

Bengal Chambers of Commerce

Shale Gas: A Game Changer in Energy

Kolkata, 17th May 2013

Keynote Address

by

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Friends from Media, Ladies & Gentlemen... a very pleasant Good Morning to all of you.

- It gives me immense pleasure to be here today in this Seminar on *Shale Gas* organized by The Bengal Chamber.
- Though this is my first formal interaction with the Chamber, I am told that it has been playing an important role in addressing key issues relating to Energy Policy, Business Management and Technology, particularly in the eastern part of the country.
- Providing a common platform for free exchange of ideas, thoughts and experiences on current perspectives and topics in itself is a great service for the particular industry as well as country at large.

- The Indian economy has been on the long-term growth trend since the decade of 90s. To fuel this economic growth, India demands more energy and the major part of this will come through fossil fuels, ballooning India's petroleum consumption at the rate of 7% or more. Our expanding economy, growing population, rising standards of living and limited availability of indigenous energy sources pose serious challenges for India's long term energy security.
- Current consumption of petroleum is more than 3 million barrels per day and will increase to about 8 million barrels by 2030; the situation for gas being no different.
- Our domestic production for oil and gas is just 27% of the current demand, which is not expected to meet the growing demand even when new discoveries are put on stream.
- In recent times, the colossal rise in demand for energy coupled with shrinking new discoveries and static reserve growth from conventional resources has led to unprecedented emphasis on search for unconventional resources.
- Mother earth has bestowed us with abundant unconventional resources, but the challenge is that, its needs technological innovations to produce them economically.
- Of the several constituents of the unconventional energy resources like CBM, Gas hydrates, Tight gas, Oil Shale and the Shale gas, the phenomenal success of shale gas exploitation due to technology interventions has caught attention of the energy industry in the recent past.
- The unprecedented growth of shale gas in US and the global estimates of shale gas resource outside USA, as per EIA, placed at 22,000 tcf with recoverable estimates of about 6,000 tcf, has generated new hopes for all the energy deficient countries with the emergence of shale gas as a major supplement to conventional fuels.
- I express my appreciation to the *Bengal Chambers of Commerce and Industry* for such initiatives to organize a seminar on Shale Gas- which is certainly the greatest Game Changer for global E&P Industry. I take this opportunity to share my thoughts before this august gathering, on developing shale gas potential in India.

- Shale gas as a concept was known to occur even before the conventional hydrocarbon plays were known, but the muted demand for gas, primarily due to transportation constraints, and its unattractive pricing did not draw attention for a long time. It was only because of advent of hydraulic fracturing coupled with horizontal drilling and improved gas price in the US market that made the shale gas production economical and an attractive business proposition.
- While the other unconventional sources like Oil shales, UCG either still fail to breakeven their cost of production or don't have a viable technology like gas hydrates; shale gas has attained the status of an economically viable, technologically achievable and widespread resource. This combination has drawn attention of many nations and almost all the major industry players to venture into this foray.
- Shale Gas is a game changer in that it represents a new paradigm in energy portfolio. In present day of concern over climate change and emissions, shale gas is believed to have the potential to play a role as an energy source that we can rely on for the next 100 years.
- Shale plays involve large basinal extent and therefore demand a high density of Horizontal wells and hydraulic fracturing to produce economic quantities of gas from the reservoir. But the low exploration risk and high success ratio make shale play most attractive. In fact, once a particular basin is proved to be positive on shale gas the percentage of successful wells goes up to more than 90%. Hence shale plays offer an attractive portfolio item for all the oil majors.
- Today in USA, shale gas production contributes to nearly 25% of the total gas production. It is because of the Shale gas, the net LNG business is adversely affected in USA; taking a 180 degree turn from import to an export oriented country.
- Technically recoverable U.S. shale gas resources now estimated at 862 tcf, amounting to 34% of its total natural gas resource base of 2,543 tcf.
- The proliferation of activity into new shale plays has increased shale gas production in US from 0.39 tcf in 2000 to over 5 tcf in 2012, making it the largest contributor to projected growth in production.

- US have drilled over 40,000 wells in different shales. Currently, different companies in US have deployed over 1500 rigs exclusively for shale gas and a close network of pipelines measuring over 600,000 km exists for off-taking of the gas to the market.
- Following the footsteps, other countries and major oil companies are indulging in massive hunt for shale gas across the globe. All the European Countries, China and Australia are in different stages of exploration and production. Though being a late starter, China is planning to raise the shale gas production to 10% of its total gas production by 2020.
- Coming to India, we have large basinal segments which appear interesting from Shale Gas point of view by drawing analogy from US basins.
- India has seven oil & gas producing basins. The hydrocarbons in these basins are sourced from the underlying mature shales. The deeper shaly formations in all these basins, which are known to possess high organic richness and maturity to gas window level, are considered potential for shale gas exploration and exploitation.
- As per the initial studies many shale sequences in well explored basins are found to be promising like Barren Measure in Damodar, Cambay Shale in Cambay, Raghavpuram and Komududem in KG and Andimadam in Cauvery basins.
- Other Basins which have large shale thickness and may be of interest for shale gas exploration in future are:
 - Assam - Arakan Basin
 - Bengal Basin
 - Gondwana Basins viz. Pranhita Godavari, Satpura , Son Mahanadi
 - Vindhyan Basin and
 - Rajasthan Basin
- The cumulative thickness of these shales is comparable or more than global best shale plays. The systematic resource estimation of all these plays together has not been carried out so far as no shale specific data is available. However, as per the EIA estimates based on the available public domain G&G information, these four basins,

namely Damodar, KG, Cambay and Cauvery, have shale gas resource of the order of 290 tcf of which 63 tcf is considered technically recoverable.

- From this preliminary estimates, it becomes more so apparent that shale gas resource base in Indian basins is adequate enough to warrant a well chalked out strategy duly supported by commensurate fiscal and regulatory provisions.
- In an attempt to ascertain potential of shale gas and estimate the shale gas resources in Indian basins, MoPNG has taken further initiatives seeking cooperation from USGS for shale gas resource estimation of potential basin of India, including study of impact on environment. The studies are in progress and likely to be available soon.
- Initiatives being taken by Govt. of India to have international multi-task ventures for shale gas are a welcome step in this direction. We are waiting for the 1st bid round of shale gas blocks proposed to be offered by late 2013.
- ONGC has been contemporaneous in making an initiative in this direction. Based on the study of the data of Cambay, KG, Cauvery and Damodar basins, an R&D pilot project was undertaken in Damodar basin of West Bengal, where ONGC already has its presence for CBM. The basin is found most suitable for undertaking the detailed investigations and testing the shale gas potential. Four wells were drilled, two each in Raniganj and North Karanpura areas and on hydro-fracturing one of the wells in Raniganj flowed shale gas to surface, first ever in Indian Basin. Integrated study suggests risked shale gas resource of about 48 tcf in Damodar basin of which about 10 tcf could be technically recoverable against the EIA estimate of 7 tcf.
- This scale of estimate arrived based on the extensive analysis of the actual shale specific data generated in the four wells of pilot study in Damodar, indicates that there is a huge scope of upward revision of the EIA estimates of 63 tcf for the country, which are merely based on the available conventional data from these basins.
- After encouraging results from the pilot study, to collapse the learning curve and quickly access the areas, ONGC has gone a step ahead and entered into an MoU with ConocoPhillips, one of the oil majors in US for undertaking further studies in four potential basins and plan for development of shale gas, starting with some more pilots in different basins.

- Under our Perspective Plan 2030, giving thrust to the exploitation of shale gas, ONGC has created a **Center Of Delivery for Shale Gas** among others, which is responsible for furthering the shale gas crusade in India. The responsibility of execution of work under the JV has been entrusted to the **Center Of Delivery for Shale Gas**.

Ladies & Gentlemen,

- Taking leads from the US experience, comparing the shales of Indian basins, it can be surmised that India holds great potential for shale gas, and of course, West Bengal has already proved to have this great potentiality. However, the similarities end here.
- There are other important issues namely availability of skills and technology, infrastructure, Land and water requirement, environmental considerations, logistics, regulatory frame work and above all techno-economics, which are altogether different from US and pose greater challenge for making shale gas as profitable business proposition in India.
- In order to shale gas really find a place and become a supplement to conventional oil and gas, these differences need to be understood and the key challenges need to be handled strategically for success of the crusade.
- These challenges are:
 - **Availability of Technology and Skills**, as exploration and exploitation of shale gas is widely different in comparison to the conventional plays and require special technical and project management skills and therefore accessing and ramping up the technical and project management skills are the most critical to the business.
 - **Requirement of technical resources and physical inputs** such as rigs, different services including frac services, specialized logging etc. and surface infrastructure is huge as compared to conventional drilling. Large number of service providers is to be attracted through special initiatives to increase the availability of cost-competitive services.
 - **On Land Usages front**, Shale gas requires large number of wells to be drilled, which will involve extensive use of land. Against much less than one well per square Kilometer for conventional oil& gas, Shale gas typically requires about 2-6 wells per Sq. Km.

[Some statistics is worth mentioning here:

Population density of India is about 370/ Sq. Km whereas that in USA is 33.7 and even in China it is 139.6. In case of West Bengal, Population Density is reported at 1035 / Sq. Km- almost three times that of India's average.

Moreover, if we look at the Land usage part:

Where Arable land in USA and China are 18% and 14.9% respectively, in India it is 48.83%. West Bengal being at a highly fertile plane, 61% of its total land is arable.

I am sure this percentage will be even higher for the fertile Burdwan District where Damodar Basin is located.]

Thus it is logical to apprehend that land use for drilling operations may face severe resistance from the locals because of disruption of communities and their agriculture activities. This will require strategic considerations for making landowners agree to provide land for development.

- **Water Requirement:** If hundreds of wells are drilled in an area, Water management for hydro-frac jobs will be a formidable challenge especially in the states where even drinking water and irrigation water is in scarcity.

[In this context also, some statistics is interesting to be noted:

Where total renewable water sources of India is 1908 Cu. Km, the same for China and USA are 2829 and 3069 respectively. So we are naturally less endowed in this front.

On the other hand, being a heavily agro-dependent country, 86% of total is used for agriculture, whereas same for China and USA are 68% and 41% respectively. This shows how constrained we are as far as water availability for industrial usage is concerned.

West Bengal being located along the Gangetic plane is endowed with good ground water potential. Its net annual ground water availability of 27.5 BCM against country's total availability of 399 BCM looks comfortable. However, considering its pro-agrarian economy, availability of huge water for its Shale gas operation is also apprehended to be a great challenge for us.]

This is crucial requirement and will require innovative solution like harvesting rain water or new frac methods like use of CO₂ etc., to address this critical input for shale gas exploitation.

- **Environmental Considerations:** Not only the consumption of water is an issue, 70% of frac water which is dewatered from the well is contaminated with hazardous chemicals; therefore needs to be properly treated before it could be reused, which is further going to add to the cost.

[Recently there is a news that two young Indian scientists working at MIT have come out with a breakthrough. Anurag Bajpayee and Prakash N Govindan have shown in pilot test that their 'Carrier gas extraction technology' can turn the contaminated frac-water into palatable water.

Let us hope that this becomes commercially successful too.]

- **On Off-taking gas to market, the available network of pipelines** in India is about 15,000 km only and will require large infrastructure development and initiatives.
 - Last but not the least is **the Gas pricing**. The kind of commotion and confusion prevailing over the gas pricing issue will play an important role in discouraging the prospective players to put in their money in this frontier. Ample clarity and an assurance of economic viability at the end of the day will be the determining factors.
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- Amidst such numerous challenges, solution needs to be found and expedited if shale gas is to transform into energy supplement. E&P operators in India need to develop workable business models, which will be specific to the Indian conditions. Indian regulators should create conducive environment to nurture this nascent yet highly potential fuel source.
 - Govt. of India is keen to maximizing the extent of hydrocarbon exploration and production by taking all round efforts to encourage the shale gas exploration and exploitation. Since shale gas E&P is different in terms of cost, timelines of development and recovery, demand of infrastructure, demands on community and

environmental issues, Govt is in the process to bring separate policy guidelines. I'm sure, the policy will address the critical issues that enhances the attractiveness of developing shale gas resources.

- It is a great feel that all the industry players are preparing to cope up with this new upcoming challenge of harnessing the shale gas resource for the economic prosperity of India.
- I hope the deliberations and discussions to be held on shale gas during the day shall bring in improved understanding of the shale gas development, business strategy and underlying economic opportunities, which shall contribute significantly to our crusade of shale gas exploration and exploitation in India, all for achieving energy security for the country.
- I once again extend my sincere thanks to Bengal Chambers for organizing such an important workshop especially at a juncture when we just initiated a long journey to exploit shale gas resource of the country. Let this initiative be a catalyst in making West Bengal the pioneer in this front by expeditious monetizing of the vast resources of shale gas that it is endowed with.
- I wish every success!

Thank you! Jai hind