Deep Water Oil & Gas: New Opportunities and Suggestions for Chinese Oil Companies

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Abstract. The rising production of Deepwater are reshaping the global market landscape. Global Deepwater production will account for 22% to 25% of international supply in 2035. The role of Deepwater is significant in the future. The oil companies have entered Deepwater fields extensively. New opportunities are emerging, and the number of tenders for deep water blocks is increasing. Deepwater terms are changed to attract more exploration investment to the sector. The efficiency of Deepwater operation has been greatly improved through project optimization and technological progress. Chinese oil company should participate in international competition and cooperation actively, extend and upgrade the whole offshore industry chain to seize the new opportunities.

1. Introduction
The global industry has generally entered the stage of Deepwater development. Global offshore oil reserves account for about 15% of global oil reserves and offshore gas reserves account for 45% of global gas reserves. The rising production of Deepwater are reshaping the global market landscape. Global Deepwater production will account for 22% to 25% of international supply in 2035. The role of Deepwater is significant in the future. The oil companies have entered Deepwater fields extensively. New opportunities are emerging, and the number of tenders for deep water blocks is increasing. Since 2010, the international investment in Deepwater exploration and exploitation has increased sharply. Brazil, the Gulf of Mexico and West Africa are still hot spots for exploration. Africa and South America have shown growth momentum. The Middle East and Asia-Pacific become important Deepwater investment regions. At the same time, Deepwater terms are changed to attract more exploration investment to the sector. The efficiency of Deepwater operation has been greatly improved through project optimization and technological progress. project breakeven has been reduced to less than $40/BOE in some mature block. Deepwater projects has been continuously economic.

2. Current Situation of Global Deepwater E&P
2.1. Deep Water become the hot spots of global oil & gas exploration discovery and development
Global energy demand will continue to grow at a slow rate. Almost all of the new energy demand will come from emerging economies, with China and India accounting for more than half of the world's new energy demand. At the same time, the energy structure gradually transformed. oil demand remains growing, but the growth rate is decreasing. Natural gas will be the fastest growing fossil fuel in the future. However, there are some uncertain factors in the oil price recovery, such as the competition of shale oil, the improvement of energy efficiency, the instability of geopolitical factors
and the rapid development of other new energy sources. Under these circumstances, Deepwater exploration and development is slowly returning. Specifically, upstream oil companies seek deep-water reserves to ensure reserve growth, and the demand for deep-water drilling platforms starts to pick up. There are 9 Deepwater projects among the 10 major global upstream projects in 2018.

The industry has entered the first Deepwater development stage. The average water depth of new discovery offshore exploration discovery has exceeded 500 meters. Deepwater oil and gas production is spiraling, reaching 6.7 million barrels per day in 2017. Deepwater production has accounted for 27% of global offshore production and 9% of global production. Deep water production mainly comes from Brazil, the Gulf of Mexico, Angola, Nigeria and other key sea areas. Many companies have gone big on high-risk deep water exploration. The number of exploration wells will nearly double to around 40, compared to the 24 completed in 2018. The majors remain at the forefront with a common theme of deep water, high-impact, high-value prospects.

2.2. Technology of Deepwater block become matured

As the Deepwater technology and equipment gradually developed, Specialized engineering service market has been formed. After the Gulf of Mexico accident in 2010, environmental protection facilities have been renewed for eight years. Emergency Base for Oil Spill in Deep Water Oilfield and supporting facilities have been built in some sea areas. The water depth of drilling operations in mature waters has exceeded 3000 meters, such as the Gulf of Mexico, West Africa and Brazil[1].

Brazil is a typical example to realize leapfrog development of marine engineering technology and equipment. After the discovery of world-class oil and gas resources in the eastern coastal waters of Brazil, various policies and measures have been formulated to develop the marine engineering industry around the exploration and production of deep water and subsalt fields. In 1973, CENPES, a technology research and development center, was established to innovate and integrate foreign advanced technologies to develop new technologies adapted to Brazil's domestic conditions. In 1986, a series of scientific development plans were launched to rapidly enhance the Deepwater operation capability. National Petroleum Company has achieved a series of first class technology of marine engineering technology, including the first deep-water mooring floating platform, the first wet subsea wellhead installed by robots, the first application of flexible pipe and rigid pipe used for semi-submersible platform, etc. At present, Brazil has built 48 floating platforms, 56 vessels and more than 30,000 kilometers of submarine pipelines. The "FPSO & underwater system" mode is called "Brazilian mode" in the industry. Brazil has break the monopoly of European and American enterprises on offshore projects, and lead the global tendency of offshore exploration and development technology and equipment. Due to its outstanding innovation and contribution to global offshore technology, Brazil won three OTC awards in 1992, 2001 and 2015. OTC is similar to academy Awards for the petroleum Industry.

2.3. International Companies come into the Deepwater Fields Widely

Since 2010, the international investment in Deepwater exploration and exploitation has increased sharply. Brazil, the Gulf of Mexico and West Africa are still hot spots for exploration. Africa and South America have shown growth momentum. The Middle East and Asia-Pacific become important Deepwater investment regions. The oil companies have entered Deepwater fields extensively.

Total will complete its Brulpadda-1 AX wildcat in South Africa. The prospect has an estimated resource of over 1 billion barrels. The first drilling attempt in 2014 was suspended due to harsh deep water conditions. This time, Total is armed with the Odfjell Deep-sea Stavanger semi-sub, a veteran of rough conditions. Brulpadda is one of Total's hottest prospects in its global exploration hopper. With Venus-1 in southernmost Namibia, Total will continue to lead the charge in ultra-deep water in the Southwest African Coastal Basin. Located on block 2913B, this giant prospect has multi-billion-barrel potential. Its 3,000 meters of water depth will be a record for Africa[2].

In Angola, Total could again go beyond 3,000 meters on ultra-deep water Block 48 with a commitment well by end 2019. Eni will also drill at least one of up to four exploration wells in the
southern area of block 15/06 in 2019. Mozambique will be another hotspot for frontier exploration. Three years after application, Eni secured rights to explore block A5-A in the Angoche basin. The basin - which is undrilled - lies in Deepwater to the south of the prolific Rovuma Basin. Drilling for oil will start mid-2019.

In Guyana, ExxonMobil signed a PSC contract with the government in 1999. Seven oilfields were discovered in the upper Cretaceous deep-water turbidity sand body from 2015 to 2018. BP has cooperated with Kosmos in the West African Sea. Following the discovery of two large ultra-deepwater natural gas fields in Mauritania in 2015, BP made another major discovery in the southern Senegal ultra-deep-water field in 2017.

3. The new opportunity of Deepwater blocks

3.1. Preferential Policies of Fiscal terms

Many governments revised the fiscal terms to attract more capitals in Deepwater block. Brazil government improve Deepwater fiscal terms, such as Local content rules relaxed and REPETRO tax relief extended to 2040. in the first round of bidding in 1999, National Petroleum Agency (Agencia Nacional do Petroleo, ANP) put forward local content rules to promote the development of domestic industry. If the proportion of local content does not reach the prescribed proportion, the contractor will pay penalty. In fact, Excessive local content will be the hurdle of project extension[3]. In the 14th round, local content rules were no longer as the tender parameter to avoid unrealistic high proportion. In the 1st to 3rd round of submarine product sharing contract bidding, profit oil rate is the only one bidding parameter. In the 14th round of bidding for R/T contract and the 3rd round of bidding for sub-salt profit sharing contract in 2017, the local content rate also greatly reduced, with 18% in the exploration stage, 25% in the well construction part in the development stage, 40% in the collecting and mining system and 25% in the fixed production unit. It has become a trend that local content rate will not to be parameters in subsequent bidding. The indirect tax system is very complex in R/T contracts, with up to nine types of taxes. High indirect taxes increase the cost of exploration and development. In the project operation, the calculation of indirect tax is also very complicated. The collection of indirect tax is closely related to the procurement strategy of the project. It depends on the purchase type which includes local and import source, and the type of procurement investment which is divided into tangible capital and intangible capital.

In December 1998, the Brazilian government introduced a partial indirect tax exemption mechanism (STAR) for the oil and gas industry. Its deadline was 31 December 2001. In September 1999, the President's decree REPETRO extended the deadline to 31 December 2005, followed by three further extensions. The latest was in August 2017, which extended the REPETRO tax exemption mechanism until December 31, 1940. The REPETRO mechanism abolished import tariffs (II), federal value-added tax (IPI) and social surtax (PIS/COFINS) on imported equipment, and reduced the state value-added tax (ICMS) tax rate at the stage of exploration and development. REPETRO mechanism only applies to non-permanent tangible assets. For instants, casing and other equipment cannot be exempted from this part of indirect tax.

Malaysia has over 1.2 billion BOE of undeveloped Deepwater reserves, with its relatively tough fiscal terms. In 2018, PETRONAS has unveiled an enhanced set of Deepwater terms that incorporates the R/C index (revenue over cost index). The mechanism uses gross revenue and spend to determine a profit split and cost recovery ceiling. The R/C mechanism was first introduced in 1996. This is the first time it has been used in a Deepwater PSC. According to WOODMAC forecasting, new Deepwater term should increase project IRR by 1% to 2%, based on the latest Limbayong asset model that they created. Limbayong is a new Deepwater development in Sabah that could take FID late next year by WOODMAC expectation.
3.2. Cost reductions

Deepwater project was suffered a hard landing in 2014. Break-even cost of pre-FID project was $78 per barrel of oil equivalent, but oil prices had plummeted below $50 per barrel at the time, most projects were not economic. With the structural reforms, favorable cyclical factors and individual changes in the industry, the operational efficiency of Deepwater exploration and development projects has been greatly improved. In 2018 the cost curve of Deepwater projects was moving downward, unit costs have fall by more than 50% compared with 2013. International companies have greatly increased the efficiency of deep water operations by optimizing project plans and management models. The key factor is the improvement of drilling rate. Operators have greatly improved the completion speed of the project. Cyclical factors also make the Deepwater industry more economic, including lower rents for drilling platforms and lower supply chain costs. Major changes have taken place in Deepwater industry through many measures such as re-evaluating project design and improving well performance. The drilling rate of single well has decreased by 20% in Brazil, 42% in the North Sea and 30% in the Gulf of Mexico since 2014. The cost of deep-water projects has fallen by 40%[4-5].

While the average NPV15 breakeven cost of the whole Deepwater industry has fallen to 49 US$/boe, significant differences remain in the regions. Latin America offers the strongest pre-FID project economics, with Brazil and Guyana the top producers. As its massive wells and world-class production capacity, Brazil is an important hot spot. Another area that should pay attention in the future is Mexico. Mexico contains huge potential that has not yet been drilled, no more than 60 wells have been drilled in the deep waters areas. Compared with the Gulf of Mexico, thousand wells have been drilled. The development of west Africa is still not economical because of tough fiscal rules and high costs.
However, costs will not always remain low. As the market recovers, the services cost will rebound again, and the cyclical advantage will disappear gradually. For instance, the average daily rent of drilling rigs is about $500,000 in 2013. Due to insufficient demand, cost has dropped to $150,000. With the slow recovery of investment cycle of Deepwater projects, the daily rent cost will be pushed back to $300,000 or $350,000 after 2020, which is less than the high level in 2013. But it is still twice the current level.

4. Suggestions for Chinese Company
China has abundant oil and gas marine resources. cumulative proven reserves of oil are 5 billion tons. The cumulative proven reserves of natural gas are 1.3 trillion cubic meters. Reserve increased rapidly and has very broad prospects for utilization. At present, four offshore oil and gas production base have been built in the Bohai Sea, East China Sea, East South China Sea and West South China Sea. There are 122 oil and gas fields in the production base. However, the degree of exploitation of offshore oil and gas resources is still very low in China. According to the third resource evaluation, the average proven resource rate of oil and natural gas is only 12.3% and 10.9%, far below the world average rate of 73% and 60.5%.[6]China's marine engineering and technical equipment are relatively backward. The production in the Deepwater block cannot meet the growing energy demand of China's economic development.

Chinese oil company should participate in international competition and cooperation actively, extend and upgrade the whole offshore industry chain. Deep-water projects have many characteristics of high risk, high investment and high return. First, companies should assess the many factors, including the resources prospects, political and security risks of resource countries. Secondly, companies should make a detailed study of deep water business cooperation model, and accumulate project operation experience for reference so as to grasp the operation capability of deep water projects as early as possible.

With the maturity of onshore exploration, Deepwater projects are facing new development opportunities. Chinese enterprises should seize the opportunity that the exploration and development of deep-water resources are still at an early stage in most global areas. They should plan the Deepwater strategy as soon as possible and participate in international cooperation widely by asset acquisition, company mergers and acquisitions or equity participation. Companies should make full use of existing deep-water projects to train their own engineers by various international cooperation and training programs. Meanwhile, companies should adopt more flexible mechanisms and methods to promote Deepwater international cooperation, including joint ventures operation, brain exchange mechanism and so on.

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