Different Business Models to resolve the sub-surface geological complexities including all poorly explored/underexplored Indian Sedimentary Basins having hydrocarbon potential.

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Summary

The exploration and development of entrapped hydrocarbon resources have now acquired an added urgency which stems from the widening gap between the demand and in-house production of hydrocarbon on the path of vibrant industry growth and to bridge this gap the availability of good quality geo-scientific data is prerequisite to exploration and exploitation of hydrocarbons.

There are two types of business models available in executing the Geophysical-API (Acquisition, Processing, and Interpretation) projects. One is conventional tendering process and another is Non-exclusive Multi-client Speculative business model. Regular tendering process works on mechanism of elimination of multiple parties and selection of single party for the award of the job based on (Bid Evaluation Criteria) BEC/BRC criterion. Whereas in Non-exclusive Multi-client Speculative surveys the concept of inclusion of multiple parties is implied as the Non-exclusive Multi-client Speculative model approved by Government of India (GOI) is non-exclusive and thereby same area/activity is awarded to many service providers based on the deployment of the advance/proprietary technology which generates unique data sets. Therefore permission process of non-exclusive Multi-client Speculative model works on mechanism contrary to conventional tendering model.

Looking at the business model in reference to prevailing surface and subsurface geological complexities and challenges an attempt has been made in this paper to discuss conventional tendering model versus world-wide popular Nonexclusive Multi-client Business Models. Significance and advantages of Nonexclusive Multi-client Business Models in the Indian context i.e. in terms of technologies (proprietary/advance) suited to the prospective areas, reduction of downtime, one model, where in no case, Government can lose any money, generation of high quality data in speedy manner has been dealt upon. The data generated through first Non-exclusive Multi-client Speculative model could map first time—the Mesozoic sediments in offshore areas of East-West coast. Further, this data could facilitated the E&P activities in deeper offshore and up to (Economic Energy Zone) EEZ areas in the eastern offshore. Special attempts are needed to provide thrust towards generation of good quality geo-scientific data on faster pace with the aim to make sincere efforts to achieve the ‘Hydrocarbon Vision 2025’ and to expedite the advance E&P activities to address the issue of energy security.

Keywords: Indian Sedimentary Basin

Introduction & Objective

The gap between demand and supply of crude oil, natural gas and petroleum products from indigenous sources is increasing over the years. This calls for an increased emphasis on the hydrocarbon exploration and production. To undertake a total appraisal of Indian Sedimentary basins for total hydrocarbon resource identification, tapping the hydrocarbon potential and to optimize production of crude oil and natural gas in the most efficient manner and to keep pace with technological advancement and be at the technological forefront in the global exploration and production industry.

To meet the target set forth in the ‘Hydrocarbon Vision 2025’ to explore all sedimentary basins. The recognized 26 (twenty six) sedimentary basins have been divided in to 4 (Four) categories based on exploratory inputs, prospectivity and hydrocarbon potential. The poorly explored/unexplored areas are mostly in category –III and IV (map-fig.1). These Indian sedimentary basins need to be understood properly and opened up for active
hydrocarbon exploration in the changed scenario. The future bigger and additional hydrocarbon discoveries may be expected from these basins. Despite best efforts, a number of sedimentary basins in India are not well explored and some of the basins are not even having any geophysical data for meaningful interpretation. Thus the geophysical data is the most essential technical input in the search for hydrocarbons. With the utilization of business models we can generate good quality geophysical data sets in a time bound manner to upgrade the geo-scientific value of Indian sedimentary basins to explore and develop oil and gas fields in the potential areas and advance E&P activities to address the issue of energy security in India.

Objectives for exploration of hydrocarbons

- India imports over 70% consumption of hydrocarbons and hence needs to bring all hydrocarbon deficient areas of the country under active exploration.
- ‘Hydrocarbon Vision 2025’ envisages that all the sedimentary basins should be explored by 2025. Non-exclusive Multi-client Speculative Business model will enable expeditious seismic survey without deploying Government funds.

- Prime objective underlying the non-exclusive multi-client speculative geophysical survey is to acquire high quality of geophysical/seismic data in respect of sedimentary basins expeditiously without involving GOI funds and make it available to facilitate awarding of oil and gas acreages for hydrocarbon exploration to E&P operators. This will also assist GOI (Govt. of India) to launch planned NELP(New Exploration & Licensing Policy) and OALP (Open Acreage Licensing Policy) rounds etc.
- India needs to produce high quality geophysical data for upcoming National Data Repository (NDR) by providing new data sets time to time for exploration of hydrocarbons.
- To encourage acquisition of high quality data with the latest available technology, by allowing competitive Service providers to acquire data on non-exclusive basis.
- Evidently, the Non-exclusive Multi-client Speculative surveys are not intended to earn revenue to Government, however, the Service providers is required to share surplus earning at a pre-determined ratio, a ratio applicable equally to all Service providers.

Different Business Models

1. Non-exclusive Multi-client Speculative Business Model (Proposed Model):

It is followed non-exhaustible resource, worldwide to generate geo-scientific data. Under this business model, the Service provider assumes all operational and financial risk, invests his funds and resources for acquiring and/or processing and/or interpreting geo-scientific data and sell Project data to interested E&P investors. The Service Provider is allowed to conduct the survey on payment of Project Fee. The service provider also agrees to supply all the produced raw and processed data along with various deliverables to the Government free of cost and to pay a Project fee. The Indian Multi-client Business Model is nonexclusive i.e. all interested service providers can conduct the surveys/ geo-scientific activities even in the same areas at the same time and to undertake such studies through Multi-client Business Model is open throughout the year. Under this model, the Service providers may make the attempts to recover the investments towards their opted activity by seeking underwriting from E&P companies either as pre-commitment before the start of the
studies or by sale of Project data once acquired and/or processed and/or interpreted. This Model enables to generate quality geo-scientific data in speedy manner with Government ownership and also to encourage deployment of the advanced/proprietary technology in evolving geological models and to understand petroleum system in sedimentary basins of India without involving Government of India expenditure and risk.

II. Viability Gap Fund (VGF) Model

As regards the un-proven basins, where the service providers are not likely to bear the entire risk by investing funds, the Government may need to launch a policy on the lines of the present PPP (Public Private Partnership) model in infrastructure wherein Viability Gap Fund (VGF) could be contributed by the Government to make this exercise viable.

III. Own Expense Funding by GOI (Government of India):

There may be areas having high risk where even the VGF may not be motivating the service providers to invest their funds to acquire data. In such areas the national government has no option but to conduct data acquisition at its own expense in a phased manner keeping fund availability in mind, and use this data to carve out blocks for acreage bidding rounds. Naturally, this model has a fund limitation, and hence, would take a long time for the government to acquire data for the target area.

Salient Features of Above Models

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Models</th>
<th>Salient Features</th>
<th>Risk of Service Provider</th>
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<td>I</td>
<td>Non-exclusive Multi-client Speculative Business Model</td>
<td>No GOI funds are required</td>
<td>100%</td>
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<tr>
<td>II</td>
<td>Viability Gap Fund (VGF) Model:</td>
<td>Part funding by GOI</td>
<td>Less than 100%</td>
</tr>
<tr>
<td>III</td>
<td>Own Expense Funding by Government:</td>
<td>100% funding by GOI</td>
<td>No Risk</td>
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Conventional Tendering Model Vs Non-exclusive Multi-client Speculative Business Model

There are two types of business models available in executing the Geophysical-API (Acquisition, Processing, and Interpretation) projects. One is conventional tendering process and another is Non-exclusive Multi-client Speculative business model.

I. Conventional Tendering Business Model

The tendering process has the following demerits as compared to the Non-exclusive Multi-client Speculative surveys business model:

- The tendering process takes relatively longer time and thus dampens the quick generation of data as technology changes quickly with time and therefore the objective to exploit the state-of-art and proprietary technologies becomes difficult.
- It requires continuous flow of funds from Govt. of India.
- The complete responsibility to maintain the desired quality of work lies with the GOI.
- The pace of work progress is slow as the payment against awarded work is almost ensured to service provider.
- Generation of multiple data sets through variance in technologies for the same area/activities is not feasible as it requires vast repeated expenditure by GOI.

II. Non-exclusive Multi-client Speculative Survey Business Model

Under the Non-exclusive Multi-client Speculative surveys business model,

i. No Government of India (GOI) funds are involved.
ii. The quality of the acquired data is ensured as the service provider has to recover the project cost through offering of the acquired data. Thereby, service providers make all attempts to generate unique data set by using state-of-the art and proprietary technologies.
iii. It provides assured quality data and also offer speedy acquisition, processing and interpretation of the geophysical data.
iv. In this model, industries perception and requirement of E & P companies are well thought-out as the scope of the work is planned by Service provider keeping in view of E & P industries.
v. The high quality geophysical data acquired with latest technology helps to resolve complex geological challenges and understand new petroleum system in sedimentary basins.

The Indian Non-exclusive Multi-client Speculative Business Model

The business model is termed ‘speculative’ for the reason that the Service provider meets the investment and expenditure out of his pocket for an unknown target population and in the absence of adequate sale of data, the expenditure on the project may go un-recovered.

The Non-exclusive Multi-client Speculative survey activity was initiated in India after the conveyed approval to conduct Non-exclusive Multi-client Speculative survey on approved model by Government of India (GOI) in December, 2005.

- Non-exclusive Multi-client Speculative survey is a business model under which a ‘non-exclusive’ permission to carry out geophysical survey activities, mainly 2-D survey, is granted to a Service provider based on an approved Model Agreement by GOI with the main objective to generate quality data for GOI without deploying Govt. funds.
- The Service provider invests his risk money and agrees to supply all the created raw and processed data to GOI and also to share the surplus revenue earned from sale of the data right with Government on a pre-determined sharing ratio.
- The ownership of data acquired and processed by the Service provider always remains with Government.
- The Service provider is given the right to sell data for a period of 10 years.

Conventionally, Government had acquired seismic data by spending substantial money and hiring seismic service providers. The cost to GOI for executing Seismic-API (Acquisition, Processing, and Interpretation) projects covering all the sedimentary basins will be huge if the conventional tendering business model is used. On the other hand, under Non-exclusive Multi-client Speculative survey, Government does not invest any funds, whereas Government is benefited with the data as well as a share in revenue.

It is imperative to mention that the Service Provider incurs full financial risk to undergo Non-exclusive Multi-client Speculative Survey and recovers the cost incurred by selling of the Project Data to E&P companies. Naturally, the quality of the geophysical data acquired by the Service Provider has to be above the quality of data acquired by conventional seismic survey i.e. in terms of proprietary/advance technology suited in these terrains to address existing geological challenges, Imaging & Data Interpretability aspects etc. For example, a Non-exclusive Multi-client Speculative seismic survey conducted along the east and west coast of India could map the Mesozoic sediments (first time) and along the east and west coast of India for the first time.

These complex subsurface geological features could not be deciphered by conventional seismic methods deployed in that area earlier i.e delivered significant value to Exploration & Production value Chain (The value of knowledge reduces uncertainty/risk in the area. There are many sedimentary basins under Category III and IV which are either prospective or potentially prospective basins. These basins lack geophysical data mainly due to complex terrain and subsurface geological complexities. For example, in Saurastra Basin (Category-III Basin), the Palaeocene Deccan Volcanics cover most of the Saurashtra Peninsula. Most of the prospective Mesozoic sediments are buried by the Deccan Volcanics and conventional geophysical methods can only image the Tertiary sediments present above the volcanics. In such scenario, only proprietary/advance technology can address the issues pertaining to image the subtrappean Mesozoic sediments which can be used for future hydrocarbon exploration and exploitation. The Himalayan Foothills is another Category III basin which signifies a very complex folded geological history. This kind of logistically difficult terrain also requires a very advanced seismic data acquisition and processing steps to clearly image the subsurface complex geological features.

Fig.2. Mesozoic Sediment Map of India
The Non-exclusive Multi-client Speculative Business Model helps in generating quality geophysical data which are highly beneficial for the GOI to offer acreages to different E&P companies for future hydrocarbon exploration during the different Licensing Rounds. For example, the Non-exclusive Multi-client Speculative data has helped GOI to offer 43.63% of the total number of blocks in NELP-VI round under offer having an area percentage of 75.28% of the total area under offer for bidding. Similarly, in NELP-VII round, 42.11% of the total number of blocks under area covering an area percentage of 64.75 of the total area was offered to E&P companies based on Non-exclusive Multi-client Speculative geophysical data. NELP-VIII offered 45.71% of the number of blocks having area percentage of 45.24 of the total area under offer based on the Non-exclusive Multi-client Speculative geophysical data. In NELP-IX round 81.34% of the total area under offer was determined based on the geophysical data acquired under Non-exclusive Multi-client Speculative Business Model.

The Non-exclusive Multi-client Speculative Business Model is a technology driven model. In this model, the Service Provider deploys his state of the art technology or its proprietary or appropriate technology to image the best possible subsurface geological features that cannot be mapped by conventional geophysical surveys/technologies used. Thus GOI gets benefitted by getting the best possible subsurface imaging which could be used for future hydrocarbon exploration at no cost to GOI.

In view of the encouraging geo-scientific data inputs of the past Non-exclusive Multi-client Speculative surveys in India, this paper emphasizes on the different aspects of the Non-exclusive Multi-client Speculative surveys.

Advantages of Non-exclusive Multi-client Speculative surveys

The advantages of the non-exclusive Multi-client Speculative Surveys over the regular surveys conducted by operators through tendering business model are detailed below:

1. **Simpler award process:**
   Award process to grant permission is simpler as the proposal is made on pre approved Model Agreements along with the scope of the work and deliverables etc. and complete proposal is prepared by the service provider itself by incorporating the needs and geological challenges faced by oil & gas industries.

2. **Speedy data generation and availability:** The generation of data is quick because the service provider is making investment on behalf of prospective clients and pre-committed oil and gas companies.

3. **A complete API package:**
   Non-exclusive Multi-client Speculative Survey is not only the acquisition of data, but a complete package of Acquisition, Processing and Interpretation of data with preparation of data packages, if required, depending on basin modeling and also integration of available geoscientific data to establish prospectivity of the area.
   a) **Quality Check & Assured data quality:** A continuous Quality Checks (QC) is done by service providers through third party domain experts during the survey activities so as to bring best data quality to maintain its uniqueness.
   b) **Use of cutting edge technology:** Cutting edge technology is pre-requisite in order to resolve the geological challenges in various sedimentary basins of India. In case of Nonexclusive Multi-client Speculative surveys keeping the above need in considerations, focused to acquire high quality seismic data by adopting large offsets and using specialized guns as seismic source to generate optimum signals. In processing also proprietary/ advance technologies are required to be used.
   c) **No cost to Govt. of India:** The Non-exclusive Multi-client Speculative Survey provides set of acquired, processed & interpreted data and the other deliverables with no cost to Govt. of India i.e. the Non-exclusive Multi-client Speculative survey does not require any funding from Govt. of India and the entire cost is borne by the service provider. Even the duties and taxes are borne by service providers. No custom exemptions are available for this sort of surveys where as this exemption may be applicable for other E&P Operators’ surveys.
   d) **Revenue to Govt. of India:** The **primary objective** of Non-exclusive Multiclient
Speculative surveys is to generate a good quality data at no cost to GOI.

c) **Complete ownership of GOI**: Despite of all investment made by service providers in Non-exclusive Multi-client Speculative surveys, the right of exclusive ownership vests with Govt. of India.

**Transparency and control mechanism**

The following are features related to transparency and control mechanism:

- The adopted Non-exclusive Multi-client Speculative survey model was approved by MOP&NG after detail deliberations the approved model / MOU is in the website of DGH. It is an open invitation; open all the time of the year. It is open to all interested parties, without any restriction,

- The same area is available for survey to more than one Service provider on ‘non-exclusive’ principle, depending on the interest of the Service provider, which makes this business model different from the normal tendering business model for procurement of goods and services.

- The mechanism to permit any number of interested Service providers to carry out survey in the same area does away with the need of tendering and selecting a single Service provider.

- The sharing ratio is fixed applicable to all Service providers.

- Similar terms are offered as per the Nonexclusive Multi-client Speculative business model to all the Service providers. Process does not entail elimination, competition among multiple Service providers.

- As this permission process and no way comparable to tendering process and open to all competitive participants without any time restriction. There is nothing in the awarding process which can be termed as non-transparent or favorable to any single Service provider.

**Technical Capability & financial standing of Service providers**

The proposals for Non-exclusive Multi-client Speculative surveys are made by the service providers of their own. The Non-exclusive Multi-client Speculative survey permission is provided based on the draft agreement approved by Ministry of Petroleum and Natural Gas.

- Data, not matching with the quality expectations of the E&P operators, affecting the Service provider’s recovery of their investment will not be sold.

- Since Government does not invest its funds, but grants only a permission to carry out the survey on a non-exclusive basis, Government’s stake in not compromised.

**Cost in respect of Non-exclusive Multi-client Speculative survey**

- The non-exclusive right will enable to facilitate competing Service providers to carry out the job at competitive costs and offer the data to the needy at competitive prices and free data set to GOI. This requires the Service provider to invest the required funds upfront and hence only Service providers having requisite financial capability will come forward for carrying out the survey. Hence evaluation of financial standing of Service provider as a prerequisite is superfluous.

- The cost of carrying out the Non-exclusive Multiclient Speculative survey varies from Service provider to Service provider depending on the technology, field parameter specifications and equipment deployed by Service provider and also the cost efficiency of the Service provider.

- Limiting the cost will have adverse impact on the quality of data and technology. However, the cost of survey borne by Service provider is a sunk cost unless it is recovered from successful sale of data and hence Service provider has always an interest to minimize cost. Cost is therefore not pre-fixed in Nonexclusive Multi-client Speculative survey, but kept open, similar as in Production Sharing contracts (PSC). However the Service provider’s initial cost estimate is kept as an upper limit for cost entitlement.

- Restricting the cost entitlement to actual expenditure reported in the books of accounts of the Service provider would serve as an improvement over initial cost estimate of the Service provider made at the time of awarding of Project.

- As in case of PSC, in Non-exclusive Multi-client Speculative business model, the Service provider
has freedom to price and market the data. A higher price is always beneficial to Service provider, who in the interest of profit would always try to maximize the price, and hence need not be a pre-condition in the model. However the price is restricted by what market can pay.

The Non-exclusive Multi-client Speculative Model is driven by technology whereas the conventional tender acts on the lowest bidder process. Some of the advanced technologies like cable less surveys, dual sensor streamers can be deployed only through Nonexclusive Multi-client Speculative Model.

Conclusion

The days of easy search of hydrocarbon are over. Most of the conventional reservoirs are now getting exhausted. As the green fields are turning towards brown fields, marginal fields are also now being looked after for hydrocarbon exploration even after knowing their low reserve potentials. The Enhanced Recovery Methods are applied to every field for extracting the last drop of liquid gold. Under such circumstances, when the nation’s demand for hydrocarbon is increasing at an exponential rate, the search for the new resources of hydrocarbon is getting hampered because of the scarcity of quality geophysical data in many sedimentary basins of the India. Under such circumstances, the nation needs to generate geophysical data at an urgent pace to offer new areas for exploration of hydrocarbon. Under the present crisis situation, the Non-exclusive Multi-client Speculative Business Model can be a viable option where the nation gets state of the art geo-scientific data without incurring any cost by GOI. This technology driven model will help the Government to offer the prospective new areas under exploration for future rounds of NELP/ OALP. Also in areas where there is complex sub-surface geology, the different proprietary technologies used by the Service Providers will help to picture the sub-surface features better as compared to the conventional geophysical methods. Non-exclusive Multi-client Speculative policy permits multiple stakeholders at one point of time. The model is such that only professional competent Service provider come forward as they can sustain with the market condition. Non-exclusive Multi-client Speculative survey is a business model to cut the exploration expenses by GOI and provide a direction to investors for exploration in the country. Also this model will help in reducing the time to generate geo-scientific data and saving of GOI funds which would be required to generate the same volume of geophysical data by deploying the conventional tendering process. Special attempts are needed to provide thrust towards generation of good quality geo-scientific data to expedite E&P activities to address the issue of energy security.