

GAS SECTOR MASTER PLAN AND STRATEGY FOR BANGLADESH –AN EXPERIENCE TRANSFER

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ABSTRACT

Bangladesh was a probable country for natural gas resources. Proper gas sector master plan & regulations are most essential for developing this sector as planned way. We have limited natural resources however effective strategy can helps to maximize its utilization safely. Presently HC sector in Bangladesh is more vulnerable taking considering operational problems, challenges of new & existing field development especially offshore. Special consideration should be given through offshore field development. This is the time for Policy maker to take proper planning and vision for near future and very careful to move forward to satisfy the country's needs.

This paper describes an objective of the Gas Sector Master Plan & Strategy and, how we can implement it steps by steps. A clear roadmap will discussed in this issue and concentrating on the Bangladesh gas sector, how it would be developed in the near future (to 2012) based on concerning factors includes proper reservoir management, relevant institutional framework, & shearing experience which have been focused on;

- Gas demand – supply projection accordingly to production matter
- Optimum future gas field development in connection to ultimate drainage strategy, drilling, completion & economical aspect,
- Recommend policy with develop institutional framework to support long-term gas field development

Keywords: Field appraisal & development, drainage strategy, Operational problems, & Institutional framework.

1. INTRODUCTION

Bangladesh would be a probable HC sector if we are followed follow the gas sector master plan in systematic way. Without making proper plan it would be difficult to compensate field operational problem. We are already late but should be start from now to follow gas sector master plan and strategy.

Gas sector master plan and its strategy is a biggest aspect required to detail discussion, because gas sector has many branches. However, this paper is focused only production and exploration planning & strategy.

75 (128 was as 2004, after that Titas 15,16, kailastila, srikail,fenchugonj, habigonj) exploration (? Only exploration) wells drilled through 207, 000 sq km area, under evaluated hydrocarbon provinces, Bangladesh rank ranked as one of the worlds most significant (what—HC provenance?). Most exploration has been conducted in eastern Bangladesh; the western part and offshore areas are relatively under explored with limited seismic and drilling. However, with 22 (23?) gas discoveries and one oil discovery, Bangladesh has a very high historical exploration success rate of about 35% very strong by world standards (shamsuddin 03).

Natural gas only is our potential natural resources.

Natural gas regulates the power generation sector, fertilizer sector, industrial sector, commercial sector and needless to say demands of fuel and raw materials in the household sectors in some cases. Gas is used about 48 percent in power generation, 24 percent for fertilizer production and the remaining gas is used for industrial, commercial and domestic purposes. Hence this sector should handle properly with effective manner.

In Bangladesh many districts there are no gas supply yet? The government had taken initiative to build the gas network in Pabna & Bogora and in near future it will extended to Khulna, Rajshahi, Rangpur, etc.. CNG is now very popular for its cost effectiveness; civilian society is apparently getting benefit for its friendly behavior in the environment. For this reason the gas demand will increasing with time.

We can not think to export gas as still we have up growing demand of gas over the country. Transmission and distribution networks in the country are not expanded though it is essential now a day. Gas demand in the country at peak hours is of 1700 MMCFD but total production capacity is of 1600 MMCFD (at 2006). Bibiyana gas field introduce as a biggest gas field and it is connect national grid with high capacity production

rate. Chevron Texaco has planned to produce 200 MMCFD in 2006, eventually it becomes 600 MMCFD with in 2008. It can be realized that 600 MMCFD gas production from one gas field is enthusiastic but should be ensure safe production flow rate to enhance more recovery for long time without damaging the field. Production from many gas fields like Sangu, Salda, Meghna, Rashidpur, Bakhrabad and Kailashtilla are significantly decreasing day by day and this continuous depletion in production will impact on our daily life though kailastila gas field Co. increase their production and they drilled two new production wells in 2006-2007. The gas supply backbone is on the verge of collapse as a major gas field Sangu has become sick. It has already given several shocks and awe. The supply to Chittagong area which mostly depends on supply from Sangu may disrupt any time. We must acknowledge the gas crisis and the policymakers should aware about the situation. We should study about the situation and invest successfully to the real development of gas production by taking new exploration arena in the country.

2. RESOURCES & GAS RESERVE

Reserve estimation is a dynamic process involving various uncertainties having lot of controversial statement about method of calculation, which will be more applicable for particular case. Tool and methodology selection is vital considering factor for estimating reserve and resource. Several gas reserve studies had been conducted and receiving different reserve figure through different committee head. This could be due to utilize of inaccurate reserve estimation methodology, inaccuracy gauge data and poor data management system.

Reserve estimation associated with certain degrees of uncertainties, therefore intensive seismic; drilling and appraisal/development activities in a systematic and sustained approach should be undertaken by the concerned organizations and agencies to reduce the high uncertainties of the country's reserve condition. The reserve estimate study "Bangladesh Petroleum Potential and Resource Assessment 2001" was prepared by the hydrocarbon Unit (HCU) of Bangladesh Energy and Mineral Resource Division and Published in January 2002. According to HCU, the proved plus Probable ultimate recoverable gas (URG) reserves estimate for Bangladesh's 22 existing gas fields is 20.44 tcf (see table -1).

Table- 1 Status of gas Reserve: (data , 2003)

Reserve		Value	Unit
Gas(Proven + Probable)	:	28.42	Tcf
Recoverable Reserve	:	20.51	Tcf
Production in August 2004	:	0.041	Tcf
Cumulative gas production up to August 2004	:	5.63	Tcf
Remaining Reserve	:	14.88	Tcf

On the basis of that report, total remaining reserve is 14.88 tcf as of September, 2004 and presently total average gas demand is 0.5 tcf yearly. Under these circumstances, it may say that we have almost 28 years

gas reserve if gas demand do not goes up abruptly. But in reality the gas demand will be increased obviously day by day. Moreover in near future the area of Bagura, khulna and Rajshahi will be connected with the national grid. TATA groups were interested to invest their assets in power, steel and fertilizer production sector. Here again the question will come about uses of gas and its availability of supply guaranty. So it is essential to discover new fields which can produce at least 7.4 Tcf to meet up demand up to 2025 figure -3 (interim report, petrobangla conducted by wood mechanize, UK, not published yet).

3. PLANNING STRATEGY:

We don't have much modern technology but we have experienced professionals in hydrocarbon sector. We are concerned about our lot of limitations in gas sector (insufficient modern technology, infrastructure, funding, research & development, drainage talent etc) however it is the high time to makes proper plan for optimum utilization of gas as well as it's by-products and develop more fields to over come these limitations. But the question is how it is possible? Answer might be is that: Based on the existing technological, technical and knowledge database, firstly Bangladesh's resource base can be divided as follows:

- New field discoveries with ensured highest priority on exploration safety issues
- Existing field development,
- Field growth,
- Add the reservoir value
- Field management and
- Human resources development.

3.1 New Field Discoveries

Current block size (about 10,000 sq km.) (samsuddin 2003) is quite large in comparison with many hydrocarbon production countries. Following standard proxy probabilistic resource method, block size can be reduced to about 5000 Sq km or less and findings most prospective block to conduct at least 2-D seismic along with 3-5 small appraisal well per year in onshore. Presently BAPEX is doing a good job particularly drilling in production and development well hence BAPEX has proved they have capabilities to carry on new field development activities however they need necessary modern rig for drilling in production & exploration well.

In Norway, at October 2007, Statoil and Hydro has been merged as one company named " StatoilHydro". Before that statoil and Norsk Hydro were exploration and Production Company individually. Statoil was 100% production and Exploration Company where as Norsk Hydro has 30 % oil business (production & exploration) and 70 % Aluminium production business. They have had competition with each other for expanding company's activities in oil sector within Norway and in abroad. Norwegian directorate petroleum (NDP) is wanted to make a police how they can work at together with unique strongest strength. Finally, NDP has been

established their strong Oil sector company reform planning & strategy vision following ways:

- Only one National oil Companies “ StatoilHydro”
- All employees treated as statoilhydro employee
- The ownership allocated Statoil 67% and Norsk Hydro 33%
- StatoilHydro expands their business both in Norway and Internationally
- Norsk Hydro fully responsible for Aluminium production company
- Converging the strength

Presently, StatoilHydro has oil production & exploration activities in the 40 countries all over the world.

We can learn lesson from Norway and making our future gas sector exploration & production plan following ways:

- Onshore drilling all over the Bangladesh must be conducted by BAPEX, BAPEX treats as exploration company in country and internationally,
- Tri lateral agreement would be made in between BGFCL, SGFL and BAPEX for funding, how to explore field, how to conduct drilling and to allocate production shearing,
- BGFCL & SGFL can be provided fund for new field discoveries,
- New Field operations should goes through BGFCL & SGFL
- BAPEX can get support initially for receiving modern technology and skill improvement training
- BAPEX as a national exploration company must be sponsored to raise its capability,
- Only Offshore activities should be open for IOC immediately.

3.2 Review Present New Field Discoveries:

As mentioned before, most exploration has been conducted in eastern Bangladesh; the western part and offshore areas are relatively under explored with limited seismic and drilling. BAPEX has been assigned to develop Shahbazpur & Fenchuganj gas fields and explore at Srikail and success to develop Fenchuganj with 41.0 MMCFD from 2 wells. There have another possibility to drill two more wells. Based on DST test result decision will come for next step.

Chevron Texaco has been given go-ahead to develop Bibiyana and Moulvibazar. It is plan to evacuating of 300-500 MMCFD gas from Bibiyana in to the national gas grid within 2006-2007. They have a plan to produce 300 MMCFD in 2006 (data may not correct), 400 MMCFD in 2007 and finally raise its production 600 MMCFD in 2008 from Bibiyana gas field. Chevron has a world standard production management system however they should follow safe flow production to avoid sand production to enhance more recovery for long period. Sand production always hamper the field life which I have discussed in field management section. Bangladesh

will be benefited to enhance at least 80 % recovery of GIIP from Bibiyana gas field.

What did we gain from seismic survey in greater Mymensingh area? What has happened to high sounding prospect of greater Mymensingh and Mobarakpur areas? Tullow has successes to develop block # 9 and drilled five wells and produced gas from most of the wells. As per geological basin structure of Bangladesh, Blocks 17 and 18 also has high possibility for discovering new field.

3.3 Existing Field Discoveries:

Has a possibility for getting benefit if we are conduct intensive seismic survey in Titas, Bakhrabad, Habiganj, Rashidpur and Kaillastilla areas? Among of them in the first phase 3-D seismic should be conducted over Titas and Kaillastilla structure immediately because still southern part of Titas is unexplored and also required to know the lower reservoir layer in Kailastilla structure. Southern part of Titas structure is still unexplored where as northern part having 16 wells. The present drainage strategy in Titas gas field may hamper ultimate recovery from southern part without conduct homogeneous drainage strategy all over the field which will create patches of water intrusion. After conducting seismic over Titas structure we may get present reservoir properties in southern part however it has possibility to get experience separate reservoir in southern part. Probable reason of this issues, I will be discussed in my oral presentation.

Habiganj gas fields showing good prospect after getting new lower gas sand. Based on proper reservoir studies hopefully more production wells have to drill in near future from this lower gas sand. We should at least try one onshore deepest exploration well (up to 5000 m) in titas structure for finding anything is new.

3.4 Added Reservoir Values

We are interest to get large reservoir sand but at the same time should not overlook the thin sand reservoir zones. Sometimes we miss the small reservoir zone because of :

- Poor log reading/inexperience Service Company
- heavy mud cake in wellbore
- Uneven borehole/ wash out
- Depth matching problem
- Miss log interpretation etc

3.4.1 How We Can Overcome:

- appropriate drilling programmme/good cementing job
- keeping appropriate ECD in reservoir zone with priority based attention while drilling in reservoir zone,
- avoiding use of excessive barite in mud while drilling in reservoir zone, barite create barrier at HP/HT formation
- Hydrostatic pressure (mud weight) is keep equal to pore pressure to reduce damage to the formation at reservoir zone
- Ensure Logging services from well reputed companies. Very often less paid logging service

- company want to use their old tools
- Smooth wellbore.

For re-development work utilizes the modern log tools (meter log) to identify the thin reservoir zones with commingling production would be the option. Carryout the 3-D seismic survey including thin bed analysis is more essential for getting small reservoir zone.

3.4.2 Field Growth:

In Bakhrabad Out of 8 wells four are producing with total of 35 MMCFD but initially its total production capacity was 210 MMCFD. Once upon a time Bakhrabad gas fields seem to be largest gas field in Bangladesh. This field is one of the most studied field of the country under BGFCL, but very little could be done due to some practical limitations. Based on Petrobangla internal committee report (2003.), BGFCL is going to drill one new well (well # 9 offset of well # 1) based on DST results which will perforates prospective L & K zones and workover of two wells (BKB# 2 & 5), based on success help to raise the production at least 40 MMCFD. Recompletion of Meghan has been taken up. After have completed the re- completion work of Meghan the well brings to production through dual completion tragedy which completed in A sand, possibility of bringing D, E and F sands.

Well # 2 in Narsingdi Gas Field has added with national grid. 3D seismic survey should be conducted over Rashidpur, Titas, and Kailastilla structure. Based on the result of seismic survey and pressure data analysis from existing wells, field development plan can be taken up and prospect of oil zones should be evaluated. Due to discontinuous nature of the reservoir sands, high resolution/3D seismic will be required in Salda also. As north, south and eastern part of the structure is within Indian Territory seismic option will be a difficult option. Drilling of several wells using truck mounted rig and monobore completion could be an option in Salda. Alternately A joint co-operation with ONGC of India can be considered. Check possibility of producing lower Boka Bil gas sand in Surma1 (Sylhet 8). Kamta gas field still contain substantial reserve (50 bcf recoverable). 2-D Seismic survey over the structure of Kamta and Begumganj fields are a prerequisite for any future development. Reserve is distributed in several faulted blocks in Semutang. Detail techno-economic study will be needed for development of this field.

3.4.3 Drilling In Offshore: Offshore Prospective:

The offshore area has proved itself as a potential hydrocarbon reservoir area. Almost in every country in the world that has offshore found their potential hydrocarbon reserve in offshore. The geological prospect indicator always looking for the ancient depositional environment where hydrocarbon can be deposited, generated in source rock and accumulated in reservoir. In this concern the offshore area (water depth <200m) display the possible organic matter depositional area and due to overburden it might generate the hydrocarbon and our tectonic history also favors the existence of hydrocarbon in offshore area in Bangladesh.

Though the offshore is proven as a potential reservoir area we should concentrate our exploration activities in offshore area without any delay. We know that we don't have that much modern technology to explore the offshore, so it is recommended to open the block for IOC's.

3.4.4 Prevent Blowout & Kick:

We have bad experience with blow out in onshore by IOC's companies. Onshore drilling is much easier than offshore drilling. The main technical difficulties of offshore drilling are following;

- Shallow gas zone (SGZ)
- Shallow water flow (SWF)

SWF is a problem in many deep water areas. Drilling of SWF may easily cause washouts and hole collapse during drilling or after the conductor and surface casing has been set. If so happens, loss of the hole may be result. The SWF is characterized by super permeable and low consolidated sands where formation water has a very high mobility. SWF or SWZ be predicted in some extent from 3-D seismic, topographic measurements or gravity measurements. Setting of a casing above the problem zone and drilling with mud often be the only measure to obtain controlled drilling through the SWF zone.

Shallow gas regulation, Norway:

- Top hole can be drilled with only ONE barrier. Potential shallow gas should NOT be penetrated
- Possibility for moving installation in case of blowout
- Pilot hole shall be drilled through all shallow gas zones
- Predicted shallow gas should be drilled with weighted mud
- Possibility to kill the pilot hole dynamically
- Putting float valve in the BHA
- Potential shallow gas zones should be logged with LWD
- Returns should be observed by ROV
- Back- up kill fluid should be available

General Regulation, Norway:

- Maintained two independent well barriers during all time and operations
- Risk assessment with preparation procedures in advance for handling of blowouts
- Risk reducing measures and training for efficient kill situations

3.5 Reservoir Management:

Any new gas field's discoveries with obtaining maximum recovery are big challenge because water cut, sand production including depletion of reservoir pressure are the common problem for producing well. Water with sand production has been observed from Sangu, Bakhrabad, Habiganj (Habiganj-8) and Meghan gas field. Gas leakage, dramatic pressure draw down, skin effect is challenge for field management / operation activities. Water & Sand production will consider as a big challenge in context of better recovery of producing hydrocarbon in near future. We takes initiate when

problem may occurs but it is requires master plan to overcome field operations problem. We should maintain conservative flow to avoid sand production, sand production, gas leakage problems are so complex requires lot of money, modern technology and foreign expert.

Gas producing companies has to set up stronger reservoir section with well experience personnel. We forgot reservoir has a life and this life depends upon various factor like (production rate, skin factor, reservoir pressure, borehole stability, formation fluid, rock strength, injection fluid, as well as clay mineralogy). We are reluctant to invest money to evaluate and studies about reservoir properties time to time. Apparently seems money invest for reservoir study has no significantly benefit however it has long ranging future benefit that we could not see. Integrated reservoir management unit should be established for better recovery. Reservoir study cell in petrobangla has been taken a project namely “reservoir management –part II” which is optimize us for study the reservoir performance in different gas fields.

3.6 Human Resource Development:

- After getting proper training ensure posting based on right man right place,
- Collaboration program with petroleum rich countries, exchange technology and knowledge,
- Local expertise can be utilize
- Well educated skill personnel should be rewarded etc

4. CONCLUSION:

The following points are highlighted Ø

- Petroleum Policy updating and enactment of gas law must be completed as soon as possible.
- Energy Regulatory Commission must be made functional with proper professionals.
- Energy professionals should be under proper compensation package to stop the brain drainage.
- Delta reservoir in our offshore has a high prospect geological point of view hence immediately start activities for exploration well in offshore without seismic however should be followed proxy method.
- It is recommended to open the offshore block for IOC’s but not onshore block.

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6. ACKNOWLEDGEMENT

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7. NOMENCLATURE

Symbol	Meaning
BHA	Bottomhole assembly
SWF	Shallow water formation
SGZ	Shallow gas zone

Figures

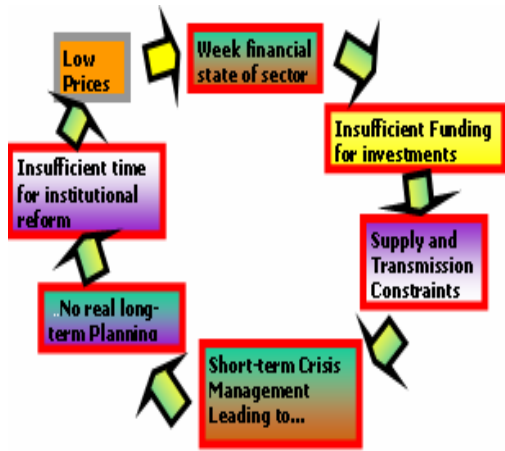


Fig 1: gas sector at present condition ⁶

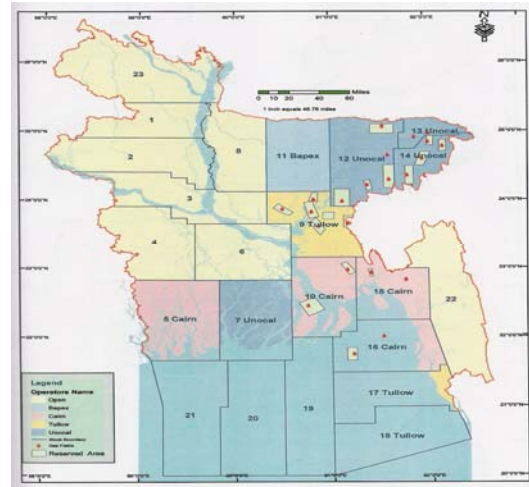


Fig 2: gas blocks over the Bangladesh ¹

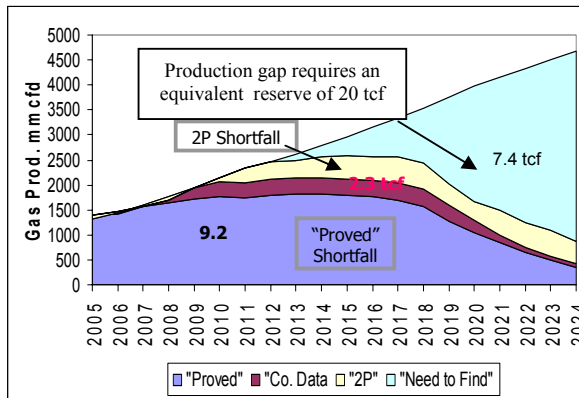


Fig 3: gas reserve projection require to meet 2025 ⁶

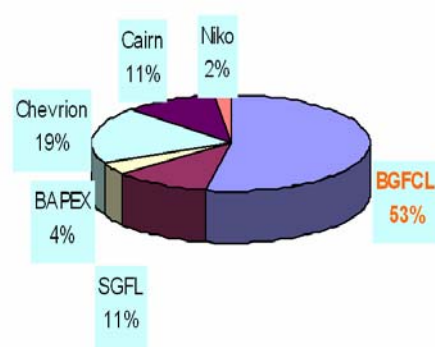


Fig 4: gas production contribution different