

Report No. 24

**BANGLADESH GAS SECTOR DEVELOPMENT:
STATUS, POLICY OPTIONS AND CHALLENGES**

Centre for Policy Dialogue

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The Centre for Policy Dialogue (CPD), established in 1993, is an innovative initiative to promote an ongoing process of dialogue between the principal partners in the decision making and implementing process. The dialogues are designed to address important policy issues and to seek constructive solutions to these problems. The Centre has already organised a series of such major dialogues at local, regional and national levels. These dialogues have brought together ministers, opposition front benchers, MPs, business leaders, NGOs, donors, professionals and other functional groups in civil society within a non-confrontational environment to promote focused discussions. The expectation of the CPD is to create a national policy consciousness where members of civil society will be made aware of critical policy issues affecting their lives and will come together in support of particular policy agendas which they feel are conducive to the well being of the country. The CPD has also organised a number of South Asian bilateral and regional dialogues as well as some international dialogues.

*In support of the dialogue process the Centre is engaged in research programmes which are both serviced by and are intended to serve as inputs for particular dialogues organised by the Centre throughout the year. Some of the major research programmes of CPD include **The Independent Review of Bangladesh's Development (IRBD), Governance and Development, Population and Sustainable Development, Trade Policy Analysis and Multilateral Trading System and Leadership Programme for the Youth**. The CPD also carries out periodic public perception surveys on policy issues and developmental concerns.*

*As part of CPD's publication activities, a CPD Dialogue Report series is brought out in order to widely disseminate the summary of the discussions organised by the Centre. The present report contains the highlights of the dialogue on the theme of **Bangladesh Gas Sector Development: Status, Policy Options and Challenges** held at the Conference Room of the Centre on January 26, 2000.*

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Dialogue on
Bangladesh Gas Sector Development: Status, Policy Options and Challenges

i) The Dialogue

This particular dialogue was organised by Centre for Policy Dialogue (CPD) as part of the process for preparing the Independent Review of Bangladesh's Development 2000, (IRBD2000) CPD's flagship research programme. The dialogue, an in-house one, was titled *Bangladesh Gas Sector Development: Status, Policy Options and Challenges* was held at CPD's Conference Room on 26 January, 2000. The dialogue was organised to review major parameters defining the status of the gas sector, scrutinise recent policy initiatives and their outcomes and assess the policy options currently available to the Government of Bangladesh. Mr. Azim Uddin Ahmed, former Secretary, GOB presented a paper entitled "Bangladesh Gas Scenario" which served as a background paper for the discussion at the dialogue (the paper is appended). With Professor Rehman Sobhan in the chair, the dialogue was attended by a number of distinguished policy makers, experts and economists (list of participants is annexed).

Initiating the dialogue, Professor Rehman Sobhan, Team Leader of the IRBD, briefly dwelt on the objective of IRBD preparatory dialogues. The IRBDs are intended to provide a basis for policy review of major developments taking place in the country and this was carried out through a consultative process. This process included participation of the broader constituencies of stakeholders in the various dialogues so that the IRBDs could benefit from their contribution based on their demonstrated expertise in particular disciplines. He pointed out that the central to this exercise was CPD's conviction that sound policies could emerge only through a close interaction amongst the policy makers, experts and academics, representing the major constituencies of the stakeholders.

Reemphasising the nature of the IRBD preparation process as a participatory one, Professor Sobhan said that the end product of the IRBDs attempts to blend the outcomes of the consultative process with results from research inputs. In this manner IRBDs try to ensure that both the analysis and the recommendations reflect a collaborative endeavour of all concerned stakeholders. Therefore, the document that went into for dissemination not only incorporated research input, but also views of various stakeholders including lawmakers, government officials, representatives of the civil society.

This dialogue report presents the full text of the keynote presentation and a summary of the major issues discussed in the course of the dialogue.

**ii) Initial Remarks by Professor Rehman Sobhan,
Chairman, Centre for Policy Dialogue**

Initiating the discussion Professor Rehman Sobhan mentioned that the IRBD chapter on gas sector should focus on four distinctive and interrelated issues and that these should come under discussion in this particular dialogue. The *first* issue was related to the actual state of supply of and demand for gas. Professor Sobhan hoped that a reasonable and realistic statement of demand and supply projections could be carved out in light of the information provided in the keynote presentation and through subsequent discussion at the dialogue.

The *second* issue, should address the state of the negotiations and the new exploration contracts which are expected to come on stream in the course of the next few years. Since these were very important issues which had been in public focus over the past few years, Professor Sobhan was of the opinion that there was a need to provide transparent account about the negotiating process specially in terms of the conditions set out in the tender and the finalised contracts.

The *third* issue concerned the emerging economics of gas. It was essential to relate the micro impact of the gas sector with the macroeconomic framework. Evidently, the results would not be the same for all stakeholder groups and there will be winners and losers. It was important to shed some light on the trade-offs to be confronted by the policy makers as there might be conflicting sets of macroeconomic interests.

Professor Sobhan suggested that the *fourth* issue could be an assessment of the prospects for gas export. It should focus on what course would the IOCs choose, if they were not allowed to export specially in light of the oft-repeated assertion that the IOCs were interested in investing in the gas sector since there was the possibility to export gas for generating the foreign exchange required for purchasing the gas by the GOB.

Professor Sobhan thought that an indepth analysis of the four issues mentioned above could lead to some concrete recommendations which would help design an appropriate gas development strategy for Bangladesh.

iii) Discussion

Gas Reserve and Supply Projection

During the discussion a number of queries were raised regarding gas reserve and supply projections. A number of participants were of the opinion that reliable estimates of total recoverable reserve of natural gas was a critically important factor in identifying the modalities for future use of gas in Bangladesh.

In general, agreeing with the projections of gas reserve and supply presented in the keynote presentation, Mr. Mosharraf Hossain, Chairman, Petrobangla mentioned that the estimates were in line with that of Petrobangla. He thought Bangladesh's current gas scenario as encouraging. He informed that BAPEX was at present producing gas from 38 wells in 9 gas fields, and has a programme of increasing its production to 1100 MMCFD by the year 2000. As regards gas reserves, his estimation was that within the 23 TCF of gas identified as reserves about 14 TCF was recoverable. Referring to the recent analysis of gas field data, he informed that the data indicated that Bangladesh's gas fields were not properly evaluated. Citing examples from such fields as Titas, Rashidpur and Habigang, he informed the participants that recent data indicated that the gas reserves were more than what was estimated earlier. He argued that as a result of the vastly improved detecting and exploratory techniques such as satellite imaging, both total and recoverable reserves would be considerably higher than those of earlier estimates.

One of the participants from BUET informed the participants that the last gas reserve estimates made in Bangladesh was in 1992. He referred to some recent studies done by the BUET. He argued that the total gas reserve and recoverable reserve would actually be much higher than what was indicated by most of the estimates made earlier. He informed the participants that the cited estimate showed that in Titas gas field, recoverable gas reserve was close to 6 TCF. This was in contrast to the estimate made by Petrobangla which was 4.3 TCF. Although Bakhrabad gas field was projected as failure by many, he would not agree with such observations. He informed that there were five estimates of Bakhrabad by different companies at different stages and time: only one estimate projected reserves to be 2.3 TCF and above whilst all other estimates were between 1.2 to 1.3 TCF. 50 percent of the gas from this field had already been recovered; standard recovery was about 60 percent. A deviation of 10 percent could not be considered as failure by any standard, he argued. He thought that the recovery may exceed 55

percent as it was producing at a very low level. He also believed that Petrobangla will be able to supply gas from the existing field of Kailashtila for the next five years.

As regards estimates, one participant informed that whenever a gas field was discovered, usually the higher side estimate of gas reserve was disclosed. Mr. Mosharraf Hossain, however, opined in this connection that this was usually done as to get the share prices high.

However, Professor Quader of BUET mentioned that if gas extraction is done at a lower pressure the recoverable reserves would rise. He informed that this was the practice in most of the developing countries. He mentioned that Bangladesh had some fields of smaller size which were unlikely to be brought under exploitation very soon. Citing examples of fields such as Samutang, Kutubdia and Shabazpur which were highly unlikely to come under national grid very soon, he opined that this should be taken into account in estimating total and recoverable reserve.

Professor Quader added that when one talked about likely reserves of Bangladesh one must look in terms of the geological structures of the country. He emphasised that without having a clear idea about these structures, it would be difficult to estimate gas reserves and recoverable reserve. A clear understanding about these structures would provide the basis for estimating the gas potential of a particular country. Consequently, he was of the view that at present we were far from knowing how much of the potential we had already used.

State of Exploration Agreements

Professor Rehman Sobhan asked the participants to shed some light on what was the state of the exploration of the gas fields. Whether Petrobangla was entering into any agreement or there was any policy not to enter into any agreement to give the exploration concession, he enquired.

In response, Mr. Mosharraf Hossain informed dialogue participants that Petrobangla was already working with four IOCs in eight blocks. Some of IOCs had left in the mean time and some structural changes were also taking place, he informed. Regarding the new round of bidding, he informed that a number of companies had been selected and negotiations with these had also been completed. He mentioned that the IOCs were not explicitly saying that they want to export gas, but they were apprehensive about GOB's real capacity to buy gas in foreign

exchange. What remained as a stumbling block for the IOCs regarding natural gas exploration is the possibility of discovery of gas in an amount which exceed Bangladesh's projected demand.

Projection of Gas Demand

As regards demand projections, Professor Sobhan observed that there remained problems from both policy and methodological perspectives. He thought that most of the demand forecasting tended to essentially regard demand as a dependable variable emerging out of the various other factors affecting the growth in the economy. He mentioned that there is another approach which has been adopted by gas and energy surplus countries, where energy supply was taken as an independent variable. In such cases forecasting was done as a consequence of available resources including various investment activities relating to this resource. He, however, mentioned that there were different mechanisms for making forecasts.

Elaborating on his argument, Professor Sobhan observed that while making projections about gas demand one should have a clear idea about the actual demand of the power sector in Bangladesh. In response to this, Mr. Nurruddin Mahmud Kamal, former chairman of the Power Development Board informed that the country faced severe shortage of gas for power production throughout 1990s which meant that the demand for gas exceeded its supply.

The Economics of Business

Professor Rehman Sobhan observed that Petrobangla was not in a position to buy the gas from the IOCs because of its resource constraints. This was evident from the keynote presentation and also from some other researches.

Mr. Mosharraf Hossain mentioned that Petrobangla was under severe economic constraints. The price Petrobangla was paying was greater than what it had paid earlier. He added that currently Petrobangla was paying 50 percent of the production as cost recovery, the remaining 50 percent it was sharing with IOCs, implying that it was getting some gas free of cost. However, recently Petrobangla had some problems in paying the bill since it has been unable to collect its bills, most notably from the PDB. In this regard Mr. Hossain informed the participants that Petrobangla managed to arrange some funds in terms of BAPEX share and also introduced a Hydrocarbon Development Fund (HDF). These were being used to cover the gap between what Petrobangla was buying and selling.

As regards Hydrocarbon Development Fund, Professor Sobhan pointed out that it was an *investment fund* not a *deficit fund*, and argued that it was obviously a structural problem of a serious nature which Petrobangla was facing - its bills were not being paid by its principal consumer.

Export of Gas

As regards the issue of export of gas dialogue participants explored the various options and choices open to Bangladesh. Referring to a US study which showed that Bangladesh might get US\$1.50 by exporting 1,000 cubic feet gas by pipeline to India, one participant mentioned that if Bangladesh opted for the pipeline exports it would take at least five years to build the pipeline and the relevant infrastructure. Alternatively, the country could earn US\$1.25 by export of power by using the same amount (1000 CF) of gas (value added).

In line with the keynote presentation, a number of participants were of the opinion that Liquefied Natural Gas (LNG) was less profitable compared to the export of gas by pipeline. Participants were of the opinion that politics should not be a deciding factor nor should it be the economic religion rather it should be decided on the basis of economic logic and the situation on the ground.

Regarding IOCs' interest in export of gas, Dr. Ijaz Hossain of BUET opined that at the end of the day oil and gas remains a very expensive and risky venture. If some body puts money into such risky business, it was very logical that the minimum attractive return had to be very high.

Pointing out to the process of preparation of the IRBD, Professor Rehman Sobhan mentioned that this in-house dialogue was meant to be a brainstorming session covering specific areas in order to chalk out the issues of concerns and challenges to be taken up subsequently through in-depth analysis. Concluding the dialogue, he also informed the participants that the team might well take the liberty of inviting the selected group back again in the near future at various stages of the preparation of this paper. Once the first draft gets ready or even when the intermediate inputs were ready he would once again request the specialists to join the IRBD for providing inputs to the preparation of the IRBD.

BANGLADESH GAS SCENARIO

Azim Uddin Ahmed

Since the subject matter is controversial, this paper will attempt at highlighting the key aspects only.

PART ONE

1. The search for petroleum started as far back as 1908 when the Indian Petroleum Prospecting Company started drilling in Sittakund, Chittagong. They conducted geographical survey and drilled several shallow wells, but no gas or oil was struck. The Burmah Oil Company (BOC) drilled two shallow wells in Patharia in 1922-23. The wells were abandoned, although there was some trace of crude oil in one well. Then after the war, the Pakistan Petroleum Limited (PPL) undertook seismic survey in Sylhet and south of Chittagong and drilled wells in Sylhet, Patharia, Chatak, Fenchuganj, Patiya and Lalmai and made first discovery of natural gas in Sylhet structure at Haripur in 1955. In 1959, they discovered another gas field at Chatak. The Pakistan Shell Oil Company (PSOC) was even more successful and discovered five gas fields at Titas, Habiganj, Rashidpur, Kailastila and Bakhrabad around this time. Natural gas found in Sylhet and Chatak was brought into production in 1960 and the first supply was made to Chatak Cement Factory and Fenchuganj Fertilizer Factory.

2. In order to clearly comprehend the natural gas situation in Bangladesh, it is important to know what has been achieved so far. This information is essential in order to critically examine the present policy and even, more importantly, to workout a strategy for the future.

3. Without going into details, the following touches on the key aspect only.

- a. Bangladesh's consumption of natural gas in 1970 was only 46 MMCFD and 75 barrels a day of condensate (liquid extracted from natural gas in a processing plant such as petrol and diesel) 29 exploratory wells had been drilled resulting in discovery in 8 wells: success 1:3.6.
- b. In the second phase (from 1971-81), both PPL and Shell left Bangladesh and Petrobangla was established in 1972. Petrobangla conducted exploration through Soviet and FRG assistance. Bangladesh Petroleum Act of 1974 was enacted and off shore oil exploration was awarded to six major international companies in 1974. By 1978 all companies departed. Only Union Oil discovered 1 (One) TCF of gas in Kutubdia, which they gifted to Bangladesh. In 1981 Shell were awarded *blocks in the Chittagong Hill Tracks, but* no oil was found. (It is interesting to note here that gas had already been discovered in Semutang in the CHT long ago) However, Shell also left soon after.
- c. In 1981, only 139 MMCFI of gas was being produced along with 186 barrels/day of

condensate. Major consumers of natural gas (as is the case even now) were Power and Fertilizer. 13 exploratory wells were drilled during this period of which 4 turned out to be gas-rich, success 1:3.

- d. It is during the third phase (1982- 90) that major thrust in the gas sector was made. With the assistance of donor countries/agencies extensive gas field development and expansion of network programs were undertaken. Chittagong was connected with gas network (Dhaka had already been covered) and supply was extend to 59 upazilas in 19 districts. More gas based fertilizer and power plants were brought into operation. 10 exploratory wells were drilled of which 5 were gas-rich and 1 (one) had oil. Success 1:1.6 23 gas development wells were *drilled*. Gas production rose to 490 MMCFD anti condensate 920 barrels/day by 1990.
- e. By 1995 gas production reached 800 MMCFD. All this had been achieved by Petrobangla by it's own efforts

PART TWO

It is extremely important to forecast as accurately as possible Bangladesh's sec total gas demand over the next 10-15 years. This will not be possible without analyzing the present consumption levels and the likely trends over next ten years or so. Before doing so, the following may be interest:

Oil Bill'

Average processing at ERL 1.2 m tons at average \$18 Barrel
Diesel consumption 50% of total 3 m tons consumed = 1.5 m tons.
Kerosene consumption 16% of total 3 m tons consumed = 0.5 tons.
Petrol consumption 3 m tons.
Balance F.O and other low consumption products.
'Faking total average price per ton as \$130 ton Annual Oil Bill = S 400 m

Gas Replacement Value '

On BTU equivalent gas at approx. 800 MMCFD (Annual 242 BCF): 7 m tons of oil = \$ 900 m annually.

GAS major consumers -

Based on current approx. 800 MMCFD at 44% power consumes 350 MMCFD approx.
Based on current approx. 800 MMCFD at 33% Fertilizer consumes 260 MMCFD approx.

Domestic plus commercial (7%) industries (7%) tea + brickfields (9%) are minor consumers. Therefore, annual gas demand and future demand projections have to be assessed vis a vis Power and Fertilizer expansion. Any projection based on hypothetical demand increases on percentage basis would therefore be misleading.

Bangladesh's Current Gas Reserve without considering-gas contracts awarded since 1993.

Total Reserve : 22 TCF
 Total Recoverable : 13 TCF
 Total Recovered : 03 TCF since 1955, the year of first production
 On present production basis of 290 BCF should last 30 years.

The above is perhaps more conservative. Studies conducted by Petrobangla indicate the following:

Table

FIELD	YEAR OF DISC	ESTIMATED GAS RESERVES (TCF)			DAILY GAS IN MMCF	AVG. COND. IN BBL
		PROVEN PROBABLE	POSSIBLE	TOTAL		
SYLHET	1955	0.44	-	0.44	5.0	13.0
CHATTAK	1959	1.90	5.27	7.17	-	-
RASHIDPUR	1960	2.78	1.67	4.45	-	-
TITAS	1962	8.32	0.14	8.46	235.0	315.0
KAILASTILA	1962	3.66	-	3.66	24.0	242.0
HABIGANJ	1963	2.98	-	2.98	85.0	3.5
BAKHRABAD	1969	1.68	2.99	4.67	150.0	300.0
SEMUTANG	1969	0.16	-	0.16	-	-
KUTUBDIA	1977	0.78	-	0.78	-	-
BEGUMGANJ	1979	0.03	0.03	0.06	-	-
FENI	1981	0.02	-	0.02	-	-
BEANIBAZAR	1981	0.24	1.32	1.56	-	-
KAMTA	1981	0.32	-	0.32	3.0	0.8
FENCHUGANJ	1988	0.35	-	0.35	-	-
JALALABAD	1989	1.50	-	1.50	-	-
MEGHNA	1990	0.07	0.03	0.10	-	-
BELABO	1990	0.08	0.06	0.14	-	-
TOTAL : 17		25.31	11.51	36.82	502.0	875.0

Note · it is believed that as a result of vastly improved detecting and exploratory techniques, such as satellite imaging, both total and recoverable reserves would be considerably higher than the figures indicated above

BAPEX is at present producing gas from 38 wells in 9 fields, and has programme of increasing it's production to 1100 MMCFD by the year 2000.

POWER SCENARIO

Power and Fertilizer		Power brake -up = 230 hydro 2678 thermal	
Total Installed Capacity		Generation Capability	
2908 MW		Gas	Others
GAS Operated	Others	1736 MW	412 MW = 2148 MW
2095 MW	813 N MW		

Due to poor maintenance and non-rehabilitation work lost capacity - 760 MW Gas powered lost capacity = 359 MW+ others = 401 MW Fuels for others are HSD/SKO/FO/LDO plus hydro. Peak hour power demand 2114 MW, Peak hour supply 1900 MW (rounded to 2200 MW) shortfall = 200 MW

Assuming generation capability loss due to maintenance work/break-down/non-availability of fuel the following resultant scenario emerges:

1736 MW at 20% loss	= 347 MW = Available	1389 MW
412 MW at 20% loss	= 82 MW = Available	330 MW
<hr/>		
2148 MW	1719 Availability	
1736 MW at 10% loss	=173 MW = Available	1563 MW
412 MW at 10% loss	= 41 MW = Available	371 MW
<hr/>		
	214	1934 total
1736 MW at 5% loss	= 86 MW = Available	1650 MW
412 MW at 20% loss	= 41 MW = Available	392 MW
<hr/>		
2042 MW		

From the above, the following picture emerges. Availability of power from gas operated plants can be maximum of 1736 MW; at 20% loss, it will be 1389 MW; at 10% loss, it will be 1563 MW; and at 5% loss it will be 1650. From other plants, availability can be maximum of 412 MW; at 20% loss it will be 330 MW; at 10% loss it will 371 MW; and at 5% loss it will be 392 MW.

Since it is not possible for all plants to function at 100% capacity, we may work on the basis of 10% loss. Therefore, maximum availability from gas operated plants will be 1563 MW and 371 MW from non-gas operated plants totaling 1934 MW. Against peak hour demand increased to a round figure of 2200 MW, the supply is 1900 MW, thus falling short by 300 MW. This figure can be accepted as quite accurate as approximately 1900 MW is being supplied against current peak demand of 2200 MW. We, therefore, arrive at the disturbing conclusion that the present predicament of the power sector is really not so much on account of gas shortage as the result of extremely poor management, resulting in the actual loss of 760 MW due to non-rehabilitation of less efficient power plants. The current deficit of approximately 300 MW against peak demand of 2200 MW is therefore due power sector deficiency. Had this power been available from even gas operated plants it would have required approximately 66 MMCFD only.

Assuming current average gas production as 800 MMCFD, average supply (44%) for power is 352 MMCFD. As we have seen, the current maximum power supply from gas operated plants is around 1563 MW and 371 MW from others. This actually accounts for the 1900 MW being currently supplied during peak hour demand. At maximum of 22 MMCFD per 100 MW, gas for 1563 MW should not exceed 352 MMCFD. The massive load shedding which the people are being made bear is the difference between the actual supply of 1900 MW and 2200 MW peak hour demand. On the basis of this calculation also we come to the same finding -that the present power crisis is not due to insufficient gas but due to serious mismanagement resulting in decline of total (both gas and non-gas) power availability. Since demand rises to 2200 during peak hours and supply is 1900 MW, the shortfall is distributed among other consumers; fertilizers, industries, commercial concerns, domestic consumers etc. If total supply of gas (for whatever reason) is less than 800 MMCFD (actual may be close to 785 MMCFD), supplying 352 MMCFD to power (during peak demand), would result in less supply of gas to other consumers. Therefore, it is possible that during peak hours, there may be marginally less production in some fertilizer plants- but this should be negligible.

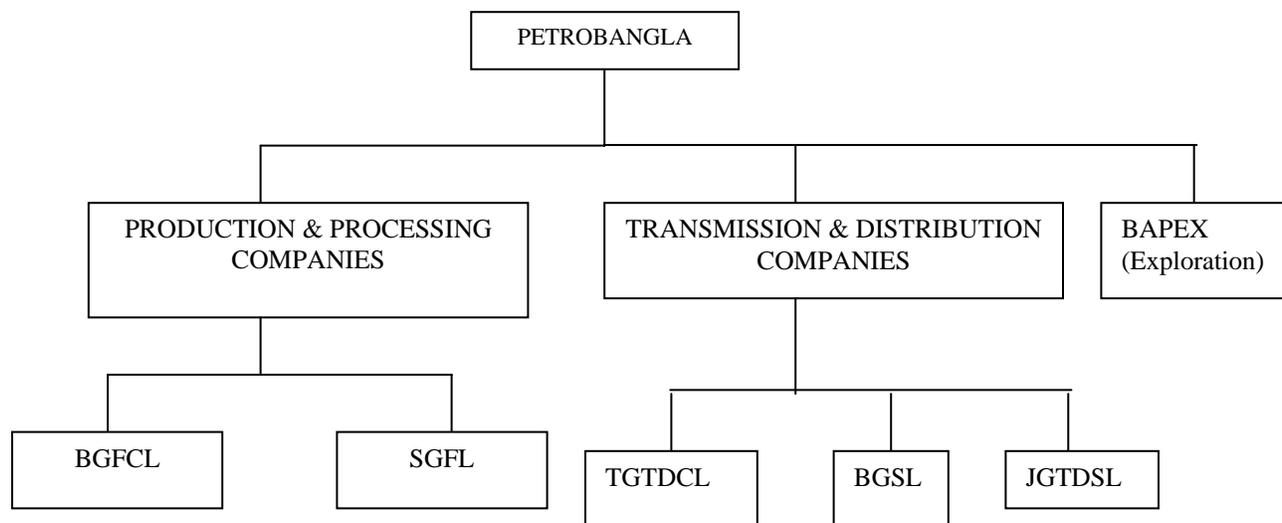
PART THREE

1. Bangladesh, has not been sitting idle. After slow growth in the first ten-year period (1971-81), gas availability rose from 134 MMCFD to around 500 MMCFD in the second ten-year phase (1981-91). There was further increase of 300 MMCFD by 1995 reaching the total production level of 800 MMCFD. At present, BAPEX'S production has stagnated to accommodate the foreign suppliers like Cairn (Ex-Sangu) and Oxy (Occidental) ex-Jalalabad. Total gas supply now should be around 900 to 950 MMCFD.

2. The result of the above has been quite remarkable, from a modest beginning of supply to Chatak Cement Factory and Fenchuganj Fertilizer factory (which almost entirely accounted for the 46 MMCFD in 1971), today almost 80 percent of gas being produced is going to power and fertilizer. Of the present 2900 MW of power, more than 2000 MW is gas fed; and the current 2 (two) million tons of Urea is entirely dependent on natural gas. Apart from multiple impact this has had on the country's economic growth, not the least has been the saving gas production has brought about in the country's oil imports, without which it would have been 4 to 5 times higher, resulting in serious depletion of foreign exchange reserves.

3. Since its birth in 1972, Petrobangla has expanded its operations in all facets of gas development; exploration, production, transmission and distribution. The present structure stands as follows:

**PETROBANGLA'S EXPLORATION
PRODUCTION AND DISTRIBUTION NETWORK**



- BGFL : BANGLADESH GAS FIELD CO. LTD
- SGFL : SYLHET GAS FIELD LTD.
- TGTDC : TITAS GAS TRANSMISSION & DISTRIBUTION CO. LTD
- BGSL : BAKHRABAD GAS SYSTEMS LTD
- JGTDSL : JALALABAD GAS TRANSMISSION & TRANSMISSION SYSTEM LTD.

- (a) From the above, one can see that fairly elaborate structure had been established for Petrobangla's exploration, production and distribution.
- (b) One of the major snags has been less than the maximum possible production at a given time due to inadequate surface facilities and *pipeline* network. From the following 1991 picture, this particular point will be clearer.

FIELDS	NO OF EXISTING WELLS	PRODUCTION CAPACITY CMMCFD)	NO.OF WELLS ON PRODUCTION	DAILY GAS (MMCFD)	AVG. PROD. COND (BBL)	PROCES. CAPACITY (MMCFD)
TITAS	11	315	10	235	315	330
BAKHRABAD	8	210	8	150	300	240
HABIGONJ	6	180	4	85	4	120
KAMTA	1	3	1	3	1	30
TOTAL	26	708	23	473	620	720

- (c) The above shows that on account of all existing wells not being in production; daily off-take of gas had to be only 473 MMCFD whereas full production capacity was as high as 708 MMCFD. It was the result of pipeline expansion, in particular, remaining behind production. This problem became even more acute with time. It was obviously the creation of inadequate and unsynchronized funding and bureaucratic delays. Despite all its achievements, Petrobangla therefore, never functioned at its peak efficiency.

PART FOUR

THE GAS SCENARIO AND POLICY OPTIONS

1. It is being stated that Bangladesh has no option but to rapidly expand its gas production in order to meet its sharply rising demand. This is, unfortunately, an exaggeration. Demand of gas for power and fertilizer (in particular) will not rise as is being made out. There are two main reasons for this. As we have seen earlier on in this paper, quite substantial increase in power availability is possible by long-neglected rehabilitation of both gas and non-gas fed existing power generation. In addition, rise in demand for power depends on the country's over-all economic growth, which is predictably going to be less encouraging than the optimistic would like us to believe. As for fertilizer, rise in demand would depend on the expansion of country's fertilizer production. There are perhaps no such immediate plans. Besides, the enterprise having a fairly long gestation period, a new plant is not expected to be in place earlier than 5-6 years from now even if there be ally thinking in that direction.

2. In this context it may be of interest to analyze the situation emerging out of Petrobangla's own demand and supply projections

Bangladesh's Supply/Demand Projections:

Maximum Production	1996 /97	1997 /98	1998 /99	1999 /2000	2000 /2001	2001 /2002	2002 /2003	2003 /2004	2004 /2005
Demand with Power peak	704	1000	1296	1433	1473	1418	1418	1413	1413
	1077	1100	1170	1273	1274	1400	1501	1610	1728

3. Petrobangla's projections (they may have meanwhile changed the supply projections) indicate supply falling short of demand. Actually, supply, as we shall see, will be available from foreign producers not only to meet this demand projection but be in considerable excess of the country's absorption capacity.

4. Given the above demand projections, total gas demand for the year 2000/01 (on the basis of peak power demand) has been shown as 1273 MMCFD. It appears that BAPEX has a programme of increasing production from the present around 800 MMCFD to 1100 MMCFD by 2000, With Cairn 200 MMCFD from Sangu alone and Oxy 100 MMCFD the supply would be 1400 MMCFD, thus it would be in excess of demand by at least 130 MMCFD. With Semutang (where Cairn has already discovered gas) coming on-stream soon, contracts under the PSC awarded to United Meridian, Oakland-Rexwood etc. it is quite possible that their total discovered gas might exceed 10 TCF by 2005. Based on 7.5% annual production of the total discovery allowed under the PSC, their productions would exceed 2000 MMCFD, totaling 2400 MMCFD, thus leaving an excess of at least 600 MMCFD over total demand including peak power requirement, Two other factors may bring about alternation in the quantum of excess gas. The excess gas would be more if the projected demand turns out to be less; but, on the other hand, it would be less if Petrobangla's production instead of increasing remains static at 800 MMCFD. In ease this happens, then alongside reduction of excess gas, Bangladesh's dependence on contractor's supplies and therefore the foreign exchange burden increases. But, nevertheless, it is very possible that' by year 2005 the quantum of excess gas may be as high as 1000 MMCFD.

A CASE FOR EXPORT AND SOME ASSOCIATED CALCULATIONS

5. It is therefore inevitable that a very strong case will very soon emerge for export of gas. In fact it is for this reason primarily that so many foreign gas operators are now engaged in capturing as many gas-rich blocks as possible. Given Bangladesh's very limited capacity for payment, they know that their only means of getting their many back is by way of export. Export, therefore, is the key element of the emerging scenario. Whether this is bad or a good thing is another matter.

6. It is relevant here to see the export provisions of the PSC *ex-Sangu*.

Natural Gas for Export:

"Subject to the provisions of Articles 14.7, 14.8 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

- (a) Contractor's Cost Recovery Natural Gas, and
- (b) Contractor's Profit Natural Gas, and
- (c) 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)

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 produced 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 (11^m) Calendar Year following the start of deliveries for the purpose of export (Article 14.7)"*

7. As can be seen the Contractor can export, if he choose to do so, the entire quantum of Marketable Natural Gas. The only limitation has been prescribed under article 14.7 is that Petrobangla can claim upto 20% for the first 10 years and up to 30% thereafter. So we see that the owner of the resource (gas) namely Petrobangla (Bangladesh actually) is limited to the quantum just mentioned regardless of domestic requirement for more. It is interesting to note here that on production of 58 BCF annually the estimated quantum of 848 BCF discovered at Sangu will run out in 13/14 years even if it is feasible to extract 100 percent. At maximum annual production of 7% of Estimated Ultimate Gas Reserve from the Production Area mentioned in the GPSA the runout period comes to almost the same. But if the Contractor chooses to sell gas as will appear from a reading of Article 14.10 (a) and (b) given below, Petrobangla is bound to buy his full share regardless whether it can get supply from any other source. Since the commitment is based on a price formula, Petrobangla shall be paying at the calculated price regardless availability at a lower price from any other source.

"The Contractor may offer such gas to BOGMC and BOGMC shall undertake that it or one of its Affiliates will purchase the gas. This obligation shall not be diminished if additional reserves of gas are discovered outside the Contract Area as long as the Contractor is fulfilling its obligation to deliver Natural Gas from the Production Area and the volume of Natural Gas so delivered does not exceed the Development Plan or such greater volume as has been agreed between BOGMC and Contractor.

"The contractual terms of purchase and sale of such Marketable Natural Gas shall be negotiated prior to and included in the Development Plan and shall include the financial terms set out in Article 14.11.

Alternatively, the Contractor can sell Natural Gas to third party.

The above undertaking to buy as stated is tagged to a price formula. Article 14.11 (the third advantage) gives the price formula. The material parts are as follows:

"The financial terms to be included in the purchase and sale agreement referred to in article 14.10 shall be as follows:

- (I) The price for Natural Gas shall be calculated as follows:
 - (a) Subject to article 14.11 (ii) below onshore gas the price shall be seventy-five percent (75%) of the Market Price calculated in (c) below converted to US dollars per mscf on the basis of thermal energy equivalents
 - (b) For offshore gas the price shall be twenty-five percent (25%) higher than for the onshore gas price calculated in (a) above
 - (c) The Market Price shall be calculated for each Calendar Quarter based on the arithmetic average of the daily APPI quotations of High Sulphur Fuel Oil 180 CST ("HSFO") FOB Singapore, only for such days as such quotations are published, for *the six* months ending on the last day of the second month preceding the start of the quarter for which the calculation of the Market Price is to be made.

- (II) Should the Market Price for any Calendar Quarter, calculated as in article 14.11 (i) (c) above, fall below a floor price of \$ 70 per metric tones of HSFO or rise above a ceiling price of 120 per metric tones of HSFO, the Market Price for that quarter *shall* be fixed at the floor price or *ceiling* price respectively.

The following are resultant calculations based on supply of 160 MMCFD

Definitions:

- TCF (Trillion cubic feet)
- BCF (billion cubic feet)
- MCF (thousand cubic feet)
- MMCF (thousand thousand (a million) cubic feet)
- MMCFD (a million cubic a day)

Sangu Reserve 848 BCF Value at US \$ 2/MCF \$1.696 Billion
Value at US \$ 3/MCF \$ 2.544 Billion

Annual Production at 160 MMCFD 58 BCF (approx.)
Value at US \$ 2/MCF \$117 million (approx.)
Value at US \$ 3/MCF \$175 million (approx.)

Share Split:

Contractor Cost Recovery (CR) 60% of 160-96 MMCFD

Contractor Profit Gas (PG) of the remaining 40% =30.4 MMCFD

Petrobangla Profit Gas (PG) of the remaining 40% =33.6 MMCFD

Total Daily Share of 160 MMCFD Contractor 126.4 MMCFD

Total Daily Share of 160 MMCFD Petrobangla 33.4 MMCFD

Value of Daily Cost Recovery Gas of Contractor at US \$ 3/MCF of 96 MMCFD = \$ 2,88,000

Value of Daily Profit Gas of Contractor at US \$ 2/MCF of 30.4 MMCFD = \$ 60,000 (approx.)

Value of Daily Profit Gas of Contractor at US \$ 3/MCF of 30.4 MMCFD = \$ 90,000 (approx.)

Value of daily Total Share of Contractor CR+PG at US \$ 2/MCF = \$ 2,52,000

Value of daily Total Share of Contractor CR+PG at US \$ 3/MCF = \$ 3,78,000

At \$ 2/MCF out of gas worth \$ 3,20,000/Contractor gets \$ 2,52,000 (approx.)

At 3/MCF out of gas worth \$ 4,80,000/Contractor gets \$ 3,80,000 (approx.)

Petrobangla gets for its share of 33.6 MMCFD at US \$ 2/MCF \$ 67,000 (app)
Worth of gas

Petrobangla gets for its share of 33.6 MMCFD at US \$ 3/MCF \$ 1,00,000 (app)
Worth of gas

Annual take of Contractor as Cost Recovery at US \$ 2/MCF = \$ 70 million

Annual take of Contractor as Cost Recovery at US \$ 3/MCF = \$ 105 million

Annual take of Contractor as Profit Gas at US \$ 2/MCF = \$ 22 million (approx.)

Annual take of Contractor as Profit Gas at US \$ 3/MCF = \$ 33 million (approx.)

Contractor Total Annual Gas Value at US \$ 2/MCF = 92 million out of \$ 117 million

Contractor Total Annual Gas Value at US \$ 3/MCF = 138 million out of \$ 175 million

Petrobangla's Annual Gas Value (Profit Gas) at US \$ 2/MCF = \$ 24 million

Petrobangla's Annual Gas Value (Profit Gas) at US \$ 3/MCF = \$ 36 million

Calculations at \$ 2/MCF Cairn receives US \$ 2,52,000 (app) monthly = \$ 7.58 million (approx.)

Cairn receives 92% in US \$ (foreign or charge) US \$ 2,33,000 (approx.) \$ 7 million

Cairn receives 7% in local currency TK 8 lacks (approx.) TK 242 lacks monthly

The above monthly figures will go correspondingly higher in case of price escalation of HSFO ex-Singapore

8. Petrobangla has to pay 92½% in foreign exchanges and 7½% in local currency for the Contractor's share of gas. The foreign exchange will obviously come from the government coffers, but Petrobangla will have to generate the Taka part from its own resources. Annual payments to the Contractor will be around Tk.400 (four hundred) crore at US \$ 2/MCF and more if the price escalates. The additional problem facing Petrobangla would be the price differential between supplies to particularly bulk consumers like fertilizer and power and the gas supplied by the Contractor. For example, at present the subsidized price for fertilizer is around one US Dollar/MCF whereas at the minimum it is US \$ 2/MCF for the Contractor. Further, there are defaulters with considerable overdue to Petrobangla such as power, whereas the terms under the GPSA are stringent with penalty provisions for delayed payment. The price differential for Petrobangla would become more onerous if Taka is devalued against US Dollar. Therefore, as a result, Petrobangla is exposed to double jeopardy- having to pay to the Contractor without being paid by at least some consumers and secondly, having to meet the difference in prices as well.

9. It is therefore of utmost importance to reduce the Contractor's Cost Recovery gas to the lowest possible levels. This would require very close monitoring by Petrobangla to ensure that the Contractor does not inflate his claims and his expenses are kept to reasonable limit.

Assuming Contractor's 30% CR = 48 MMCFD at US \$ 2/MCF = US \$ 96,000/Day

Approx. 48% of Remaining PG 112 MMCFD = 54 MMCFD (approx.) US \$ 2/MCF = US \$1,08,000/Day

Total CR+PG = US \$ 2,04,000 say \$ 2,00,000/Day

This is a reduction of US \$ 50,000/Day approx. from maximum claim

Contractor's (CR = \$ 35m) + (PG = \$ 39m) = \$ 74 m (approx.) out of \$ 117 m/year

Assuming Contractor's 20% CR = 32 MMCFD at US \$ 2/MCF = US \$ 64,000/Day

Approx. 48% of Remaining 12g MMCFD PG = 61 MMCFD (apron) = US \$ 1,22,000/Day

Contractor's (CR = \$ 23m)+(PG=\$ 44m) = \$ 67 m (approx.) out of \$117 m/year

Total CR+PG = US \$1,86,000/Day

This is a reduction of US \$ 64,000/Day (approx.) from maximum claim.

From the above one can see that even by substantially reducing the Cost Recovery gas, the Contractor's daily take remains very high. The reason is simple. The saving from CR is being added to PG resulting in the Contractor getting very substantial part as Profit gas (PG). This situation is fundamentally flawed because the lower the cost of the Contractor in Petroleum Operations the higher becomes his profit

10. There could be another even more compelling reason. There is little doubt that the country would be needed considerable amount of money (almost entirely in foreign exchange) to buy gas for its own use. The scale of fund requirement would of course depend on a number of assumptions.

They are as follows:

BAPEX's PRODUCTION REMAINING STATIC AT 800 MMCFD YEAR 2000/01

BAPEX 800 MMCFD
DEMAND 1273
2000/01
Balance 473 MMCFD

Value of GAS	Contract's at 60% CR and 25% PG
AT \$ 2 MCF = \$ 946000/day	\$ 662200/day - \$ 241m/yr
AT \$ 3 MCF - \$1419000/day	\$ 993300/day = \$ 362m/yr

2005

BAPEX 800 MMCFD
DEMAND 1728 MMCFD
BALANCE 928 MMCFD

VALUE OF GAS WITH CONTRACTOR'S SHARE

AT \$ 2 MCF	= 928X\$2X365X70% = \$ 474 m/year (Contractor's share)
AT \$ 3 MCF	= 928X\$3X365X70% = \$ 711 m/year

11. The above figure will vary with BAPEX's production and the capacity of Petrobangla to reduce CR gas of contractor by strict monitoring. This possibility is however remote. Besides, the current gas exploitation by foreign operators would be found to be 7 to 8 times costlier than

that of Petrobangla. It is therefore very unlikely that the foreign investor would allow reduction of CR gas from 60% of total gas produced in a given year. However, with the degree of reduction in the contractor's expenses (if feasible), Bangladesh's share of CR gas would enhance to the extent it becomes part of PR gas. Secondly, in the above calculations, the contractor has been given only 25% PG which is rather conservative. The PG of contractor ex-Sangu is 48%

12. Other possibilities exist which again would alter the above figures, First it is possible that BAPEX's own production may be curtailed (I understand it has already started) to accommodate the foreign gas operators; and secondly Bangladesh's demand may not rise as projected. The third possibility is the country having to curtail gas consumption for lack of fund to pay the foreign suppliers. There may be other permutations and combinations; but, nevertheless, this factor would almost certainly be a very strong case for gas export.

MANNER OF EXPORT

13. It will help to remember that Bangladesh has already entered into contractual obligations under the PSC and subsequently, upon discovery, the GPSA. These, when executed by contracting parties, are binding documents under the rules of the International Chamber of Commerce and the Rules of the International Centre for Settlement of Investments Disputes. There are provisions in these documents that permit the Contractor to export his share of gas in case Petrobangla either declines or is unable to buy it. It is extremely doubtful if escape from their implications or obligations is possible by application of the dictum of "sovereign right" favouring one of the contracting parties.

14. In case gas export becomes inescapable, the question would arise as to its manner or mode. The PSC allows the contractor to export excess gas, but restricts it to one mode only, and that is by setting up of an LNG infrastructure. Needless to mention an LNG facility is a multi-billion Dollar investment and once established, would be fully recoverable from the export earning as part of CR gas. Therefore, a stage may soon arrive when the LNG export would have to be weighed against the cheaper form, namely the pipeline option. Nevertheless, opting for any particular manner of export, all factors together with in-depth cost benefit analysis will have to be done. It needs to be mentioned, however, that in case exportation becomes unavoidable and pipeline option is chosen as relatively more beneficial, the PSC would require necessary amendment.

IMPLICATIONS OF GAS EXPORT

15. It is being argued with good reason, that export of gas would not be in national interest. The question tagged to this issue is one of quantum and the country's own short-term as well as long-term requirement. It must never be forgotten that natural gas is a non-renewable energy source and perhaps the country's only resource of great value. Table () shows the proven-probable and possible reserves in the fields exploited by Petrobangla upto the year 1990. Proven, and probable reserves alone, as will be noticed, should last including incremental demand at least quarter of a century. With more sophisticated techniques and satellite imaging available now, it is possible not only to extract more from a particular field but also to gather more information about its potential. This factor alone should considerably enhance the potential of existing fields under Petrobangla.

16. Since Bangladesh has chosen to depart from the policy that was being followed till 1993 and part with gas-rich or even discovered fields in favor of foreign operators, the implications of exportation need to be examined. It has been seen that the PSC allows the Contractor maximum of 60% of gas produced in a given year as Cost Recovery (CR) gas. In this context, it has been considered that by close and skillful monitoring the Contractor's claims could be reduced in order to improve Petrobangla's share from modest 30% (or 20% ex-Sangu) to something more respectable. In case of export this situation as will be seen becomes more complicated and onerous for Bangladesh.

17. Since BAPEX has come to virtually a dead-end and all gas blocks are being allocated to foreign investors, Petrobangla will have to buy Contractor's share of gas (in addition to what it receives as its share of Profit gas) to meet its requirements. This gas, needless to mention, will be extremely costly, as it would reflect the contractor's high investment plus his profit. Each Dollar spent or purported to have been spent will have to be borne by Petrobangla. Therefore, in the coming days, increase in gas demand will not be such a good news for Petrobangla. As already discussed, export of gas may therefore become unavoidable.

18. Let us now examine the export scenario:

Exportable GAS

Exportable gas may consist of contractor's share and share of Petrobangla. Contractor's share shall include all domestic costs (some immediate and balance staggered) and thereafter his profit. There is little doubt that given additional expert cost (cost in addition to recovery of domestic investment -whatever may be the mode of export), 60% of gas exported shall be recoverable towards costs and the balance 40% shall consist of Petrobangla's 75% and Contractor's 25%, thus yielding Petrobangla only 30% of total gas.

19. The following simple figures will show: -

$$\begin{aligned} 1000 \text{ MMCFD} \times \$ 2 \text{ MCFx } 70\% &= \$1400,000/\text{day Contractor} \\ 1000 \text{ MMCFD} \times \$ 2 \text{ MCFx } 30\% &= \$ 600,000/\text{day Petrobangla} \\ \text{Total} &= \$ 2000,000 \$ 2 \text{ m/day of gas} \end{aligned}$$

The above quantum of export shall exhaust 1 (one) TCF of gas in less than 3 years. The period *will be* longer if *the* quantum of export increases gradually from 100/200 MMCFD and reaches 1000 MMCFD in five years or so. But there is no gainsaying the fact that Petrobangla will receive only \$ 60,000/day and Contractor \$ 1,40,000/day if export is 100 MMCFD -- the figures changing but the ratio remaining the same with every increase in the volume. The figures will again vary with increase in gas price (if there be any). This is, of course, very simple arithmetic, but valid. The details (both in case of pipeline or LNG export) will surely consist of many other elements such as amortization and profit etc., but the broad spectrum shall, more or less, remain the same. There will be substantial difference in Cost Recovery period for LNG vis-a-vis pipeline options. Again, LNG option will not be feasible if export becomes imperative or unavoidable over a shorter time frame and the captive quantum be less than 5/6 T.C.F.

20. There is another aspect of this scenario worthy of serious consideration. We have seen that natural gas discovered in 1955 has, over the years, brought about quite a remarkable

transformation in the country's economic development It is doubtful if Bangladesh *would* have had a viable economy-let alone a developing one - without this resource. Following a policy of utilizing it in consonance with its own development efforts, the country has consumed less than 03 TCF (bulk over past 15 years) since discovery. As accelerated consumption since 1981 onward has shown, gas availability has not lagged behind the pace of over-all development. Even incase of power, there is a suppressed demand not for lack of gas, but absence of efficient planning and execution in the power sector itself. As we have seen, even the current power crisis has not been caused by shortage of gas.

21. Related to this issue, there is another extremely important factor namely, the country's sovereign right over its own resources. Since all blocks (including gas-prone as well as discovered) are being parted with 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. In this context, I may quote from a paper I wrote more than a year ago.

"There is another clear possibility emerging out of the current policy. There is no doubt that all the 23 blocks are not gas rich. Of these 8 more attractive blocks have already been allotted. The remaining gas rich blocks are on the allotment list. Since all gas prone blocks would have been given to foreign operators very soon, it could be said without fear of contradiction that at the end of the day Bangladesh would be left with almost nothing of its only real resource, having palmed off 80% to the foreigners- Whatever the reserve (and it is very unlikely to exceed 30 TCF), at 71/2 % of annual extraction of total discovered reserve, it would all be exhausted by the year 2011 or thereabouts. The rest is left to the imagination of the reader."

PART FIVE

PRICING AND MANAGEMENT ISSUES

1. In the paper "Bangladesh: Energy and Development" mention has been made of ownership and management of gas and power and the Pricing policy of these two energy sources. These issues require exhaustive socio-economic analysis, which is not possible within the framework of this paper. However, certain basic aspects of these issues may be broadly outlined here.

2. It is fundamental that costlier the project, venture or enterprise the costlier shall be its output. Keeping this basic factor in view, Bangladesh has been following the policy of keeping its gas tariff lower for power and fertilizer than other consumers. For example, in the year 1990 the following was the tariff structure for major consumers.

Power	:	Tk. 37.95	per MCF
Fertilizer	:	Tk. 32.82	per MCF
Industries	:	Tk. 80.50	per MCF
Tea Estates	:	Tk. 90.62	per MCF
Commercial	:	Tk. 126.50	per MCF
Domestic	:	Tk. 74.75	per MCF

Note: The gas tariff structure is fixed by the government annually in consultation with Petrobangla. The structure has surely undergone change over the years but the principle of variable pricing has remained intact.

3. Favorable pricing for power and fertilizer is self-explanatory. For example, if gas tariff is increased by a Dollar, *the* price of fertilizer shall increase by more than Tk. 2000 (two thousand) per metric ton. The same is true of power generation, although the impact on power tariff would be marginally less. Any enhancement in gas tariff and as consequence in power tariff, will result in increasing the cost of domestic product to the degree of its dependence on either or both of them. For example, in case of Urea fertilizer, gas dependence being very high the impact of increase would be such higher than for a product with lesser degree of dependence. Its consequential multiple impact on agriculture can also be assessed.

4. That domestic gas pricing has to be in line with international price structure is a fallacy. International pricing is relevant in case of fixation of export price and infixing tariff under gas contracts only. A country may have a price structure, which suits its own socio-economic aims and objectives and over-all quantifiable and unquantifiable benefits for its people. This flexibility and control available to the government is however going to be eroded and diminished as the quantum of contractual supplies increases.

5. It would be almost impossible for the government to avoid appreciable enhancement of gas tariffs to meet *its contractual commitments*. The *situation* would become increasingly onerous as the burden becomes two-fold----higher tariff and liability of payment in foreign exchange. Inevitable Taka devaluation vis-à-vis Dollar would make the resultant situation even more complicated. Then the question would arise as to the foreign exchange liability for payment--- the consumer or Petrobangla? I am afraid, I am only scratching the surface here. Its multiple impact requires in-depth analysis and the emerging scenario may not be very pleasant.

6. The same applies to power sector. Here again I can see a two-fold impact. Private sector power generation would be certainly costlier than generation under PDB. In this context one must not overlook the fact that despite some relatively old power plants together with chronic neglect (for whatever reason) in timely repair and rehabilitation, PDB's generation loss (mainly technical) has not been unsatisfactory. The deficiencies of PDB's operations have been not so much even in its transmission network, but distribution. It is here that the bulk of so-called system losses have occurred. The reasons are many but all relate to poor management and inability or unwillingness to control corrupt practices down the line. The purpose of this paper is not to apportion blame, It is nevertheless not difficult to see that given the required purpose and will these problems were certainly not insoluble.

7. Private generation's power cost shall directly emanate from its higher establishment and operating costs plus the element of profit. The private entrepreneur will also have to buy costlier gas (costlier than now), further enhancing his cost of production. He will certainly charge all these in foreign exchange. The issue that would bedevil here would be similar to gas consumption - whose liability to bear the foreign exchange element? What happens to tariff-- would it be subjected to fluctuating gas tariff? Would higher gas price be applicable to both PDB and private operation? Then, again, would private operation be free of all that ails PDB?

8. One can easily see that a complicated situation is very likely to emerge. I recall here a former Chairman of the PDB confessing lack of expertise in dealing with proposals or offers submitted by private companies. Can we therefore expect a better performance in monitoring the

operations of private sector ventures? Would it be the same story as one sees emerging in the gas sector where Petrobangla has signally failed to monitor, let alone control, expenditure purportedly incurred by private operators?

PART SIX.

1. Alternative sources of energy, such as hydel or solar, are a remote prospect for Bangladesh. Even if there was such a possibility in some distant future, there is no alternative to natural gas for products such as fertilizer. The prospects for utilization of coal are good, but they are limited to primarily power generation and that also not exceeding 10 (ten) percent of total demand.

2. It would not be an over-statement that natural gas happens to be the base on which the entire industrial and commercial superstructure has been built. Its continued availability in ever-increasing volume in keeping with rising demand, is therefor a sine qua non for the country's economic survival.

3. In order to comprehend the emerging gas scenario, it is necessary to remove some misconceptions which have led to somewhat distorted perception of the situation. This paper has made an attempt which very briefly are as follows:

- (a) Future gas supplies will cost the country many times more, resulting in multiple cost impact on almost all products including agriculture
- (b) Gas production will be in excess of the country's demand.
- (c) Given the country's limited capacity to pay, it will be increasingly burdensome to meet its own rising gas demand.
- (d) Export of gas is unavoidable, both in terms of contractual obligations and the increasing need for foreign exchange.
- (e) The country does not appear to be receiving more than 30 (thirty) percent from gas exportation.
- (f) Are we also looking at the ghastly prospect of complete exhaustion of this non-renewable source of energy in not too distant a future?

4. I think the time is overdue for a national debate on this issue.

Dialogue on Gas Sector Development: Status, Policy Options and Challenges

List of Participants

(in alphabetical order)

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