

EXPLORATION ACTIVITIES IN BANGLADESH GAS

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ABSTRACT

Bangladesh, which constitutes one of the largest deltas of the world, has proved its hydrocarbon potentiality through discovery of 22 gas fields during the course of drilling only 65 wells over a period of last 90 sporadic years of exploration. Exploration activities in Bangladesh are divided in three phases. Phase I (1910-1933), Phase II (1951-1971) and Phase III (1971-2004). The method and intensity of exploration activity changed with the change in regime, technology, economic system and political environment. In phase-III, the Bangladesh Government undertook different strategies under different long-term plans. International Oil Companies (IOCs) have joined in exploration activities under PSC from 1993.

Key words: Gas exploration, British - Pakistan and Bangladesh regimes, public and private sectors.

I. INTRODUCTION

'Proper utilization of Petroleum Products' is considered a driving force of economic development both in developed and developing countries. But historically, exploration activity was always slow due to low demand and utilization of gas resource in this region. There was always lack of vision and understanding of the economic opportunity. Gas began to be perceived as a free commodity [1]. Well-planned local or foreign investment was absent throughout. For a long time this sector remained financially, technically and structurally underdeveloped. Initiatives were launched from mid eighties to liberalize the energy sector. During the last three decades, Bangladesh gas has emerged as a sector of "huge potential." As evident from overall energy balance of Bangladesh, gas is the major indigenous energy resource fuelling the national economy.

II. EXPLORATION ACTIVITIES IN BANGLADESH

Hydrocarbon exploration activities have been continuing in this territory since the early days of

the twentieth century. The Government in three different regimes mainly undertook exploration activities. In the first phase, the British government took the initiative of exploration activities. The second phase was known as the Pakistan Regime. This government introduced early forms of geophysical methods for the first time. During the 1950's and 1960's mainly onshore wells were explored. After independence, the government of Bangladesh intensified the activities. Precisely 50% of the gas fields were explored in the last 33 years. Before emergence of Bangladesh as an independent state in 1971, exploration was conducted under the following two programmes-

A. State Exploration Wings

In three phases, the Government mainly undertook the exploration activities. But in the early two phases, some foreign companies were appointed by the Government to carry on the exploration activities. The private sector activities in all sectors of exploration, production and distribution accelerated in the past three decades after the emergence of Bangladesh.

B. Joint Venture Programs

Before the present contract structure called the Production Sharing Contract, worldwide two types of contracts were popular under the joint venture program. They are:

- i. **Risk Sharing Contract** - This type of contract was used in Latin America almost two hundred years ago. Under this contract a portion of every unit output produced was taken as rent, it is seen as similar to Ad-valorem excise tax, which is imposed per unit of output sold. In present days, this type of contract is nonexistent.
- ii. **Production Licensing System** - This type of contract was generally used before 1970. Under this contract government used to take 20% of the production as royalty, which excluded all forms of taxes like corporate income tax and excise duties. The above two contracts do not provide enough incentives for the oil companies to take part in exploration activities as they have to bear all sort of risks in different stages of oil production.

C. Three Phases of Exploration Activities [2]: Phase I (1910-1933)

In the early days of exploration, drilling was targeted near seeps in the fold-belt. In this phase, foreign companies without any discovery drilled six exploration wells. The first drilling was done in 1908 in the Sitakunda anticline, according to records available with Petrobangla- the State Oil and Gas Company. A company called Standard Vacuum had undertaken exploration activities as early as 1910. Burma Oil Company also drilled several wells in Patharia between 1923 and 1931. The first oil field (not gas) in the region was discovered in mid-1930s in Digboi. That is, in short the history of exploration activities in the region until the partition of India in 1947.

D. Phase II (1951-1971)

During this phase, an early form of modern gas physical method was used for the first time. From drilling 22 exploratory wells they discovered eight gas fields. During the Pakistan period, a Petroleum Act was passed in 1948 under which few IOCs were given 'area concessions' for conducting exploration activities. During the 50's and 60's major international companies explored mainly

onshore wells. Some geophysical surveys were also conducted to delineate structures. A foreign company called Stanvac drilled at Kutchma, Bogra and Hazipur and found them all dry. The authorities, with the help of Burmah Oil Company, also conducted a series of drilling in northeastern Sylhet region where they struck the country's first natural gas reserves in 1955 at Haripur. The Oil and Gas Development Corporation (OGDC), the National Oil Company was formed in 1961; and in the subsequent years, with the help of well-known foreign company Shell drillings were conducted. Shell Pakistan discovered most of today's major gas fields in Bangladesh during the late fifties and sixties. This company discovered Rashidpur (1960), Kailashtila (1962), Titas (1962), Hobigonj(1963) and Bakhrabad (1969) gas fields. Natural gas was discovered at most of those places except Cox's Bazar. Energy remained as a reserved sector for most part of the Pakistani period and during the early years of Bangladesh period.

E. Phase III (1971-2004) [3]

After the emergence of Bangladesh, the Bangladesh Petroleum act was promulgated following which Petrobangla was formed in 1974 to promote and regulate exploration, production and distribution of petroleum. During the period 1972-1996, the national organization Petrobangla and foreign oil companies drilled 27 wells including 8 offshore wells. Petrobangla discovered nine gas fields and one oil field. Foreign companies started operating in Bangladesh in 1974 but the first legislative framework was formulated in 1993.

III. PUBIC SECTOR PERFORMANCE IN THE RECENT PAST (1973-2002) [4]

A. First Five-Year Plan (1973-1978)

The need for development of natural gas as a source of energy was recognized in the First Five Year Plan (1973-78). In this plan, priority was given on the transmission and distribution related works with a view to accelerating the use of natural gas as fuel and industrial raw material. One of the objects of Two-year Plan (1978-80) was to accelerate the pace of exploration activities and encourage expanded use of gas, particularly as a substitute of imported petroleum. An intensive effort was made during this period to find new hydrocarbon sources, particularly in the offshore areas, but with limited success.

B. Second Five Year Plan (1980-1985)

Implementation of the Second Plan started with the objective of maximizing the utilization of indigenous natural gas and saving foreign exchange through substitution of imported fuel. The plan envisaged raising the supply of gas to 128 Billion Cubic Feet in 1984-85 from 44.5 Billion Cubic Feet in 1979-80 in order to enhance the share of natural gas in commercial energy consumption from 37 per cent in 1979-80 to 68 per cent in 1984-85. At the same time, exploration activities were geared up in search for oil and gas. During the plan period, drilling of six exploration wells were completed against the planned target of nine wells. Out of these, four wells were found to have gas reserves.

C. Third Five Year Plan (1985-90)

The Third Plan envisaged maximizing the use of natural gas to reduce pressure from fuel import bill, explore the major gas fields to assess the proven reserves and conduct exploration for oil and gas. In order to achieve these objectives, the plan set a target to drill 18 development wells and 5 exploration wells for hydrocarbon. In the Third Plan, 16 wells out of 18 development wells were drilled. Only 2 out of 5 exploration wells were completed. Gas supply was raised from 94.6 Billion Cubic Feet in 1984-85 to 165 Billion Cubic Feet in 1989-90.

D. Fourth Five Year Plan (1990-95)

The Fourth Plan was launched with the objectives of ensuring the supply of increased quantum of commercial energy mainly from indigenous resources and optimizing its utilization. Drilling of 5 exploration wells were planned to be executed. In practice, no exploration drilling was completed during the Fourth Plan. The main reason in this respect was financial constraint; non-availability of project equipment and lack of expert personnel in the State Owned Exploration Company. The Production Sharing Contract (PSC) partners were expected to drill at least 10 exploration wells during the plan period. New wells were planned and the target was to have 45 production wells (net number of wells was to be 41 as 4 wells were expected to be shut-off). By the end of the Fourth Plan, 42 wells were completed (net 39 wells, 3 wells were shut-off). The plan was to have 35 wells in operation.

Against this target, 33 wells were put into operation up to June 1995, while two others came on stream shortly thereafter. Peak demand for gas was estimated to increase by 300 Million Cubic Feet Per Day to 950 Million Cubic Feet Per Day by 94-95; in reality peak demand was registered at 850 Million Cubic Feet Per Day by 1994-95. Annual production of gas was planned to increase from 165 Billion Cubic Feet to 275 Billion Cubic Feet by the end of Fourth Plan. Actual production of gas reached 247 Billion Cubic Feet.

Performance during 1995-97: The oil, gas and natural resource sector is highly important in determining the growth prospect of the economy. Over the two-year period, the major objectives in this sector were to ensure a reliable and uninterrupted supply of commercial energy mostly from natural gas. During this period, emphasis was given on the development of the private sector in the oil and gas exploration activities. During this period, 564 kilometers of seismic survey were conducted and Bangladesh Petroleum Exploration Company Limited (BAPEX) drilled 2 exploration wells. Both exploration wells (Shahbazpur and Saldanadi) led to discovery of gas.

E. Fifth Five-Year Plan (1997-2002)

Despite Government efforts with its limited resources in exploration and production, the overall gas situation was not at all satisfactory. Since FY1997 Petrobangla experienced serious difficulties in its Bakhrabad and Feni gas fields resulting in suspension of production and gas shortage. In FY 1998, only 280 Billion Cubic Feet gas was produced against a projection of 345 Billion Cubic Feet. Gas shortages (96-98) imposed high costs on the economy in the order of US \$ 2.5 million a day. The geological and geophysical surveys will be intensified to discover and delineate new hydrocarbon bearing structures and to determine the extent and potential of existing gas fields. It is expected that a total of 3000 Kilometers of seismic Survey and about 1200 Kilometers of geological survey were undertaken during this period. At the same time, programs of drilling 7 exploration wells were implemented during the Plan period under the public sector. Drilling of production wells in Rashidpur/Habiganj gas fields and drilling of appraisal cum development and workover wells in Titas fields have been planned

during 1997-2002. The major targets in this respect were the drilling of appraisal and production wells in Saldanadi and Shahbazpur (2 + 2 = 4), Rashidpur (4 wells), Habiganj (4 wells), Titas (3 wells) and workover of about 10 wells, together with the drilling and establishment of 480 Million Cubic Feet Per Day in the process plant.

F. Private Sector Participation and Activities under PSC

One of the policies by government is to involve the private sector in development of hydrocarbon resources of the country through participation of IOCs under Production Sharing Contract (PSC). To expedite petroleum exploration, a new Model PSC was formulated in 1988. In 1989, the area of the country was divided into 23 blocks of which 17 blocks including 6 offshore blocks were offered to the IOCs for competitive bidding. In 1993, government announced a new petroleum policy to seek participation of IOCs in hydrocarbon exploration and production through PSC. PSC seems essentially a method of attracting local and foreign capital in upstream petroleum operation. Supply of gas under PSC is available from 1998. All contracts between oil giants and Bangladesh government are PSC. Under this contract the private foreign companies take about 40% (this amount is negotiable) as their recovery cost in the entire lifetime of the project, and the two parties share rest of the production and the profit. Under the PSC the foreign companies discovered three gas fields of which two were in offshore area.

IV. RATIONALE BEHIND TAKING PRODUCTION SHARING CONTRACT

Obviously it is an issue of importance to determine PSC is essentially a method of attracting local and foreign capital in upstream petroleum operation. GOB and Petrobangla enters into a contractual agreement with a contractor for exploration, development and production of hydrocarbon. In exchange for the capital invested in exploration, development and production activities, the contractor obtains a share of the value of gas to recover its costs (cost gas) and a profit (profit gas)

at a predetermined wellhead price. In exchange they are to commit a minimum work program (will be discussed latter) at different phases of the contract period. The reasons behind this type of contract that are generally put forward by some local oil experts and major oil giants (companies) can be summarized follows:

1. This contract is tagged with profit directly which was not provided under the Production Licensing System as greater incentive for private sector participation.
2. Countries around us (like Myanmar, Vietnam, Thailand, Malaysia, Brunei, China, Pakistan, India and Nepal) also use this framework. It helps the international companies to calculate and compare their cost-benefit analysis in this part of the world.
3. All the major oil companies throughout the world currently use this contract.
4. There is no tax on machinery and salaries of personnel from abroad.

So, it is clear that the PSC is relatively better, as it is a risk-minimizing contract that gives greater incentive for greater investment by the private sector. But any contract that is made must serve our national interest. If any contract does not ensure any benefit in terms of pursuing our national objectives like privatization, big foreign direct investment to reduce the Dual-Gap (the export-import and investment-saving gap), more employment generation, etc. then we should not go for such contract.

A. First Phase Production Sharing Contract Activities

Following the Petroleum Act 1974, six (6) PSCs, were signed in the same year with major International Oil Companies like ARCO, Union Oil, BODC (Nippon Oil), Canadian Superior Oil, Inaftaplin (Yugoslav State Oil) and Ashland Oil Company. The activities of the above IOCs were limited in the offshore areas. The brief resume of the First Phase PSC activities are presented in Table 1.

Table 1: Resume of First Phase PSC Activities (1974-90)

Production Sharing Contractor	Drilling Activities	Discovery
ARCO	1	0
Union Oil	1	1
Inaftaplin	2	0
BODC (Nippon Oil)	3	0
Ashland	0	0
Canadian Superior Oil (CSO)	0	0

Source: *Petroleum Exploration Opportunities in Bangladesh*, GOB & BOGMC (Petrobangla), July 1998.

In the 80's Shell Oil Company and Scimitar were active in the onshore areas under PSC and ended with the discovery of Jalalabad Gas Field. At the beginning of 90's government policy changed and incentives offered by the govt. attracted the international oil industry. As a result Occidental, Cairn Energy PLC of Holland Sea Search, Rexwood-Okland and UMC Bangladesh Corporation were active in exploration under 6 different PSCs in 8 Blocks. It is significant that IOCs operated under first phase of PSC have met with spectacular success at the beginning and created huge enthusiasm in the exploration

activities. Most of the agreements were signed during 1995 [5]. Only Cairns signed its contract for block 16 in 1994. The Cairns Energy PLC, as we have mentioned earlier, has discovered the first offshore gas field. Occidental worked in two blocks (13 &14) also discovered the Sylhet gas field. Block no. 17, 18, 22 were given for drilling in1997 to Rexwood and UMC. Successfully, their efforts resulted in the increase in total reserve by 260 Million Cubic Feet. Second extension period of drilling under first round of PSC activities are shown Table 2.

Table 2: PSC Activities

Contractor	Block No.	Date of signing	Result
Cairns Energy PLC and Holland Sea Search Occidental	16 (Offshore)	5-5-94	Sangu Gas field discovered
	12	11-01-95	
Occidental of Bangladesh LTD.	13 & 14	11-1-95	Sylhet Gas field discovered
Cairns Energy PLC & Holland Sea Search	15	12-6-95	
Rexwood Okland	17 & 18 (Offshore)	18-1-97	
UMC Bangladesh Corporation	22	16-2-97	

Source: *Petroleum Exploration Opportunities in Bangladesh*, GOB & BOGMC (Petrobangla), July 1998.

Under the first round the companies working in different blocks has some definite work programs. Their work programs are broadly divided into four phases. They are -(i) Initial years (ii) First Extension (iii) Second Extension (iv) Third

Extension. First three phases have the duration between two-and-three years. But the third extension usually depends on the performance in the previous phases. The work programs of 8 blocks under first round bidding are given in Table 3.

Table 3: Work Programs of 8 Blocks under First Round Bidding

Company	Block	Initial yrs.		1 st Ext.		2 nd Ext.		3 rd Ext.	
		Period	Drilling	Period	Drilling	Period	Drilling	Period	Drilling
Occidental	12	2 Yrs.	-	3 Yrs.	2	2 Yrs.	1	-	
	13, 14	3 Yrs.	2	2 Yrs.	3	2 Yrs.	1	-	
Cairn	16	3 Yrs.	-	2 Yrs.	1	2 Yrs.	1	-	
	15	3 Yrs.	2	3 Yrs.	2	2 Yrs.	2	-	
Rexwood	17, 18	2 Yrs.	-	2 Yrs.	2	3 Yrs.	2	-	
UMC	22	1 Yr.	-	2 Yrs.	1	2 Yrs.	1	2 Yrs.	2
Total	8		4		11		8		2

Source: *Petrobangla*.

It is observed from the table that during the first and second extension the IOCs conducted the highest amount of drilling. About 60% of the total drilling is done during these phases [6]. In the third extension the only company UMC had a programme of 2 drillings. It is to be noted that the number of drillings specified in different extension period may vary. It also depends on the success from drilling in the preceding extension period. Some IOCs often drill a well just to comply with the PSC deadlines. The drilling programs in a specific block may increase if the IOCs expect success from more drilling in a specific drilling area. This fact is observed in case of Sangu – where

their planned number of drilling was 2; one in first extension and the other in second extension. But when they had been passing through their second extension – they completed 5 drillings.

B. Second Round Bidding

Bangladesh has been divided into 17 onshore and 6 offshore blocks of different sizes ranges from 1650 to 13500 square km for petroleum exploration. Among these, 5 onshore and 3 offshore blocks were assigned under the first phase PCS. The remaining 12 onshore and 3 offshore blocks were open for second round bidding. List of the block open for second bidding round is given in Table 4.

Table 4: Blocks open for Second Round Bidding

Onshore Blocks			
Block No.	Area (Sq. Km)	Block No.	Area (Sq. Km)
1	5740	7	9985
2	10034	8	7290
3	9538	9	7846
4	9402	10	8702
5	10976	11	7787
6	9442	23	13500
Offshore Blocks			
Block No.		Area (Sq. Km.)	
19		11170	
20		12153	
21		12454	

Source: *Preparation of a Gas System Development Plan, Final Report*, Asian Development Bank, July 1996.

More than twenty companies, including some of the 'oil majors' like Shell, Mobil, Chevron, Texaco and Unocal, participated in the bidding by submitting offers for 12 of the 15 blocks that had been put up for PSC contracts. BAPEX, the exploration wing of Petrobangla -the state oil and Gas Company - also participated in the bid as joint venture partners of some IOCs. There had been no offer for three blocks in the country's northwest- blocks 1,2 and 23. The bidding appeared quite stronger than expected, with block 9 attracting the highest number of seven bids followed closely by other geologically promising areas like blocks 10, 11 and 6. Negotiations under the second round bidding went about in an agonizingly slow pace. Shell and Unocal are now producing gas from two gas fields under PSC.

In 1981 Shell Oil Company was awarded a PSC. Shell drilled the Sitapahar and Salbanhat well, which were dry. In 1988 Scimitar Exploration was awarded a block. They discovered the Jalalabad gas field. In the early nineties 8 blocks were awarded to 4 companies under PSC. In total 11 exploration wells were drilled and three gas fields were discovered. Two gas fields, previously discovered Jalalabad and newly discovered offshore Sangu, were developed under PSC and are in production. The first 3D seismic survey took place in Bibiyana. Latest PSC activity is shown in the following Table 5.

Table 6 provides a summary of the exploration activities in three phases described in this article.

Table 5: Second Round PSC Explorations

Well Name	IOCs	Result And Status
Sonadia 1	Cairn	Dry
Jalalabad 5	Occidental	Exploration
Kapna	Unocal	Dry
Maulavibazar 2	Unocal	Discovery
South Sangu 1	Shell	Exploration
Reju 1	Okland	Dry
Ratna	Unocal	Dry
Sandwip East	Shell	Dry

Source: Petrobangla Website, February 2004.

Table 6: Exploration Activities in Bangladesh

Phase	No. of wells	Discovery	Success Ratio	Exploration Basic
I (1910-33)	6	None	Zero	Near seep
II (1951-71)	22	8 gas fields	2.75: 1	Seismic and other early geographical method
III (1971-2003)	32	14 gas fields 1 oil field	2.13:1	Digital Seismic

Source –Petrobangla, November 2003.

Since 1972 the national and international companies that resulted in the discovery of 13 gas fields drilled a total of 32 exploratory wells. Since the first exploration well was drilled in 1908 a total of 128 wells have been drilled in Bangladesh till 2001, of which 63 are exploration wells.

Of the exploration wells, 13 are in the offshore resulting in two discoveries and the rest 52 are on shore with 20 discoveries. Interestingly, of the 52 onshore wells 45 exploratory wells were drilled in the eastern margin of the country with the discovery of 19 gas fields.

C. Recent Gas Export Debates and Exploration Activities

More than a decade has passed since the liberalization process in the energy sector. Outcome of such transformation in this sector is bound to be associated with pleasure and pain. Developing countries in the world have more or less similar experiences because of local political influences, pressure from donor countries/ agencies, lack of political will, corrupt administration, weak institutional, infrastructure and other factors.

The implication of the PSC came to public attention when Unocal, after the Bibiyana discovery, proposed in 2001 to export the gas through pipeline to India in order to recover its investment quickly. This Gas of Export issue became a national issue and there is an on going debate analyzing risk and benefits of exporting. The exploration activities (both public and private) are also receiving public attention. There is also a great uncertainty about the ultimate magnitudes of Bangladesh gas resource. Seven different (1992–2002) institutions/ organizations estimated a range from 9.04 to 61 Trillion Cubic Feet. This uncertainty over the ultimate size of the reserve creates, in turn, uncertainty as to the best natural gas exploration strategies.

V. CONCLUSION

Even though exploration history for oil and gas goes back almost a century, exploration density has

remain very low due to low demand and utilization of gas resource, change in exploration contracts and policies of three different regimes in Bangladesh. The first phase of exploration ended with no success. The second phase discovered 8-gas fields with a success of 1 gas field out of 2.75 explorations. The current phase started with public sector activity with lack of modern technology and capital, proper planning, lack of energy experts and adequate infrastructure and in late eighties it welcomed private sector through PSC. The application of the latest exploration technologies by the IOCs brought about the highest success ratio in the exploration history of Bangladesh. So far only about 65 exploration wells have been drilled, which resulted in discovery of 22 gas fields of sizes ranging from more than 4 Trillion Cubic Feet to 25 Billion Cubic Feet GIIP. This indicates the extremely low exploration density but high success rate of exploration wells.

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