source of irritation to the people and the nation. For years, precisely since the very emergence of Bangladesh as an independent country, the vexed question of its gas export to India has been tormenting the people who, on their turn, have all along opposed the very idea. We will discuss the details of the gas export in the next chapter. During the last Awami League regime, the then Prime Minister Sheikh Hasina had somewhat resolved the controversy by declaring that the issue of gas export cannot and will not be taken into consideration before fifty years. And it must also be said to her credit that she told the visiting American President Bill Clinton in March 2000 that the question of

natural gas export by a pipeline to India by an American Company can only be considered after 50 years on having examined the reserve position and requirements of gas in the country. The people then heaved a sigh of relief, but maintained that the idea of exporting raw gas must be abandoned in all circumstances.

But unfortunately, however, on the very second day and third day of coming into power in October 2001, some important cabinet ministers of the BNP led four-party alliance government called for the export of gas to India, where the BNP as the leading opposition party of the country had earlier sharply criticized any proposal of gas export from Bangladesh. In report to this somersault of the government, the people from all walks of life held huge demonstrations across the country. Then Prime Minister Khaleda Zia declared that there would be no gas export without meeting the domestic requirements. The controversy and the demonstrations softened down. But, as ill luck would have it, the board of investment of Bangladesh, on behalf of the government suddenly signed an 'Expression of Expectations" with the Managing Director of the Tata Group of Industries of India September 2004 in Dhaka (POT no.19 2005: 311). The giant Tatas proposed an investment of 2 billion US dollars (about TK.12000) in Bangladesh for building power plants, fertilizer industries and a 10-million ton capacity steel mill with gas as raw material and fuel. This, needless to say, the people here took as a treacherous deal and cruel joke with them, as anyone could realise that it was a stealthy way of indirectly exporting gas to India through Tatas. The Board of Investment was also supposed to conclude a firm and formal agreement with the Tata Group December 2004.

To recount further, noted public leaders, leading engineering and technological exports and steel mill association leaders opined that all these would be a death warrant to the national economy of Bangladesh and a sell-out of the country. Many demanded the resignation of the Industry Minister Matiur Rahman Nizami and the Chairmen of the board of Investment. The secret negotiation is going on with Tata Group who has demanded the supply of 350-million cft gas per day at the disastrously low rate of the

supply to the Karnafuly Fertilizer Company (KAFCO) at Chittagong (POT no.19 2005: 311). What's more, the huge consumption of gas by the Tatas will understandably make a fatal blow to prospective investments by Bangladeshi entrepreneurs which, it goes without saying, tantamount to a sort of strangulation of the country's own national economic growth.

The country's energy experts and economists warned the government not to accept the Indian industrial giant Tatas $3 billion investment proposal, noting if allowed, it would severely diminish the country's energy security (The Daily Star 2006) Heavily criticizing the government for maintaining non-transparency about Tata's investment proposal. Nuruddin Mahmud Kamal, former Chairman of Power Development Board (PDB), said the energy adviser is not thinking about the interest of the country at all. "Tata alone will dry up around 2.14 tcf gas if the proposal is accepted but we will not have gas after 2016. So, it is an issue of energy security of the country that the government needs to think seriously", he mentioned (POT no.123 2006: 2). People of Bangladesh do not want to take risk by allowing the Tatas in their country. Whole country now against for gas export to India, nevertheless whether it is raw gas or by products. It makes the government always critical to take decision on gas export.

GOVERNMENTS RELATIONSHIP WITH IOC

Unocal Chief in Bangladesh Terry Budden has claimed that the International Oil Company (IOCs) is the major players in gas exploration in Bangladesh. "Without involvement in the oil and gas sector, the country neither meets its own historical nor its future demands," he said and argued that the government should give necessary incentives to encourage IOCs to continue their exploration in this country. Budden said that IOCs discovered 14.8 trillion cubic feet (tcf) gas out of the total proven reserve of 16.2 tcf while Petrobangla discovered only 1.4tcf (POT no.290 2000:1459). He further said that so far about 4 tcf gas was produced of which 97 per cent came from the gas field. Discovered by IOCs.

But the official documents of Petrobangla showed that the contribution of foreign oil companies in the country's gas sector development was not what is being claimed by IOCs. Until the signing of the Production Sharing Contracts (PSCs) by the British Oil Company Cairn Energy in 1994, foreign Oil Companies, in most cases performed as contractors of the government rather than investors. Asked about the future plan of Unocal in Bangladesh, Budden said would not go for further investment unless the government ensures a potential market (POT no.290 2000:1459).

US Oil Company Unocal would scale back its investment in Bangladesh if the government failed to ensure a market for the Bibiyana field find within the next 18 months- quoting a top official of the company. Unocal's primary feasibility study indicated a pipeline to New Delhi would be the best utilization of excess gas in Bangladesh and it had a huge market across the coal estates of west Bengal into New Delhi and Bombay (POT no.190 2000: 1002)

But Unocal thinks that Bangladesh's gas potential is pinned up because the country's condition is not right to develop industry and use its gas reserve. By exporting gas, Bangladesh can get the hard currency needed to further stimulate investment through infrastructure development. Bibiyana was the biggest discovery of Unocal and a world class field with a capacity of four to six trillion cubic feet on natural gas. If that field is developed.

Since the government is not in favour of gas export, some international oil companies are now thinking of producing petroleum by using natural gas, one of the best options to ensure the optimum use of the country's hydrocarbon resources. World Bank also stated to have indicated that it might finance the project for setting up of plants to produce petrol and diesel by using gas. The country could save at least $700 million while it could expand the domestic market for the gas by producing oil from gas.

PRODUCT SHARING CONTRACTS

Product Sharing Contracts harden the relationship between IOCs and Government of Bangladesh. The International Oil Companies engages in the exploration and production of the country's natural gas by signing Product Sharing Contracts with Petrobangla. An understanding of the relevant provisions of the PSCs would contribute substantively to a comprehension of the obligations of Petrobangla.

PSCs are structured so that an IOC makes an initial bid and, if successful, enters into negotiations with Petrobangla with respect to the contract's key elements. The initial bid proposes the critical features such as maximum cost recovery by the IOC, the share of production between the IOC and Petrobangla, and the price at which the IOC share of gas production would be sold to Petrobangla.

There are two elements of product sharing; one is termed as "cost recovery" and the other as "profit gas." Under the PSCs, the IOC is similar to a contractor who gets paid for costs and risks from its share of the output from successful drilling. The IOCs are responsible for all losses related to unsuccessful drilling. In a successful field, the output is shared. First, up to some predefined maximum, the IOC receives a share of output characterized as "cost recovery" to compensate for the cost of exploration and production specific to that field. The residual quantum, known as the "profit gas," is shared between the IOC and Petrobangla, based on the initial bid and subsequent negotiations.

Production costs are independently audited in each case of successful drilling, but in any case, the shareholders of the IOC have an incentive to keep costs down; cost overruns directly reduce the returns to shareholders. But it is worth mentioning here that the production costs of the international oil companies so far have been four to seven times higher than that of Petrobangla. The PSCs also stipulate that the price for offshore gas will be 25 percent higher than the price for onshore gas.

Under the PSC terms, Petrobangla is bound to purchase the IOC share of gas output. Currently Petrobangla is paying the IOCs at a rate of $2.80 per 1,000 cubic feet, but selling the same at a subsidized rate of $1.40 in the domestic market, resulting in a sizable burden for Petrobangla. By having to purchase 168 Bcf (billion cubic feet) of gas

from mid-1998 up to April 2002, the corporation regressed from an initial position of profit to the point where it was showing a total loss of $1.5 million (Jaccard et al. 2001: 26).

Table 3.1

Contract for Gas Exploration under Production Sharing Contract (PSC)

Oil Company	Exploration Block	Area
Occidental of Bangladesh Ltd./Unacol.	Block 13, 14	Greater Sylhet District
Occidental Explorations of Bangladesh Ltd./Unacol	Block 12	Greater Sylhet District
Cairn Energy and Holland Sea Search JV	Block 15, 16	Bay of Bangal and greater Chttagong District.
Rexwood Okland JV	Block 17, 18	Bay of Bengal
United Meridian Corporation	Block 22	Greater Chittagong Hill District
Uncial/Bapex	Block 7	Barishal and Patuakhali
Tullow/Chevron/Texaco/Bapex	Block 9	Gazipur,Narshindi, Comilla, Chandpur
Shell Bangladesh Exploration and Development BD/Bapex	Block 5, 10	Laximpur, Noakhali, Bhola, Shatkhira, and Bangherhat

Source: Petrobangla as in Pepole's Republic of Bangladesh (2002), *Bangladesh Economic Review 2002*, Dhaka: Ministry of Finance, June, p.81.

Since the late eighties, exploration for oil and gas in Bangladesh by the public entities has slowed down dramatically, as it was envisaged that IOCs would mostly conduct this relatively risky business under the PSC framework. This has not worked as anticipated due to low level of exploration undertaken by the IOCs and because such exploration has later been linked by one IOC to an ensured gas market (Kamal 2002: 2). The following tables demonstrate the results of product sharing in the case of two fields operated by international companies.

Table 3.2

Table Offshore and Onshore Profit Gas Volume Splits (Sangu Gas Field)

Block (field)	Type	CR% (Max)	Sharing of Profit Gas (For production level in MMcfd)											
			Up to 150			151 to 250		251 to 350		351 to 450		451 and above		
			IOC%		PB%	IOC%	PB%	IOC%	PB%	IOC%	PB%	IOC%	PB%	
16 (Sangu)	On shore	55	45		55	35	65	25	75	15	85	12.5	87.5	
	Off shore	60	Up to 100			35	65	25	75	15	85	12.5	87.5	
			50	50										
			101 to 150											
			45	55										

Source: Article No. 13.6 (b) of the Product Sharing Contract

Table3.3

Table Offshore and Onshore Profit Gas Volume Splits (Jalalabad Gas Field)

(Note: CR=Cost Recovery; IOC=International Oil Company; PB=Petrobangla)

Field	Type	CR% (Max)	Sharing of Profit Gas (For production level in MMcfd)					
			Up to 150		151 to 300		301 and above	
			IOC%	PB%	IOC%	PB%	IOC%	PB%
Jalalabad	Onshore	55	22.5	77.5	20	80	17.5	82.5

Source: Article No. 13.6 (b) of the Product Sharing Contract

Above table clearly shows that a sizable portion of profits is awarded to the oil companies operating in the fields. The Sangu PSC (Table 3.2) contains both onshore and offshore production splits during the major cost recovery period and afterwards. Because of relatively higher investment and a generally higher risk factor, the offshore provisions

are comparatively more favorable to the contractor. The Jalalabad field, which was discovered by Petrobangla, was leased to an IOC for production. For that reason, and due to its being situated on shore, the contract provisions are relatively favorable to the Petrobangla Corporation (Kamal 2002: 2)

The foreign oil companies are not well regarded by many Bangladeshi citizens. Most consider the Product Sharing Contracts, under which the companies are operating to be disproportionately beneficial to the companies, depriving the people of their share. Therefore, the general people are suspicious about the IOC's pressure toward a quick export decision. Targeting the IOCs for blame is simplistic, ignoring the greater issues. Like any other investor, oil companies need to show return on investment for their shareholders. It is the role of Bangladesh itself to create all safeguards and uphold the country's interests.

From the analysis, we could find that the response to the complex problems faced by the energy sector has been to propose unbundling, corporatisation, privatization, and the creation of an independent regulatory body, for both gas and power. However, implementation of the reforms has been slow because of stiff resistance from the bureaucracy, the officials of the concerned agencies (e.g. Petrobangla and PDB) and their trade unions (Murshid and Wiig 2001: 31). The Ministry of Energy and Mineral Resources has, in principle, accepted the reforms but feels that there is room for differences of opinion with regard to the pace and speed of implementation. There is also certain reluctance on the part of the Ministry to devolve power entirely to an independent regulatory body, due in part to a long history of intervention in the sector. Civil society and the political parties are not very vocal about the question of reform. There is, however, a great deal of concern about the presence of powerful IOCs in the country and whether Bangladesh is able to safeguard its national interests and ensure negotiation of an equitable and fair contract.

The memory of a gas- field explosion in Sylhet (Magurchara) is fresh in people's minds. The IOC operator concerned, despite the considerable damage caused, due to contractual weaknesses paid no compensation. Similarly, there are concerns that moves taken by IOCs to encourage exports of natural gas to India by pipeline may not be in Bangladesh's best economic and strategic interest, and must thus be handled carefully. Energy sector reforms by definition include acts to minimize transmission and distribution losses, metering the consumers, removing political interference in running the utilities etc. - measures that would be expected to make the energy authorities financially viable, thereby stimulating further investment in the sector.

CHAPTER IV

NATURAL GAS IN BANGLADESH: EXTERNAL DYNAMICS

NATURAL GAS IN BANGLADESH: EXTERNAL DYNAMICS

In the international arena, Bangladesh is so important in the context of energy. Energy consumption in Bangladesh constitutes only 0.1 percent of the total world energy consumption. Coal, oil, natural gas, peat, hydropower, animal-power and biomass fuels are commonly used energy resources in the Bangladesh. According to Petrobangla, the estimated reserve of about 13 trillion cubic feet (Tcf). Among the non-renewable sources of energy, only natural gas has been extracted commercially. The country that is produced and consumed the natural gas in the significant quantities. In the world energy balance, natural gas is expected to gain more ground. Over the coming 20 years its consumption is expected to rise by 69 percent from 78.8 trillion cubic feet (Tcf) to reach 133.3 Tcf in 2015. In this situation how Bangladesh is going to handle its natural gas reserves for its own country development, whether utilising the reserves only for domestic purpose or earning the foreign currency and investment by the way of export. In the growing demand for natural gas, how Bangladesh attracted by neighbouring countries and IOCs.

Bangladesh is strategically located in between two great geo-economic areas, namely South and South-East Asia, bordering India to the north, west and north-east, Myanmar to the east and the Bay of Bengal to the south. The Bangladesh landmass also almost entirely separates off the northeastern Indian states (the Seven Sisters) from the rest of India save for a narrow strip of land over which a long and precarious road and rail link is maintained. Apart from its strategic location, Bangladesh and its surrounding areas are thought to be rich in energy resources, which remain largely untapped and unexplored. Bangladesh's own gas reserves appear to be sizeable and have generated considerable interest amongst the large international oil companies. Northeast India and Myanmar are well endowed with gas, in addition to possessing significant oil reserves. Neighboring Nepal and Bhutan also enjoy a huge, largely untapped hydro-electricity potential. The South Asian economies (especially India and Bangladesh) have been experiencing good rates of growth in recent years, at around 5-7 percent (Murshid and

Wiig 2001: 2). The huge Indian economy has opened gradually to foreign investment. The demand for commercial energy and power has increased rapidly, leading to large emerging shortages manifested in frequent power outages. Demand in Bangladesh is also set to rise quickly (at 6-8 percent), although from a much lower base. Thus, in the medium term demand for power in India is likely to rise quickly and the country will need to evolve a policy strategy to ensure adequate supplies. Bangladesh are also concerned about its longer run energy security and may need to look beyond its borders to achieve a sensible and optimal energy strategy.

This chapter mainly focuses on the external dynamics on Natural gas. In brief, role of Petrobangla (Government owned company) and IOC (International Oil Company), their Production Sharing Contract (PSC), government's dilemma in gas export, External pressure and domestic pressure, advantage and disadvantages of gas export ect., it will also discuss the external dynamics on Bangladesh gas. Now we will see the above issues briefly one by one.

INTERNAL PERCEPTION ON NATURAL GAS

Even there is a different opinion on reserves of natural gas and the demand in Bangladesh concern, which we discussed in the earlier chapters, still one group of peoples opinion that, Bangladesh have enough natural gas for many years of domestic consumption for current and even increasing levels of use. This relatively high reserve to domestic production and consumption ratio discourages further exploration and development investments by IOCs. With the current and growing reserves, investments today to find additional natural gas are not particularly attractive. Such investment face the risk of waiting decades before any new gas found can be brought to market and sold. Even if domestic consumption increases at truly outstanding rates, a string of successful exploration wells can worsen the prospects for the investor of finding a domestic market for natural gas within a reasonable time period. At some point, private gas exploration investment will diminish or even cease and Bangladesh will lose not just the exploration

investment but also the spin-off economic activity that is associated with it. This could happen very soon, as experiences in many jurisdictions have shown before.

The solution, followed by most natural gas-rich countries, is to develop export markets. This generates government revenue from the public share of production revenues. It improves the country's balance of trade, enabling the import of key technology and goods. For foreign investors, exports maintain prospects for a return on investment within a reasonable time period. This in turn helps sustain the continued flow of foreign investment into this sector, and any domestic spin-off activity in the natural gas industry.

While there are compelling arguments in support of natural gas exports, there are also arguments against.

First, some argue that the size of the domestic resource is really not well known, and in any case still very modest, so that any dedication of gas to export is premature. There is a risk that exports would hasten domestic shortage. Export opponents point out that Bangladesh has limited geographic region with natural gas potential and that expansion of reserves, even with substantial further exploration, may not occur (Jaccard 2001:31). Also, if Bangladesh does start to run out of natural gas, it has less ability than do wealthier countries, like the US or Canada, to develop or purchase other sources of energy. This is especially so if alternatives involve significant imports.

Second, some argue that, even if the domestic resource is found to be plentiful, natural gas is so valuable that all of it should be devoted to domestic use and domestic economic development, even if that use is far in the future. Revenue from exports can never compensate for the foregone benefits of domestic use.

Finally, some argue that exports of a natural resource endowment are dangerous for a developing country like Bangladesh. Unless carefully managed-which means public debate over appropriate institutions for regulating the sector and for spending the revenue arising-the natural gas may do little to improve the lives of the country's citizens.

The export of its natural gas is one of the most controversial issues in Bangladesh. Bangladesh have been divided into 23 blocks for gas exploration and, among them, the 8 richest blocks were allotted to the International Oil Companies (IOCs). The IOCs are now investing 52 per cent of the country's total foreign direct investment (FDIs) in the energy sector, and there has been a production-sharing contract (PSC) with the IOCs. The PSC allows Petrobangla (a government-owned corporation) to buy gas from the IOCs as cost recovery and it sells it to the domestic market at a lower price. Since Bangladesh has very limited capacity for payment, multinational companies known that only the way of getting their money back quickly is to export gas. In PSC, there is a provision of gas export in LNG form, but now the issue is of export of gas through pipeline to India. It is being argued with good reason that export of gas would not before the national interest. The question related it this issue is of the quantum of gas to be exported and the countries own short-term as well as long-term requirements.

Regarding the quantum of gas, the recent study of Petrobangla, estimated that the total gas initially in place (GIIP) and initial recoverable reserve of Bangladesh is 24.745 TCF and 15.51 TCF, respectively. Out of this reserve, 4.07 TCF has already been produced (up to February 2001), and the remaining reserve is 11.42 TCF. Since all gas-prone blocks have been distributed to foreign operators, it could be foresee that within a very short period of time, it would all be exhausted by the year 2011 or thereabouts (CPD 1999: 8)Around 12 multinational energy companies signed Production Sharing Contracts (PSC) with GoB, which is also questionable to some extent for some controversial clauses in the contract, and two are now engaged in gas production and supply to the domestic market (The Daily Star 2002).

INTERESTS OF IOC IN BANGLADESH'S ENERGY RESOURCES:

The most powerful extraneous influence in Bangladesh's energy decision-making is that of IOCs. These foreign companies have high stakes in the energy decision making process because they have invested millions of dollars in exploring, producing and marketing gas under PSC. The tense interest of the US government, over and above its oil companies, in securing maximum benefit from Bangladesh's actual and latent resources.

A major concern that evoked much comment relates to PSCs and the relationship between the IOCs and their local agents. Many expressed an apprehension that perhaps these contracts were being signed in haste and in a situation of inadequate transparency. There was a strong feeling that the people had a right to know about the details of these contracts, although some acknowledged that it was not practicable, or even desirable, to keep the public informed about the painstaking and complex process of negotiations on a day to day basis. A consistent and pervasive theme relates to suspicion of sell-outs to IOCs. Thus some opposition leaders even suggested that if they come to power and find that unfair contracts have been awarded, they reserved the right to revoke them. The question of local agents and their role was also raised. It was asked why the IOCs recruited these agents in the first place, even before a contract was drawn up. This leads to unnecessary lobbying and attempts to influence the course of negotiations and to gain favours. Indeed, often the proteges of powerful ministers operate as local agents, a situation that serves to heighten unease and fears of a sell-out. There was a concern about monopolistic tendencies emerging in the gas market. Most argued that more rather than fewer companies should be awarded contracts.

There was also a view that the presence of US companies might act as a deterrent to potential Indian intentions of asserting control over Bangladeshi gas resources. Generally, it was felt that Bangladesh could engage in effective negotiations given the will and perhaps the disposition to seek expert help when needed. At a more tactical level, there is a school of thought that believes in accelerating the whole process in order to cash in on the excellent response from international IOCs. Inability to do so may mean

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

RIGHT TO EXPORT THE GAS: PROVISION IN THE ARTICLE

Article 14 of the PSC allows the contractor three distinct advantages. Articles 14.4 to 14.9 deal with the situation where the contractors have opted to export their part of the gas (Ahmed 2001: 154). The following two Articles of the PSC are significant:

Subject to the provisions of Articles 14.4 and 14.9 contractor shall have the right to export any marketable natural gas, as defined in Article 14.5 produced from the contract Area in the form of Liquefied Natural Gas ("LNG") either directly or via a third party. Such volume shall consist of

- Contractor's Cost Recovery Natural Gas; and
- Contractor's Profit Natural Gas; and
- BOGMC's Cost Recovery Natural Gas and profit Natural Gas or, where applicable, the remaining share of BOGMC's Natural Gas over the reservation Pursuant to Article 14.7.

Where the contractor intends to export the Natural Gas as LNG, the related LNG export agreement between Contractor and BOGMC; such agreement shall allow, if appropriate, for the use of third party facilities (Article-14.4) (Ahmed 2001: 154). Where

BOGMC has installed necessary facilities to transport and use gas to meet domestic requirements, BOGMC shall be entitled to its option to retain in kind any Natural Gas production up to BOGMC's share of Profit Natural Gas, but in no event more than 20% of the total Marketable Natural Gas. The actual monthly amounts to be retained by BOGMC shall be notified to contractor prior to the conclusion of relevant export contract(s) and such Monthly amounts shall be fixed for the duration of such contracts. At the request of BOGMC, the limit of 20% stipulated herein will be increased to 30% at the beginning of the eleventh Calendar year following the start of deliveries for the purpose of export (Article-14.7) (Ahmed 2001: 154).

What went wrong before and after signing the PSCs?

Even though the PSCs had their obvious benefits, their planners did not carry out any analysis of possible fallout. There was neither a risk analysis nor a sensitivity analysis to measure the uncertainties. Things were done hastily and more on an ad-hoc basis. After signing the PSCs, Petrobangla (owned by GOB) got about five/six years to improve its organizational structure to properly monitor the PSCs. Next to nothing was done in this regard. Petrobangla needed to have a good team of petroleum accountants, lawyers, procurement engineers and a strong team of petroleum geologists and engineers. Unfortunately, what we notice is that small group of people with non-specific qualifications are currently monitoring four PSCs. Naturally the IOCs took full advantage of the situation. In many cases, interference from the Energy Ministry made the situation even worse.

The major point of contention between Petrobangla and IOCs is obviously cost recovery. Every cost has to be paid for by Bangladesh and any over invoice by the IOC reduces the country's share of the profit. A strong management and monitoring team could reduce the existing friction to a minimum. If the same mistakes are repeated in the case of export of gas, we will head towards more disputes and perhaps losses. Unilateral decision-making authority must be taken away from the ministries. It is frustrating and

counterproductive when a recommendation made after months of review and bureaucrats in the ministry overturn negotiation by technical personnel in Petrobangla. There are many such instances of decisions that went against the interest of the country. Decision-makers must be held accountable and should be involved in all negotiations from the beginning. Policy-makers, regulators and operators must be separated by means of sound legislation. Petrobangla cannot play these roles all at the same time. Shortfall develops within the country. The Utilization Committee's suggestion of "limited export from new discoveries" [GOB, 2002b] does not address this issue properly or adequately (Ahmed 2001: 156). This would be purely ad-hoc in nature and bound to fail. A general mechanism must be devised that ensures a win-win situation for all parties.

PERCEPTION ON GAS EXPORT

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

EXPORT OF GAS

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

political and strategic grounds. A frequent question raised refers to the reliability of the estimate of gas reserves. It is felt that not enough data is available on this critical aspect to allow any meaningful decisions to be reached. There is a widely held perception that entities that are likely to have access to the relevant data are not sharing it with the government or the public.

There is an uneasy feeling that the government has inadequate information and should take steps to develop its own capability to enable it to make an independent assessment of the reserve position. Other concerns have also been flagged. There is a need for an assessment of domestic energy requirements under alternative development scenarios. There is a view that even if such estimates/studies exist, there has been inadequate discussion and dissemination of their findings. On the basis of domestic requirements a strategic plan should therefore be chalked out in terms of alternative options - conversion to power, CNG, LNG or fertiliser etc. It is felt that once supply and demand parameters have been solidly established, the surplus, if any, could be exported.

There is a clear, albeit implicit, notion that it is preferable to use the nation's gas reserves directly for its own development. Thus, comments like "we should not squander our natural resources" are frequently made (Murshid and Wiig 2001: 34). It is likely that these views are predicated upon anxieties about the ability of Bangladesh to secure fair, advantageous terms in negotiations with powerful foreign entities. Moreover, there is the implied fear of India, the obvious customer for natural gas exports, which is deemed to be a powerful neighbour that tends to pursue a policy of regional dominance over the smaller countries in the region.

Thus a number of distinct views have emerged about the desirability of exports: The official position of the Government of Bangladesh is that exports may only be undertaken after ensuring that the country is able to meet domestic gas demand for the next fifty years. This position reflects the popular as well as the political mood in the country. The difficulty of this position is that much depends on an accurate estimate of proven gas reserves as well as establishing demand parameters with some degree of

accuracy - both extremely difficult tasks. The ADB seems to be striking a moderate stance and advocates limited exports to bordering regions of India. This position finds some support amongst some observers in the local academic community. The IOCs and the World Bank advocate substantial gas exports by pipeline to India, mainly to the New Delhi market. Thus some IOCs (e.g UNOCAL), along with the World Bank and a small section of the academic community, support gas exports of up to 3.5 TCF. Others like Shell, with support from the World Bank, would like to export up to 7 TCF (Murshid and Wiig 2001: 34).

Most opposition political parties, including the Left, Jamaat-e-Islami and the BNP, appear to be entirely opposed to exports through a pipeline. Many adherents of the ruling party privately support this position as well. The preponderant view is that the gas should be used for local consumption, e.g. for power generation and fertiliser production, or in the manufacture of gas-based products. A slight deviation from this position is taken by some that feel that exports may be permitted only after value-addition, e.g. as LNG. Another view that has found some favour among some foreign and local academics is to have a five-year moratorium on exports, presumably to give adequate time to the government to explore all the alternatives carefully before a decision is reached. Public opinion regarding gas exports may have softened over the years to some extent – but almost certainly there remains sizeable opposition to large-scale exports. Thus, the limited export argument could be sold if adequacy of reserves could be convincingly demonstrated. In general, exporting after value-addition is much less controversial, so a serious effort needs to be made to examine the option of gas-based power exports.

THE PIPELINE OPTION

There is a feeling that the structure of the PSA, under which gas has to be purchased in US dollars and, according to many observers, at a high price, and the discovery of large gas fields imply that Bangladesh will be forced into a situation where there may be no option but to export - even if only to pay the IOCs for gas off-takes.

There is increasing pressure on Bangladesh, not only from IOCs but also from powerful donor agencies and foreign governments, notably the US, to agree to exports - preferably pipeline exports. The motivations are clear. It may also be perfectly correct that this would be a win-win situation for all concerned - however, as matters currently stand this is not self-evident to a large number of people. Quite apart from the economics of gas pipelines, which may well be attractive, there are political-strategic considerations that may be important. They have to do with broader Indo- Bangla relations, including resolution of outstanding border disputes, access to Indian markets for Bangladeshi products, which India has repeatedly promised but never delivered, and vague fears of Indian domination - fears that cloud the entire debate as India is perceived with suspicion. There is the added problem of insurgency in India's Northeast, close to Bangladesh's northeastern and eastern borders, and suggestions that a pipeline to mainland India could invite attacks on it. In the same vein, it is debated whether India may send in its army to protect access to a strategic good like gas if supplies become threatened (Murshid and Wiig 2001). The main point is that unless Indo- Bangla trust improves, the potential for reaping the benefits of regional co-operation will remain small, even in the face of sizeable economic benefits. The fact that at least one major political party has made a career out of an anti-Indian stance does not help matters.

GAINS FROM EXPORT

We find that a scenario has emerged where export of gas, however, risky in terms of its ultimate benefits to Bangladesh, has become almost inevitable. In fact, it would not be inaccurate to say that export is an inherent or integral part so a scenario involving the IOCs. The IOCs appears to have already calculated that Bangladesh's demand would fall short of IOC production and that Petrobangla would be unable to buy back the ever-increasing gas produced by the IOC. The IOCs are therefore pressing hard for permission to export gas. But in what mode? Recently, Mr. Forrest Cookson, president of the Bangladesh-American Chamber, has disclosed that the study of this subject by a US firm shows pipeline export to be the most beneficial mode of gas export, followed in

sequential order by power, LNG, and fertilizer. (Murshid and Wiig 2001: 174) According to this study the deficit gas demand projections of India show a more than 1 TCF current yearly requirement for Bangladesh gas which could be doubled in 4/5 years time.
A simple comparative analysis of export options is presented below:

Pipeline Export

- Cheapest of all forms of liquid hydro-carbon exports, both oil and gas
- Gives greater flexibility to both exporter and importer, as they can adjust volume, as required, without affecting cost of operation.
- Less vulnerable to fluctuations of international pricing, being subject to agree formula, where exporter and importer know the ceilings.
- Least affects the exporter in case of disruption of supplies for any reason.

Power Export

- Involves much higher initial investment.
- Third party involvement (i.e. private sector) may create complications; both in terms of initial investment as well as operational costing, thus posing difficulties in assessing actual return to the country.
- The so-called value addition needs careful analysis.
- Since the major part of exportable gas belongs to the IOC contractor, it is difficult to see the modus operandi of an arrangement where ownership of the export gas and the export of power by IPP are differentiated.
- The power export option is not exclusive of the pipeline option. Both can be opted for together.

LNG Option

- Requires multi-billion dollar investment, all of which will have to be borne by Bangladesh in the form of cost recovery.

- Needs captive gas of at least 5 TCF.
- More vulnerable to global price fluctuations.
- Amortization with very high operational cost reduces the net return to a level, which is below the returns from both the power and direct pipeline transfer.

Fertilizer

- Very high initial investment.
- Very likely to face similar problems as in the case of KAFCO.
- Net return to the country less than that of both pipeline and power options.
- With the major part of exportable gas belonging to the IOC contractor, it is again difficult to assess the modus operandi of this arrangement.

Gas export has remained an issue of contention ever since a number of gas fields were discovered by Petrobangla, along with the involvement of the International Oil Companies in the late 1990s. Disagreements over the issue of gas exportation differ on various levels.

The question of gas export has remained a highly politicized issue. Public sentiment is generally against gas export and the expert community of the country is deeply divided over this issue. In recent years, the issue of natural gas export has been widely discussed in the media by the country's leading experts and economists. Intense domestic criticism of the idea of gas exportation has prompted successive governments in Dhaka to put off any decision in favor of exporting because of its potential political consequences. Interestingly, the two main political parties of Bangladesh—the Bangladesh Nationalist Party (BNP) and the Awami League (AL)—only vehemently oppose export while they are in the opposition, in order to gain popular support. Prime Minister Khaleda Zia's Bangladesh Nationalist Party opposed gas exports while it was in opposition from 1996 to 2001. After forming the new government in October 2001, the BNP lawmakers in a number of public statements demonstrated subtle indications of a possibility of gas exportation if needed. In an interview given to BBC, Bangladesh's

Energy Minister, Mosharraf Hossain, commented that "if exporting is found to be economically beneficial, the government will definitely decide to allow it" (Rahman 2001 online web). Finance Minister Saifur Rahman also stated that the administration of Prime Minister Zia might go for natural gas export "provided that it is beneficial for the country" and that "no resource in the true sense is a resource if it remains under the soil" (Alexander's Gas and Oil Connections 2001 online web). These indications have come under tremendous pressure from the general people and the government has now declared that the country should first be assured of fifty years of reserves before any decision on export is taken. Arguably, over-politicization of the issue is depriving the country of an effective policy framework to deal with the issue of export.

As previously mentioned, over a period of thirty years since 1972 the total government funding for Petrobangla has been only US$ 300 million for exploration and field development purposes. Nevertheless, out of the twenty-two gas fields discovered in all, Petrobangla has discovered ten gas fields and one oil field. At the same time, it is true that reserves of these fields are smaller than reserves discovered by the International Oil Companies. BAPEX, the lone state-run Exploration Company in the country, is not getting sufficient government funding to undertake new exploration. A government decision on May 25, 1994 entitled BAPEX to receive four percent of revenue earned from the country's total gas sales, about, half of which was allocated exclusively for exploration. Later, the share of new exploration was decreased to one percent, and BAPEX has yet to receive the money for exploration (The Independent 2003.These facts show that the country has the needed local expertise, but that the government is unable to provide the necessary funds for exploration and development of natural gas.

Under the present conditions, the equation is very simple: with a current proven reserve of 15.1 Tcf, and domestic consumption of 1,054 MMcfd, it will take little more than fifteen years to deplete the resource. It is clear that the availability of new gas must be ensured by 2015 at the latest. If further exploration and production does not take place, the country may have to consider importing gas after 2020, until production from newly discovered fields commences.

Finding new gas would mean undertaking costly and extensive exploration, which the government can hardly afford. At the same time, Bangladesh is under pressure from the IOCs, foreign aid donors, and development banks like the Asian Development Bank and the World Bank to generate revenue by exporting gas, mainly to its closest market, India. The government of Bangladesh is now facing competing pressures of financial obligation and gas reserve insufficiency, exacerbated by the urgent need for exploration and development.

THE ISSUE OF GAS EXPORTATION TO INDIA

The issue of pipeline gas exportation to India was first raised three years ago by Unocal, an American oil company operating in Bangladesh. Unocal Corporation has submitted a gas pipeline proposal to the government of Bangladesh, which includes the construction of a thirty inch diameter, 847 mile (1,363 kilometer) long pipeline with an initial capacity of 500 Mmcfd of gas, from northeastern Bangladesh (from the Unocal-developed gas field Bibiyana) to New Delhi with an extension.

Arguments against Export

- The proven reserves of 15.5 Tcf of gas, by no means a huge amount, is inadequate to meet the country's mid-term domestic demand.
- Regarding the economy of gas export, taking the Unocal proposal as an example, the country's earnings are a projected US $3.7 billion, but it will take twenty years to earn. When the country's annual export income is over US$ 6 billion, annual income of US$ 160-185 million from gas will not be very impressive.
- As mentioned earlier, purchasing gas from the IOCs has become too much of a burden for Petrobangla, for which export could be a possible solution. However, some economists assert that gas purchase liability can be managed

by the government. The amount of money payable to IOCs is 2.3% of the current export earning and is likely to come down to only 0.64% in 2020.

- Domestic use of natural gas is far more beneficial for the Bangladeshi people as consumers than exportation, because this is the cheapest source of energy for the country.

Arguments in Favor of Export

Immediate revenues, especially in foreign currency, are something the government needs urgently, as well as immediate investment for energy sector reform. The World Bank has estimated that Bangladesh loses around US$ 1 billion per year due to power outages and unreliable energy supplies (CAB on Bangladesh 2003 online web). It also needs money to provide necessary funding for Petrobangla so it can stand again as a viable institution and take the responsibility of gas exploration and production. These much needed dollars can come from gas export revenues.

- The government of Bangladesh at present does not have the funds to accelerate new exploration works to even keep pace with the country's domestic demand.
- IOCs have already discovered more than 4 Tcf of gas in the last five years, so there is no reason why they should develop these fields or explore more fields if they do not have the market for their production.
- IOCs are still not receiving their full and timely payment from the government for the gas sold to Petrobangla due to the government's financial constraints. Thus, export will be an incentive for the IOCs to invest more and accelerate the process of exploration and development.
- As a country heavily dependent on foreign aid, Bangladesh cannot ignore the external pressures from investors and donors who are in favor of exporting gas.

Under these circumstances, if put in a simplistic manner, the decision to export would depend upon the size of reserves and the future demand-supply projection of natural gas. In the case of reserves, vast differences prevail in estimates of the gas potential of the country. Although optimistic forecasts estimate the existence of 60 to even 100 Tcf of potential reserves, these forecasts remain speculative and need to be backed by more concrete studies. A number of active gas fields in Bangladesh have performed below their initial forecast. For example, Chattak gas field was estimated to have 1 Tcf of natural gas, but was abandoned after producing only 26.5 Bcf. Bakhrabad, another significant gas producing field of the country, has brought its realized yield down to 50 MMcfd instead of producing 200 MMcfd as originally estimated (Ahmed 2001). An opposite view predicts a demand based on the level of energy consumption required for ensuring economic growth, and estimates a gas requirement of approximately 28 Tcf to increase per capita energy consumption from the current 197 kgoe to at least 260 kgoe (an energy consumption level currently prevailing in India). The issue of natural gas export from Bangladesh, therefore, demands more examination and evaluation. The government needs to develop a pragmatic strategy that will fit into a long-term energy policy of the country, which can make "realistic assessments of the availability of gas and relate this to a dynamic forecast of the volume and composition of energy demand made under alternative assumptions" (Ahmed 2001).

GOVERNMENT'S DILEMMA

There are many impediments to development in Bangladesh, some of them being low income, high population growth, scarcity of resources and corruption. Gas is the only valuable natural resources of Bangladesh. The best utilization of natural resources could be the basis of the economic development of Bangladesh. It is the government's responsibility to make sure natural resources is utilized in the most efficient manner. Due to lack of resources, expertise and technology, the Bangladesh government was not able to accelerate natural gas production and discovery till 1990. After liberalizing the economy in the early 1990s, the government invited the IOCs to produce and discover

natural gas. The Government of Bangladesh signed PSC with the IOCs that Petrobangla will buy gases from IOCs as Cost Recovery (CR) and distributes it in the country.

Under PSC, Petrobangla has to buy gas from IOCs at a higher cost than the international and local markets. The government is providing subsidy to this sector. There was a provision in the PSC of gas export, but in LNG form. The provision was made with the aim of getting benefits by establishing and transferring technology of LNG plant that will also encourage motor vehicle owners to use environment friendly and less costly fuel. It is true that Petrobangla is facing shortage of funds and domestic private market is not capable to meet-up the costs of IOCs. But it would not pose any serious problem if they maintain PSCs. Before investing, IOCs also knew the situation of Bangladesh's economy (Ahmed 2001:64).

It is now clear that export of gas will not give benefit more than that of its diversified utilization for productive purposes. The IOCs are continuously threatening to leave the country if no decision is taken. On the other side, civil society and opposition political parties often give threatened to burn out the pipeline in case of a decision.

The Government is in a dilemma: if it concedes to the pressure by the IOCs, it annoys the public at home, and if it represents the public view, it annoys the investors. Developing countries like Bangladesh have to depend on foreign assistance. It is also important to note that donor countries and agencies play a vital role in the political process of developing countries like Bangladesh. The issue of gas export from Bangladesh is a case that explains the global political economy of energy. Until now (2005), the ruling party has not taken any decision in favor of gas export; no quick decision is expected until next general elections in 2006.

At a dialogue organised in 2002 by the Centre for Policy Dialogue (CPD), Dhaka, politicians, business leaders, representatives from IOCs, exports, academicians and noted economists observed that the export option of gas could be considered only after ensuring a reserve for long-term domestic consumption. (The Financial Express 2002). They also

demanded that production-sharing contracts (PSCs) with international oil companies (IOCs) should be renegotiated if it is certain that the country is paying munch more than the existing international gas price. They, however, observed that all aspects of energy security must be taken into account while taking a major policy decision about the sector. Some selected comments from the policy makers are outlined below:

State Minister for Energy and Mineral Resources A.K.M. Mosharraf Hossain (sacked in June 2005 for allegedly taking a luxuriouscar from a Canada-based IOC, NIKO) said that the country required huge investment for meeting local demand of gas supply. According to him, by the year 2030, 20-40 billion US dollars will be required for supplying gas to the local people (Hossain 2005: 60). He observed that the government is giving a huge subside to Independent Power Producers (IPPs) for making huge profits. He also agreed that different aspects of energy security should be taken into consideration and there should be transparency at the time of taking any policy decision.

Political secretary to the opposition leader in the parliament, Saber Hossain Chowdhury, said that the Awami League is not against the export of gas, but before that, domestic consumption of the natural resource should be ensured for a long period. He also pointed out that the national resources should be utilized for national development.

Former state minister for foreign affairs, Abul Hasan Chowdhury, said only four-percent people were getting gas from pipeline and only 20 per cent people have access to electricity. '.... there (seems to be) a consensus that under the present circumstances, the question of (exporting) gas (does not arise),'he said. Awami League lawmaker Kazi Zafarullah also said the contracts with IOCs were not right. '(They were) against the interest of the country and must be renegotiated,' he said. Another Member of Parliament from the opposition Awami League, Faruk Khan, said there was no logic behind export of gas from the present reserves. He expressed the fear that the security and sovereignty of the country might be jeopardized if the pipeline was installed to export gas (Hossain 2005: 60).

Opposing the gas export, general secretary of the communist party of Bangladesh (CPB) Mujahedul Islam Selim said that, if necessary, public opinion could be mobilized internationally for terminating the 'unfair PSCs with IOCs'. It is evident from the above comments that the people of the country were against the export of natural gas. Some government ministers have been trying to convince people in favor of exporting gas.

For India, Bangladesh gas can make only a marginal dent on its energy security because, the quantities sold will enable augmentation of electricity generation capacity by approximately 6 per cent only. However, considering that natural gas is a clean energy source, and it will be available in the northern region where peak shortages are acute, it might be worthwhile for India to purchase this gas.

But for India to actually access this gas, the prices will have to be right. If India were to take on the entire IOC purchase costs plus transportation, it might find that Bangladesh gas is too expensive to buy for power generation purposes. Any price that is in excess of $3/ Mcf (inclusive of pipeline tariffs upto HBJ pipeline) is unlikely to be acceptable in India which has alternatives in the form of landed LNG as well as new domestic gas finds. In this context, it might be instructive to note that currently many gas-based power projects are on the verge of being shut down owing to very high gas prices to be replaces by coal-fired plants.

To make the gas available at prices acceptable to India, Bangladesh may have to bear a part of the burden of IOC purchase costs not to speak of levying any additional duties or depletion premia. Around 65% of Petrobangla's gross revenues are paid to the government in the form of taxes and compulsory dividends. Bangladesh government comfort its part, waives the taxes and duties on IOC gas so that it can be offered to India at an affordable price.

POTENTIAL FOR REGIONAL CO-OPERATION

There are significant complementarities in the energy sector amongst the countries of the region. Energy endowments include coal (mainly India), gas (India, Pakistan, and Bangladesh) and hydropower (India, Pakistan, Bangladesh, Sri Lanka, Bhutan and Nepal). There are no technical or economic reasons to prevent the development of bilateral or regional agreements to utilise these resources more efficiently and contribute towards the creation of a regional energy hub or an economic growth zone. The economic and technical advantages of a regional electricity and gas grid/pipeline are many. It ensures greater supply security and reliability, reduces the reserves needed for meeting peak demands, lowers costs through economies of scale (transmission is a natural monopoly), increases diversification of primary sources of energy and contributes to overall efficiency. The formation of a SAARC committee (Technical Committee on Energy) is a small step in the right direction. The prospect of an inter-regional electricity grid has also been put on SAARC's agenda.

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

subsidy practices; and an estimation of gains from regional energy trade. Simultaneously, political irritants have to be removed before real commitment can be generated for co-operation.

REGIONAL SUPPLY-DEMAND POTENTIAL: INDIA, NEPAL AND BHUTAN

These three countries are likely to be the most relevant for Bangladesh in its endeavor to chalk out a regional energy strategy. Nepal and Bhutan are endowed with considerable hydroelectric potential and could compete with Bangladesh in the regional export market or power. Alternatively, cheap power imports from these countries may be something that Bangladesh will need to consider actively in the long term. India, on the other hand, is looking to augment its sources of energy and is eyeing Bangladeshi gas along with possible pipeline gas from Iran (via Pakistan) and LNG from the UAE. As far as Bangladesh are concerned, India represents a potential market for power and gas. Thus, commercial energy demand scenarios in India need to be carefully analyzed by Bangladeshi policy makers. Similarly, Bangladesh also need to focus on potentially energy-rich Nepal and Bhutan to explore the potential for a regional approach to energy security (Murshid and Wiig 2001: 5).

EXTERNAL DYNAMICS: INDIA'S POSITION

The Indo-Bangladesh relationship can be explained through the term: 'good neighbours with bad taste'. The people of Bangladesh do not trust India for many reasons. The apprehensions about India are further reinforced due to the galloping trade deficit. In formal terms India's exports to Bangladesh exceeds US$ 2 billion. Despite being urged by Bangladesh, which reduced its tariff structure. India continues to pressurise Bangladesh to allow transit to transport goods and services to other parts of India (Hossain 2005: 65).

There is tension over land and maritime borders with India. As different disputes and misunderstandings continue to mar Indo-Bangladesh relations, the steps being taken by the IOCs, on the one hand, and India, on the other, are seen as a conspiracy against the national interest of Bangladesh, even if their interests are coincidental.

The government may adopted a policy of not exporting gas through pipeline without ensuring gas reserves for 50 years domestic consumption, it was encouraging gas export in the form of value added products like electricity and fertilizers (The Daily Star 2000).

Number of Eco-projections showed that pipeline gas export would be most profitable, Bangladesh was moving very cautiously in this regard, but the potential gas buyer India would not wail forever for Bangladesh to decides whether we would export gas or not. India's gas requirement was likely to go up by leap and bounds under pressure from both the industrial and domestic sectors, it preferred to turn east because Bangladesh gas will be cheaper and available in the next door. Apart from this, India has a plan to get a natural gas from the Iran through Pakistan, and from Myanmar through Bangladesh. The reserves of Pakistan and the Myanmar are high compare to Bangladesh. India may drop the idea of Bangladesh gas when it starts to get the gas from the other two countries. During last year there was a triparties talks have been gone between India, Bangladesh and Myanmar for exporting natural gas from Myanmar to India through Bangladesh. During the talks, Bangladesh put up a proposal for a 'corridor' between Nepal and Bhutan and Bangladesh through Indian territories. Bangladesh will earn about 125 million dollars annually as transit fee for the pipeline, that would run through Arakan state in Myanmar via Indian states of Mizoram and tripura before crossing Bangladesh to Kolkata. But Bangladesh stand is very clear that, it would agree to the signing of a triparties agreement to allow a gas pipeline from Myanmar to India only if New Delhi agreed to give it a "corridor" with Nepal and Bhutan. Now there is no progress in this agreement after Bangladesh clearly mentioned about its demand, where India found difficulty.

Bangladesh has very good gas reserves by which it attracted the foreign investors, now they are not ready to invest further in Bangladesh due to lack of domestic market and government opinion on against the gas export. From the external dynamic, we could analyse that, IOCs pressure, economic compulsion is one side, on other side strong feelings of nationalism lead Bangladesh government to critical situation regarding the gas export. So if Bangladesh gives a way for export, India is the only viable option, because of geological factor. Apart from India, Nepal and Bhutan is not that much viable market, in Myanmar it has enough gas for them and also excess. IOCs cannot carry the gas to their country also; they have to sell it in nearby for that India is the best option.

CHAPTER V

CONCLUSION

CONCLUSION

It is clear that energy is a crucial national issue, and natural gas is an invaluable resource. Bangladesh have quality gas, which is the countries most readily usable and least expensive commodity. The poverty-ridden country of Bangladesh, which is still struggling hard with its development, cannot afford to make mistakes regarding the utilization of natural gas. Only 5 to 6 per cent of the population in Bangladesh is using gas in domestic and commercial activities.

At present the whole country is intensely focused on gas export debate, but the solution to its long-term energy security does not depend only on the decision of whether or not to export. Whether it exports or not, Bangladesh is going to run out of conventional natural gas anyway, either within twenty years, or at best within fifty years. The country should focus more on its long-term energy security. The export decision should be a part of the country's broader energy policy. It is indeed a good sign that the people of Bangladesh are deeply concerned with the issue of export; such concerns prove the existence of democracy. In truth, the whole process of decision making should be more transparent and open to the public. In case of such a decision, citizens of Bangladesh would like to see how export activities fit into the country's larger long-term energy policies and how the common people—the owners of this resource—will benefit from export earnings. In this case, the need for transparency cannot be emphasized more strongly. The people of Bangladesh are demanding to see a comprehensive strategic plan from the government that clearly outlines how the government would address expansion of rural electrification, ensuring uninterrupted domestic energy supplies and increasing efficiency among the various energy agencies by means of a thorough energy sector reform plan.

If the country could find ways to connect each home and industry with uninterrupted supplies of natural gas, and at the same time export value added products that will offer a competitive advantage for Bangladesh. In that way, the economic and social benefit would be immense. Although any source of electricity gives around thirty

percent efficiency, the direct use of gas gives efficiency better than ninety percent. It is indeed an irony that, despite being blessed with such an energy asset, Bangladesh is one of the most energy starved countries in the world, lagging far behind in its development process. It is incomprehensible why the whole country cannot be networked with natural gas. Concerns over what the government is doing to meet the country's future demand of electricity through increasing use of indigenous natural gas have remained unanswered. In the event that the government finds the option of export to be an economic imperative, the decision must be made in a convincing and transparent manner, free of ambiguity. Judging from the level of corruption that exists in the country, the potential for more of the same can hardly be ignored. The government should provide a straightforward accounting of what it intends to do with the money saved through gas export.

The proposed study started with the assumptions that lack of national consensus over the distribution and utilization pattern of gas has led to inefficiency in its development, another one is the decision to export gas from Bangladesh is under the external as well as internal pressure. First as well as the later both are directly or indirectly caused mainly because of improper management, weak political setup, high feelings of nationalism, which is the affecting the development of energy sector. In details,

The independence of Bangladesh was the result of its people's aspirations for democracy, self-identity, equality, freedom and progressive society. Ironically, the progress made in the past thirty-five years of its independent existence has belied all those over-optimistic hopes in reality in Bangladesh. Despite sustained domestic and international efforts to improve economic and demographic prospects, Bangladesh remained a poor, overpopulated, and ill-governed nation.

A two party polity that commands considerable support of the voters at the grassroots dominates the present political scenario. Sadly, political parties in Bangladesh have come to be known to pursue their own well being instead of articulating broader

public interest. Political infighting and corruption at all levels of government are main constraints for economic development.

Attempts by the opposition to unseat the government is premised around conformational techniques that including strikes, hurtles and more seriously, parliamentary boycotts. This type of continuous boycotts by the opposition party in the parliament makes difficulty to take the any developmental decisions. As generally in any other country, Ministry of Energy of the Government of Bangladesh is the nodal agency to propose, initiate and finalize all decisions related to energy. However energy production, utilization and export also need the concurrence of other ministries like commerce, Foreign Affairs, Finance and Industry, as their decision impinge on each other. This type time taking process leads to unhealthy decision on energy sector. Apart from the party politics between two parties, within the party itself there is poor administration.

The public utilities in the energy sector in Bangladesh are in a deep financial crisis, partly due to an inappropriate tariff structure, problems with maintenance, system loss and low collection rates. At the same time, consumers' access to electricity and gas is constrained, while load shedding reduces the quality of the power supply. The GoB is well aware of these problems, but still adopts a go-slow policy regarding the reform process. Regarding production, the GoB has opened up the market to IOCs and IPPs. Tax policy towards multinationals seems quite attractive and to discriminate against domestic firms.

There is some difference of opinion about the volume of gas reserves in the country. The Fourth Five Year Plan 1990-95 (FFYP) states that the country has fifteen gas fields with a total estimated reserve of about 13 trillion cubic feet (Tcf). Hydrocarbon unit & Norwegian petroleum Directorate joint study estimated the proven and probable gas initially in place (GIIP) of the discovered field as 28.79 Tcf and recoverable reserves as 20.44 Tcf. It also estimated the undiscovered resource potential of the country between 18.5 Tcf (90% probability) and 63.7 Tcf (12%) with a mean of 41.6 Tcf. United States

Geological Survey (USGS) and Petrobangla joint study divided the country into six Assassment Unit's (AU) based on their geological attributes. This study estimated the Gas reserves from Onshore 23.34 Tcf and from Offshore 8.78 Tcf, totally 32.12 Tcf.

Regarding production, at present 54 wells were producing 1326-1370 mmcf of gas per day. The future domestic demand also has a different answer. According to gas production forecast, during plan period the production would be 1535 mmcf in 2003-2004 fiscal. The capacity would be 1571, 1608, and 1603 mmcf in 2004-2005, 2005-2006 and 2006-2007 fiscal respectively. The Petrobangla earns a huge amount of money every year, it failed to implement any single project on its own due to bureaucratic tangles. Example, Petrobangla gave TK 1600 crores to TK1800 crore in VAT or customs duty to the national exchequer. It contributed a total of TK1612 crore to the exchequer in the year 2000-2001.

At that time, the annual consumption of natural gas in the country was 1 Bcf, but this figure has risen so that natural gas is now the major fuel for power generation in the country. From only 67 Bcf in the first decade, the consumption of natural gas rose to 279 Bcf in the following decade and thereafter to 1067 Bcf during 1981-90. During the last decade (1991-2000), Bangladesh's natural gas consumption reached 2490 Bcf. Moreover the demand for natural gas from competing consumers (particularly electricity) would grow at a faster rate in the future decades. Thus the demand forecast has put the gas sector in a challenging situation.

Under the present conditions, the equation is very simple: with a current proven reserve of 15.1 Tcf, and domestic consumption of 1,054 MMcfd, it will take little more than fifteen years to deplete the resource. It is clear that the availability of new gas must be ensured by 2015 at the latest. If further exploration and production does not take place, the country may have to consider importing gas after 2020, until production from newly discovered fields commences.

In Bangladesh, energy resources are neither adequate nor varied. Biomass, natural Gas, petroleum products and used to meet the demand of different end-use sectors, such as, domestic, commercial, industrial, transport, agriculture and non-energy use. The basic principle of energy availability is to ensure the supply of appropriate sources of energy to meet the demand of different end use sectors. In a particular situation if supply of energy is less than the demand an insecure situation arises. Energy insecurity may also occur due to lack or purchasing power of the people. An imbalance between supply and demand of energy may take place at different levels (household, individuals, community, district or division in region level such as eastern and western region across river Jamuna in Bangladesh). Nevertheless, energy insecurity is a multidimensional problem. Worse still is that there are no firm statistics available to illustrate the country's demand, supply, and capability of power and gas generation.

Government has to overcome the constraints, address expansion of rural electrification, ensure uninterrupted domestic energy supply and increase the efficiency among various energy agencies by means of a thorough energy sector reform plan. During the last thirty years, the government has made consistent efforts in expanding the use of natural gas. Due to technical and financial reasons, it has not been possible to ensure rapid expansion of natural gas to different parts of east zone. All developmental activities of the West Zone (across the river Jamuna) have been severely affected due to serious shortages in the supply of primary (gas and coal, for example) and secondary (electricity) energy resources. Unlike other fuels such as oil, natural gas has relatively low energy content per unit value, making it expensive to transport. Also the actual use of gas depends upon the location and size of the gas reserve and the surrounding market environment.

The reform progress in transmission and distribution has been far from successful. Liberalization of production without distribution may lead BPDB and Petrobangla into an even more difficult financial situation than before the reform process started, since contracts with the multinationals are based on a take or pay principle. The donor response, at least from ADB and WB, to the slow reform process is to link their aid

programmes to the current reform processes. The establishment of an independent regulatory body is of high priority. Several political reasons for the slow implementation of the reform process and the 'nationalistic' position regarding the use of the gas reserves are discussed. We argue that the implementation of reforms have been slow because of stiff resistance from the bureaucracy, the officials of the concerned agencies and the trade unions. The debate about the use of gas is political (whether or not to trade with India) more than economic (the opportunity costs of domestic use in terms of lack of export revenue and transfers of technology). Energy, like other commodities, is to some extent a tradable good, at least in a regional context.

Energy decision making has been influenced in Bangladesh by power influences external to the government institutions, both from within and outside Bangladesh. Within Bnagladesh, corporate interests concerned with gas and oil utilization, transmission or even exploration and production have tried to influence decisions to their advantage. The most powerful extraneous influence in Bangladesh's energy decision making is that of IOC. These foreign companies have high stakes in the energy decision-making process because they have invested millions of dollars in exploring, producing and marketing gas under PSC.

The terms of the PSCs between Petrobangla and IOCs are loaded entirely in the latter's favour. Not only do they tie Petrobangla down to a purchase price that is higher than the domestic consumer price of gas, but even require the payment to be made in foreign currency to the tune of 92.5 percent. Furthermore, Petrobangla's share of free gas can be realized only and if only cost-recovery gas in purchased and paid for by Petrobangla.

Critical decisions governing the issue of gas development, relations with IOCs, the role of domestic institutions and exports appear to originate in ad hoc decisions with generate needless controversy, often of an uniformed nature. Bangladesh badly needs an energy policy which can make realistic assessment of the availability of gas and relate this to a dynamic forecast of the volume and composition of energy demand made under

alternative assumptions. Such an exercise would enable us to estimate the benefits and modalities of a gas export strategy and relate this to a dynamic agenda for regional cooperation in energy. Such an exercise would relocate the debate on gas exports from the realm of political rhetoric and address the issue as part of a strategic vision designed to ensure optimal resource use.

Owing largely to political rather than economic reasons, gas export has become an emotionally charged issue for Bangladesh. Public opinion is firmly against gas exports. A decision on life-and-death matter for the nation, such as the export of its only main source of finite energy, cannot or must not be taken till a more tangible picture of the reserve situation emerges from successful exploration activities.

The only other option that might rescue Petrobangla from the situation is export of gas. By virtue of the location of gas deposits, India can be the sole export destination at prevailing gas prices. But the terms of the contract do not permit export of gas through pipelines. Government sanction is required for pipelines. Government sanction is required for pipeline exports.

If the Bangladesh government decides to allow pipeline exports, it will bail Petrobangla out of a sticky situation. It will also do itself a favour by using gas exports revenues to clear its trade deficit with India. Refusal to allow exports will not only aggravate the precarious financial position of Petrobangla; it will also impact further investments in exploration/production. Static or shrinking supplies will lead to increasing unmet domestic demand and deceleration of growth.

If Bangladesh does not export, it will not be able to pay the IOCs. If it does export, and within a short period of time the gas reserves will be finished. And there is no optimistic view that export proceeds will be utilized in a productive manner. If it does not export, it can use the gas to meet the domestic demand and further investment of IOCs in gas-based power generation; fertilizer production can recover IOCs cost as well as helping the country move toward sustainable economic development. If it does not allow

IOCs to export, they will leave the country and gas will remain unexploited under soil or will be exploited at a slow rate and economic growth will be stunted.

Intense domestic criticism of the ides of gas exportation has prompted successive governments in Dhaka to put off any decision in favour of exporting because of its potential political consequences. Interestingly, the two main political parties of Bangladesh-the Bangladesh Nationalist Party (BNP) and the Awami League (AL)-only vehemently oppose export while they are in the opposition, in order to gain popular support.

The whole export-economics should be made clear to the public before any policy decisions are made. A detailed risk analysis of the construction of pipelines and a cost-benefit analysis of different options of export has to be calculated. The people would like to know the mechanics of export and every detail of the contract signed with the Oil Company, and also with the importing country. Moreover, the long-term framework under which investors may operate—such as the rights of the companies engaged in gas exploration and production and their obligations in relation to the government—should be transparently developed and consistently implemented.

But export or no export, for the long-term energy security of the country the government needs to takes some concrete steps. The following are recommended:

- There is a need for the government to launch a vigorous campaign to attract foreign and local investment in the energy sector. Bangladesh's energy sector has every potential to attract foreign direct investment for small and medium range industries, which use natural gas as raw material. For example, the Chinese Shenzhen Huxian Group has already shown interest in investing US$ 600 million to set up a methanol synthesis manufacturing company in Bangladesh. The government could provide various incentive packages to attract Specialized Engineering Firms, such as Lummus ABB, that are in the business of setting up petrochemical and other related factories.

- At present, Petrobangla and its subsidiaries, like any other government organization, have become much less effective. The government fund allocations for these agencies are far from adequate. It is imperative that the government considerably increases funds and provides facilities to these organizations so that they can stand as viable and effective organizations again, and take up the role of gas exploration and production of gas, eventually ending the country's dependency on foreign oil companies.
- The government should develop institutions and train more people in the energy sector, particularly in the areas of petroleum and natural gas engineering, gas processing, transmission and distribution, in mining and refining, and in geological and economic studies. Doing so would be a long-term investment requiring sustained effort, but it would reap significant rewards in the future.
- Bangladesh should use gas export, as a bargaining chip in negotiations with India to provide duty free access to the latter's products, a demand long denied by India.
- Regional cooperation is a major component of an efficient allocation of resources, as many of the energy resources yield optimal benefits when exploited by two or more countries based on their respective comparative advantage in gas production, processing, marketing, and distribution or utilization. Thus, effective and appropriate regional cooperation could be one possible solution to long-term energy provisions for the region in general and Bangladesh in particular. Bangladesh is strategically located between two major economic regions—South Asia and Southeast Asia. Surrounding areas have both huge demands for energy and rich potential for energy resources. Nepal, Bhutan, and northeast India have resources to support hydro-electricity generation. Despite all the limitations and imbalances within these countries, the prospects for long-term regional energy cooperation look attractive. In this regard, Bangladesh does not necessarily have to confine itself to cooperation within South Asia, but can also actively cooperate with neighboring Southeast Asian countries. Bangladesh is already a member of organizations like the

South Asian Regional Energy Coalition (SAREC)—comprised of Bangladesh, Bhutan, India, Nepal, Maldives, and Sri Lanka—and Bangladesh, India, Myanmar, Sri Lanka, Thailand Economic Cooperation (BIMSTEC), where the energy sector is one of the priority areas. At present, Bangladesh need to assess its options through detailed project analyses. Whether Bangladesh decides to export gas or not, any pipeline going through its land as a part of a regional pipeline network may have positive results for the country. A gas pipeline network in the South Asia region would also allow importation from member countries from outside the region. Thus it could be concluded that it is in the long-term interest of Bangladesh to actively situate itself in the emerging South Asia and Southeast Asian energy system as a supplier, delivery agent, and consumer.

The study is finally end with, proving the assumption. That is, Lack of national consensus over the distribution and utilization pattern of gas has led to inefficiency in its development, another one is the decision to export gas from Bangladesh is under the External as well as internal pressure. Improper management, weak political setup, high feelings of nationalism, found main constrains in the both the assumptions.

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ANNEXURE I

BANGLADESH: COUNTRY OVERVIEW

President: Iajuddin Ahmed

Prime Minister: Begum Khaleda Zia (since 10 October 2001)

Independence: December 16, 1971 (from Pakistan)

Population (July 2005E): 144 million

Location/Size: Southern Asia, bordering Bay of Bengal, between India and Burma/55,813 square miles (about the size of Wisconsin)

Major Cities: Dhaka (capital -- population, 10 million), Chittagong (2.8 million), Khulna (1.8 million), Rajshahi (1 million)

Languages: Bangla (official, also known as Bengali), English

Ethnic Groups: Bengali (98%), tribal groups, non-Bengali Muslims

Religions: Muslim (83%), Hindu (16%), Christian, Buddhist, others (1%)

ECONOMIC OVERVIEW

Finance Minister: M. Salifur Rahman

Currency: Taka (Tk)

Gross Domestic Product (GDP) (2005F, market exchange rates): $60.1 billion

Per Capita GDP (market exchange rate, 2005F): $421

Real GDP Growth Rate (2004E): 5.3% **(2005F):** 5.2%

Inflation Rate (consumer prices) (2005F): 6.0%

Merchandise Exports (2005F): $8.7 billion

Merchandise Imports (2005F): $12.4 billion

Merchandise Trade Balance (2005F): -$3.7 billion
Major Trading Partners (2005): United States, India, China, Japan, United Kingdom, Germany, France, Singapore

Major Export Products: Garments and knitwear, frozen fish, jute and jute goods, leather and leather products, tea, urea fertilizer, ceramic tableware

Major Import Products: Capital goods, foodgrains, petroleum, textiles, chemicals, vegetable oils

ENERGY OVERVIEW

Minister for Energy and Mineral Resources: Begum Khaleda Zia

Proven Oil Reserves (1/1/05E): 56 million barrels

Oil Production (2004E): 6,725 bbl/d, of which 6,000 bbl/d was crude oil

Oil Consumption (2004E): 96,000 bbl/d

Net Oil Imports (2004E): 89,275 bbl/d

Crude Oil Refining Capacity (1/1/05E): 33,000 bbl/d

Natural Gas Reserves (2005E): 10.6 trillion cubic feet (Tcf) (current estimate from *The Oil and Gas Journal.* Other estimates vary widely. The US Geological Survey has estimated that Bangladesh has an additional 32.1 Tcf in "undiscovered reserves.")

Natural Gas Production (2003E): 420.2 billion cubic feet (Bcf)

Natural Gas Consumption (2003E): 420.2 Bcf

Coal Production (2003): None

Coal Consumption (2003): 0.8 Mmst

Electric Generation Capacity (2003E): 3.6 gigawatts

Electricity Production (2003E): 17.4 billion kilowatthours (94% thermal, 6% hydro)

OIL AND GAS INDUSTRY

Organizations: Bangladesh Oil, Gas, and Minerals Corp. (also known as **Petrobangla**), formed in 1974, is the state company responsible for oil and gas exploration, production, and distribution. Petrobangla also is involved in exploration and production for minerals, including coal. Petrobangla has 11 operating companies, including **Bangladesh Petroleum Corporation** , formed in 1976 and a separate corporate entity, handles oil imports, refining, and marketing. **Bangladesh Petroleum**

Exploration Company (Bapex) is the exploration subsidiary of Petrobangla. Besides Bapex, Petrobangla has 7 other subsidiaries: **Bangladesh Gas Fields Company Ltd.** (gas development and production, mainly in central gas fields); **Sylhet Gas Fields Ltd.** (responsible for northern gas fields operation) Gas Transmission Company Limited (national gas transmission system);

Rupantarita Prakritik Gas Company Ltd. (natural gas liquids and liquefied petroleum gas); **Titas Gas Transmission and Distribution Company** (regional gas distribution, with 73% of the market);

Bakhrabad Gas Systems Ltd. (regional gas distribution, with 21% of the market);

Jalalabad Gas

Transmission and Distribution System Ltd. (regional gas distribution, with 6% of the market).

Refinery: Chittagong (33,000 bbl/d)

Foreign Energy Company Involvement: Cairn, Halliburton, Occidental, Rexwood-Okland, Shell, Texaco, Unocal

Gas Fields: Bakhrabad, Beani Bazar, Chattak, Feni, Habiganj, Jalalabad, Kailashtilla, Narshingdi, Rashidpur, Sangu, Shahbazpur, Sylhet, and Titas

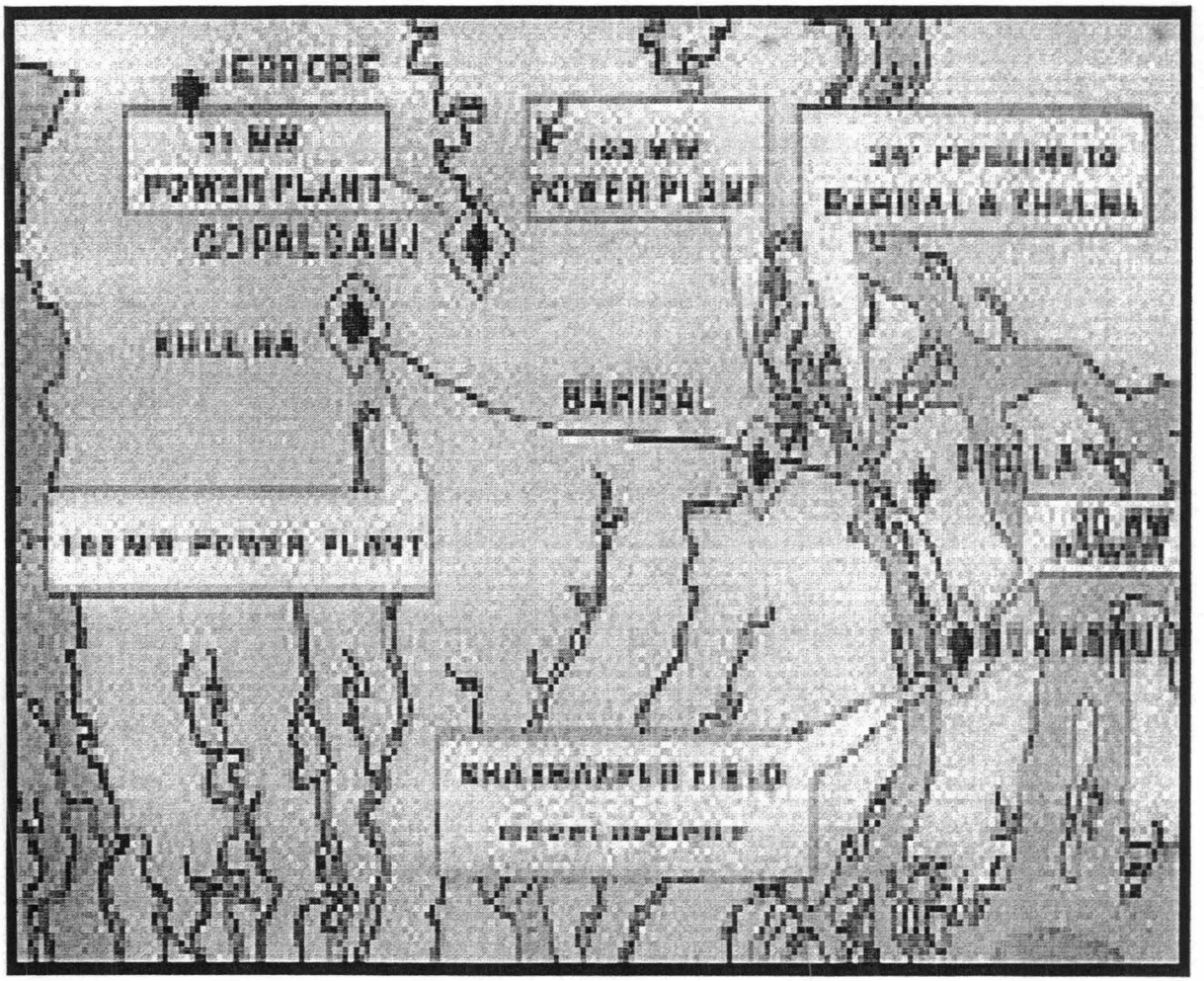
Ports: Chittagong, Mongla (Khulna)

Sources for this report include: Central Bank of Bangladesh; Dow Jones News wire service; Global Insight Asia Economic Outlook; Economist Intelligence Unit ViewsWire; Electric Utilities Databook for the Asian and Pacific Region; Financial Times; the Independent; Modern Power Systems; New York Times; Oil and Gas Journal; U.S. Commerce Department, International Trade Administration - - Country Commercial Guides; U.S. Energy Information Administration; U.S. State Department Background notes on Bangladesh; U.S. Trade and Development Agency -- Bangladesh Strategic Gas Utilization Study; World Gas Intelligence, World Markets Online. Page 8 of 9 Bangladesh Country Analysis Brief

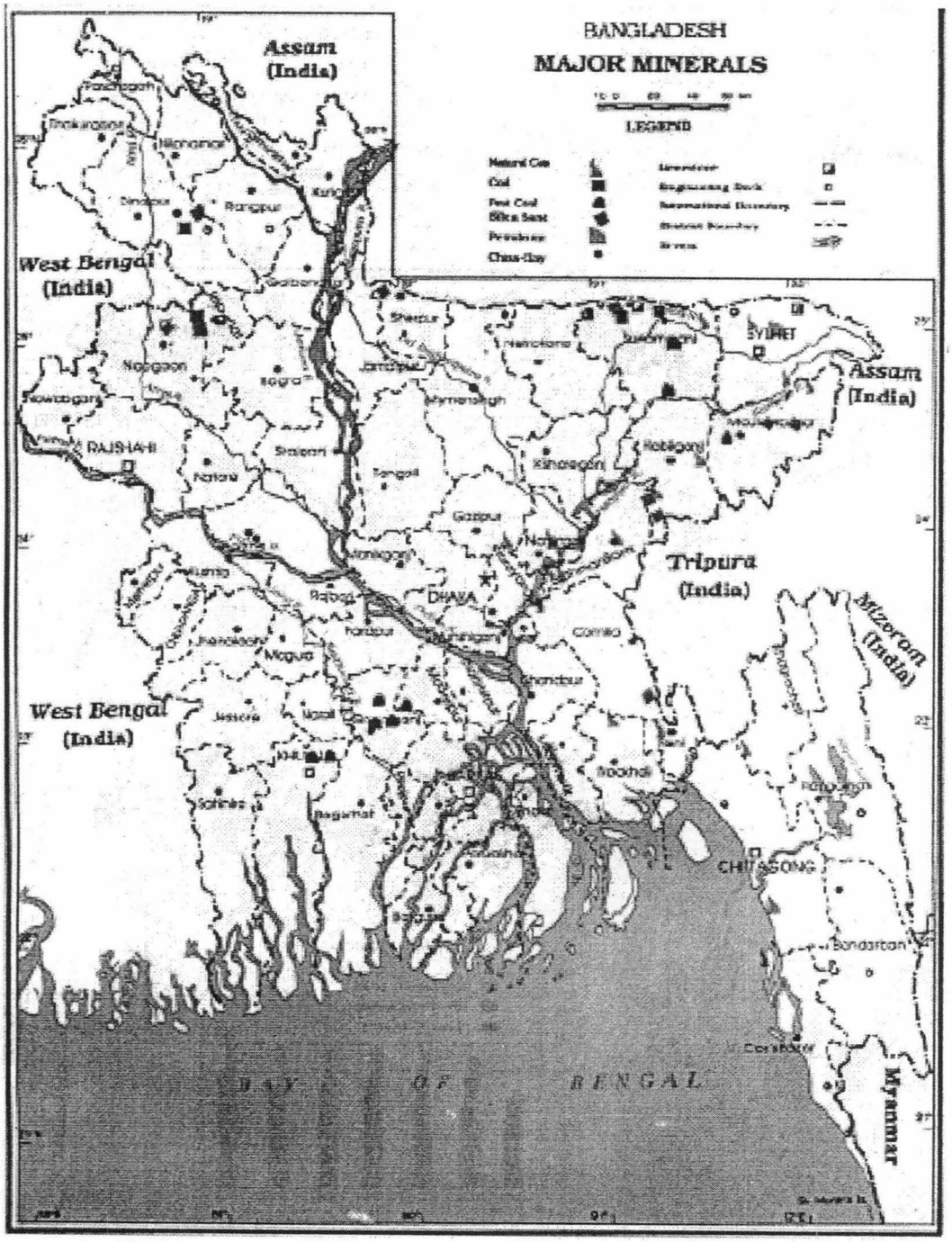
ANNEXURE II

Bangladesh

UNOCAL ACTIVITIES



MAJOR MINERAL IN BANGLADESH



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