

Exploration and appraisal activities in 2006 - 2012, plan for 2015 and strategy for future upstream activities

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Abstract

One of the most important activities to the technical staff in general and petroleum geologists in particular is to orient the exploration activities, to evaluate the potential hydrocarbon reserves then to conduct its production logically. The first issue of this paper is to introduce to the readers and to colleagues (in and out of the petroleum domain), a summary of the exploration and appraisal activities of Petrovietnam in Vietnam as well as overseas during the period of 2006 - 2012 with the sudden changes reflecting, especially in background of the world's economic crisis that has occurred. Several petroleum contracts have been signed, the 2D and 3D seismic acquisition has been conducted, more than 150 exploration and appraisal wells have been drilled during this period and several new fields/ discoveries have been found in both offshore Vietnam and overseas. The total incremental reserves is one of the good examples to demonstrate that Petrovietnam's orientation in the oil and gas exploration, appraisal and production domain is correct.

An exploration and appraisal plan for 2015 and a strategy for further campaigns of exploration and appraisal have also been dealt with in this document with the main points and real events being emphasised. This paper also presents the importance of extending co-operation, sharing experiences and strengthening the abilities to farm-in overseas petroleum contracts by applying a diplomatic petroleum policy.

Content

In the context of a background global economic crisis, the petroleum industry in Vietnam is facing an important challenge, how to continuously affirm Petrovietnam as a key industry with the receipts per year of around 25 - 30% of Vietnam's GDP. It is requested that Petrovietnam needs to have the right orientation in this new stage, in order to maintain stable national power security.

Although Petrovietnam's functions comprise all up to down-stream activities, with exploration, appraisal and production in upstream; in mid-stream storage, transportation, export and import, processing, distribution and sales of petroleum; and downstream is refinery and petrochemistry, finance, banking, insurance and other related services, Petrovietnam always defines its core business (a main function) as exploration and production activities.

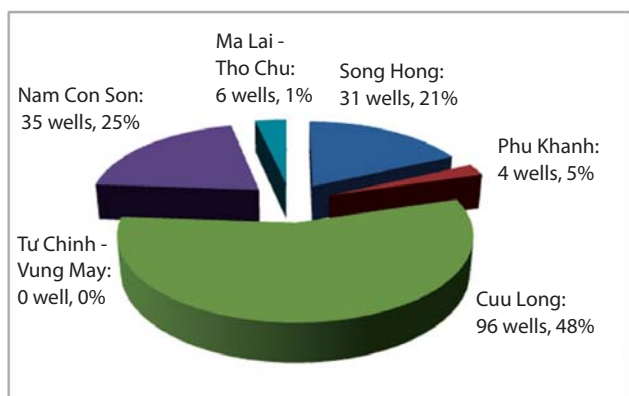
The real results of 2006 - 2012 have confirmed Petrovietnam's orientation in exploration and production both in Vietnam and

overseas, was correct. Besides keeping oil production stable and conducting exploration and appraisal activities in order to drill potential prospects and upgrade new discoveries to development and production, ensuring the incremental reserves were stable, was also very important to Petrovietnam during this period.

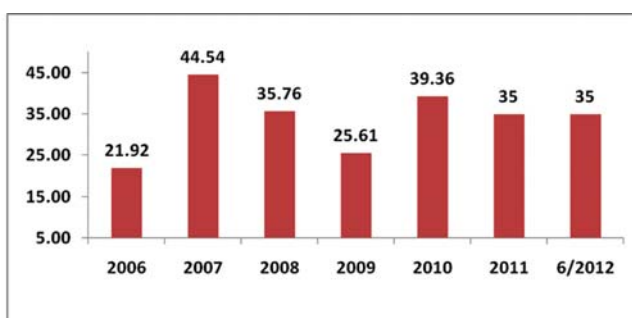
Since Petrovietnam took the initiative of seismic acquisition, up to June 2012, much seismic information

Year	Petroleum Contract
2006	5
2007	7
2008	7
2009	13
2010	4
2011	5
2012	1 (+4)
To 2015	5 per year

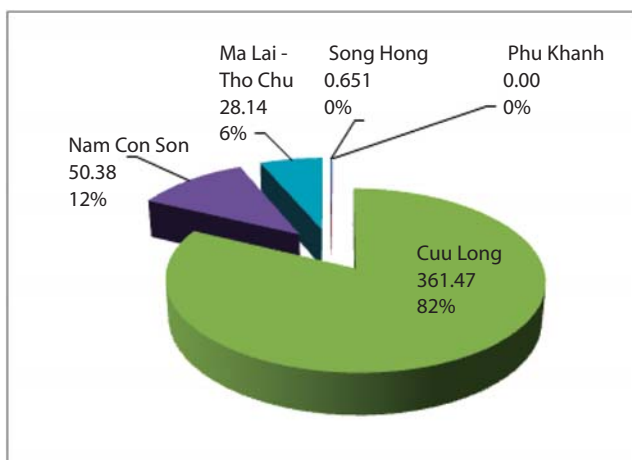
Well	2006	2007	2008	2009	2010	2011	6/2012	Total
Exploration	8	21	15	15	17	11	4	91
Appraisal	17	12	13	13	9	10	7	81
Total	25	33	28	28	26	21	11	172



Number of exploration and appraisal wells in 7 years (2006 - 2012)



Incremental Reserves in the last 7 years (2006 - 2012) (MM tons)



Cumulative production distribution in Vietnam (dated to June 30, 2012)

has been acquired with 85,000km² of 3D and 130,000km of 2D, covering all blocks and basins in Vietnam’s continental shelf, both onshore and offshore.

In the period 2006 - 2012, there were 62 petroleum contracts in effect, with 3 - 5 petroleum contract per year in new areas and relinquished areas. This indicates the success of Petrovietnam in attracting foreign investment to Vietnam as well as Petrovietnam’s own investment.

The exploration and appraisal activities therefore have been conducted vigorously, with more than 550

exploration and appraisal wells being drilled by operators and Petrovietnam/PVEP. During 2006 - 2012, 172 exploration and appraisal wells have been drilled focusing on the Cuu Long basin (96 wells), the Nam Con Son basin (35 wells) and the Song Hong basin (31 wells)... More than 375 million tons of oil equivalent have been produced (440 million cubic meter of oil equivalent) with most in the Cuu Long and Nam Con Son basins (in 2006 - 2012, 94.50 million tons of oil equivalent). The production was stable with 15 - 17 million tons of oil equivalent per year in Vietnam. The incremental reserves were still around 35 million tons in the recent years as the 5 year’s plan 2006 - 2010, though Petrovietnam still faces with more challenges: The huge fields are now in a declining stage, the new fields/discoveries are mostly small (marginal fields) with high production expenditure...

The overall exploration overview shows that the Cuu Long basin is still important with the facilities and the infrastructure available, the exploration and production activities hence have been focused to upgrade the new discoveries/fields to develop (the number of exploration and production wells in the Cuu Long basin is 96/172 wells, with 48% of exploration and production wells in 2006 - 2012), the production reserves in the Cuu Long basin hence amount to 82% of the total reserves in Vietnam.

There are some kind of plays which have been found in the period of 2006 - 2012 called new play concept: Karstified carbonate basement (Ham Rong), stratigraphy trap in the Miocene (Cat Ba), new gas discovery in carbonate reef in the Lower Miocene with CO₂ not so high (Ca Voi Xanh) in the Song Hong basin; the petroleum system in the Phu Khanh basin has been confirmed with the reservoirs in carbonate reefs of Miocene age (Ca Map Trang, Tuy Hoa); the oil discovery in Pre-Tertiary weathered granite basement in Nam Con Son basin (Gau Chua - Gau Ngua - Ca Cho) has been evaluated as a new play with high potential resources in this basin which has high pressure, deep water, petroleum system. Based on new technology, it will be ready for development and production in the near future.

However, Petrovietnam has always thought that the potential resources in Vietnam are not great, hence the policy of speeding up the investment overseas has been the orientation of Petrovietnam since 2006 with remarkable success. Up to now (June 2012) 24 petroleum contracts have been signed by Petrovietnam/PVEP,

in which 18 projects have been conducted: fields in production such as Cendor (PM-304), D30 (SK-305) (Malaysia); North Khosedaiu, Visovoi (Russia); fields under development such as 433a & 416b (Algeria), Junin-2 (Venezuela), 39 (Peru), West Khosedaiu (Russia) and Nagumanov (Russia). Eleven projects are in the exploration phase, such as:

1. Block Champasak & Saravan (Laos);
2. Block Savanakheth (Laos);
3. Block XV (Cambodia);
4. Block Randugunting (Indonesia);
5. Block M2 (Myanmar);

6. Block Danan (Iran);
7. Blocks N31, N32, N42, N43 (offshore Cuba);
8. Block 162 - Ucayali basin (Peru);
9. Block Marine XI (Congo);
10. Block Majunga (Madagascar);
11. Block Kossor (Uzbekistan).

Up to June 2012, Petrovietnam acquired more than 18,500km of 2D seismic and 7,500km² of 3D seismic information and drilled 58 exploration/appraisal wells. The incremental reserves (shared for Petrovietnam/PVEP's percentage) is around 175 million tons of oil equivalent (1.3 billion barrels of oil equivalent), getting 24 million tons of oil equivalent per year with probability of success (POS) as 36%, higher than that of the 5 year's plan 2006 - 2010 (25%).

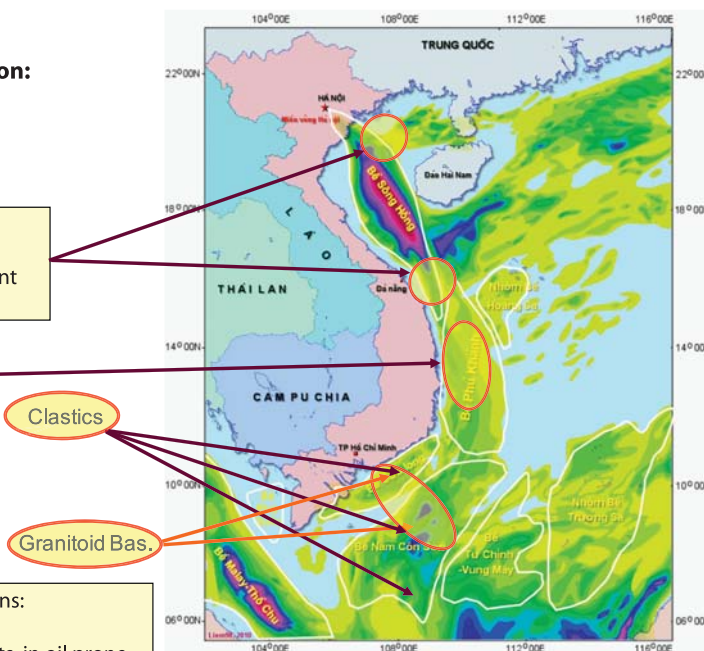
Vietnam briefly evaluation: Important discoveries in 2006 - 6/2012

Song Hong: New plays:
 - Stratigraphy
 - Buried carbonate basement
 - Carbonate reef

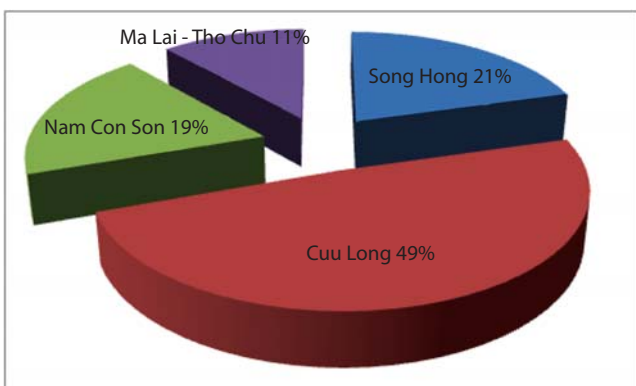
Phu Khanh
 - Petroleum existed
 - Carbonate reef

Cuu Long: New plays:
 - Middle Miocene
 - Oligocene (E, F)

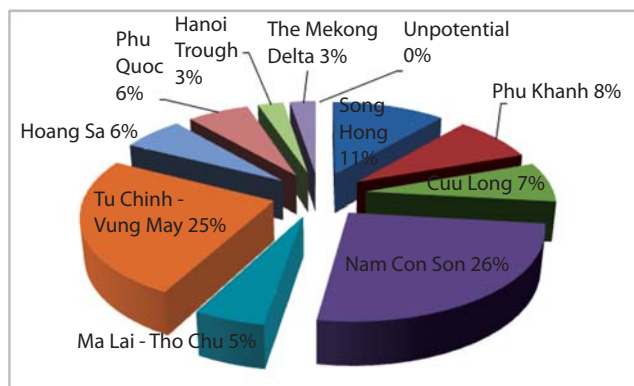
Nam Con Son: Lesson Learns:
 - Granitoid basement
 - Oil disc. in closures w/faults, in oil prone



As the annual hydrocarbon reserves and potential resources report (dated to 31 December, 2011) approved by Petrovietnam's President and CEO shows, the recoverable resources are around 1.85 - 4.80 billion cubic meter of oil equivalent, in which reserves are 1.40 billion cubic meter (Song Hong



Recoverable Resources (un-mapped) around 1.45 - 3.40 billion cubic meter of oil equivalent



Recoverable reserves (includes the discovery) around 1.40 billion cubic meter of oil equivalent



Acquisition Vessel: Binh Minh 02



Jack up - PVD 1

21%, Cuu Long 49%, Nam Con Son 19% and Ma Lai - Tho Chu 11%). With 450 million cubic meter of oil equivalent produced, the remaining reserves are around 950 million cubic meter of oil equivalent. The remaining recoverable resources in Vietnam are around 1.45 - 3.40 billion cubic meter of oil equivalent, of which: Nam Con Son comprises - 26%, Tu Chinh - Vung May - 25%, Song Hong - 11%, Phu



DST #2: Kinh Ngu Trang - 1X (Oligocene: 1,200 - 1,500pbd)

Khanh - 8%, Cuu Long - 7%, Phu Quoc - 6%, Hoang Sa - 6%, Ma Lai - Tho Chu - 5%, Hanoi trough - 3% and Cuu Long trough - 3%.

With the policy of speeding up the exploration and production activities in deep water, Petrovietnam's plan to 2015 and the strategy beyond is to continuously conduct seismic acquisition in these areas including: Phu Quoc, South - East Nam Con Son basin and Phu Khanh deep water areas. Petrovietnam will negotiate in order to sign more new petroleum contracts, joint studies, bilateral/trilateral contracts, non-exclusive seismic acquisition contracts and self-investment contracts based on co-operation and co-development between all regional countries. The main target of Petrovietnam's exploration and production in Vietnam is keeping in balance the production of 30 - 35 million tons of oil equivalent per year.

For its overseas exploration and production strategy, Petrovietnam will continuously conduct effective exploration and production activities in the areas where petroleum contracts have been signed, speed up new discoveries/fields to development/production stages with the incremental reserves 50 - 75 million tons of oil equivalent to 2015; trying to get the overseas production as 10 million tons of oil equivalent by 2015 (3.3 million tons of oil equivalent per year). Petrovietnam would also like to farm-in the overseas petroleum contracts by the petroleum diplomatic policy in order to get more discoveries/fields in development/production phases to supplement to the internal reserves, and to expand the exploration and production activities in regional areas as well as worldwide.